

Minimise Study Time Maximise Scores



Exam/Study Tip # 6: Developing a Faster and Smarter Brain

Neurons are the main cells that make up the nervous system, transmitting electrical and chemical signals between one part of the body and another.



The human brain has over 100 billion neurons or nerve cells which control bodily function – from regulating cellular reactions, enabling you to think and learn, to coordinating movement of the body.

In the brain, nerve cells don't work alone. They form highly interconnected networks where the activity of one neuron directly influences many others.

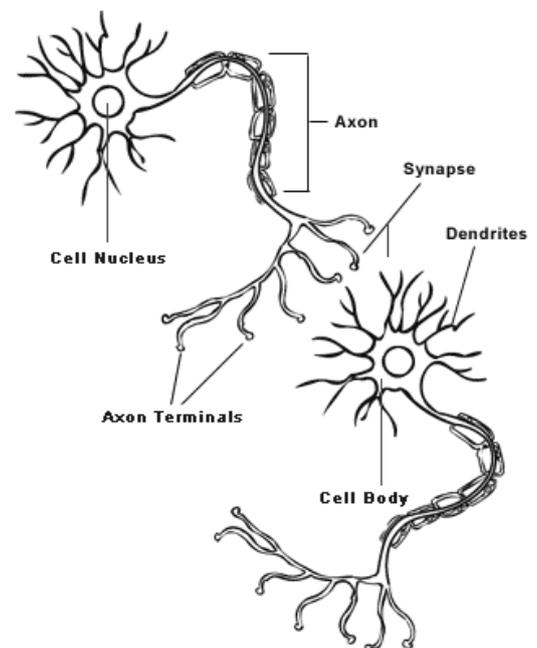
Within these neural networks, nerve cells are aligned in a head-to-tail fashion, and are separated by a small space called the synapse. Brain chemicals known as **neurotransmitters** are able to cross the synapse, relaying signals from one neuron to the next. Transfer of information occurs quickly and efficiently – recent studies show that our brain can process the equivalent of 20 Mb/sec through the optical nerve alone!

Neuroplasticity

Scientists used to believe that a brain's structure could not be changed or improved. Over the last 20 years, research has, however, shown that our brains can adapt, change and grow throughout our entire lives. The brain is capable of finding new and better ways to organise neural connections, remove neural pathways that aren't being used, and very importantly, create new ones. This ability to adapt and change is called **neuroplasticity**.

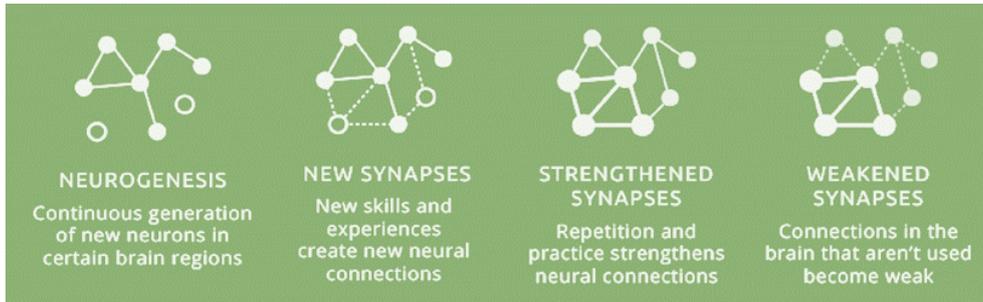
Neuroplasticity can result from:

Traumatic events	Stress
Meditation	Emotions
Paying attention	Learning
Social interactions	New experiences
Diet	Exercise



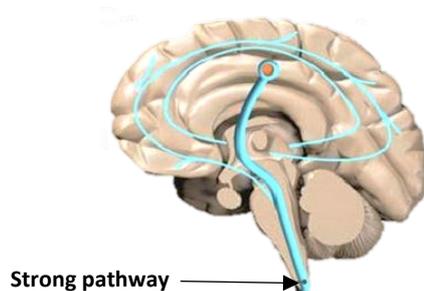
Neural Pathways and Neuroplasticity

Every pathway within a network is associated with a particular action or behaviour. How this pathway is used will ultimately determine its fate.



- Every time we think, feel or engage in an activity, we strengthen the corresponding neural pathway.

i.e. Practise and repetition strengthen neural pathways.



- The more frequently a pathway is used, the easier it is to perform the corresponding action or behaviour.

i.e. The more you practise a skill, the easier it becomes to apply.

The more you revise a topic, the easier it becomes to retrieve and apply that information in tests and exams.

- Neural pathways that don't get used on a regular basis become weaker, which is why we then find that skill or activity harder to do.

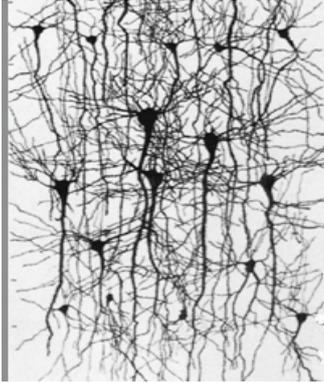
i.e. You'll forget what you've learned unless you revise it on a regular basis.

- New thoughts and skills produce new neural pathways.

i.e. To create new neural pathways and connections, you need to apply what you've learned to questions and applications that are different to what you've previously been exposed to.

- As the number of neural pathways increases, it takes less time to send signals from one part of the body to another.

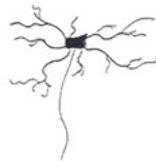
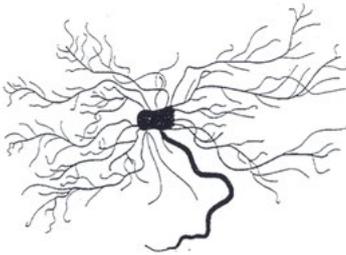
The greater your exposure to different applications and perspectives, the more effectively information becomes engrained into long-term memory. It then becomes faster and easier to recall information when it's needed, and how effectively you're able to apply information in the exams.



An extensive neural network (left) consists of larger numbers of neural pathways and connections than less developed networks (right).

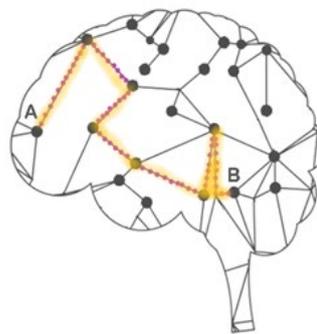
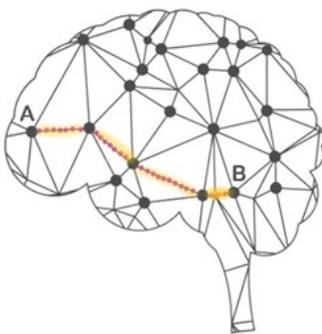
Extensive neural network

Less developed networks



Extensive neural network

Less developed networks



Not only does an extensive neural network (left) offer a greater number of neural pathways, it also provides more direct (and time-saving) pathways to transmit electrical and chemical signals from one part of the brain to another.

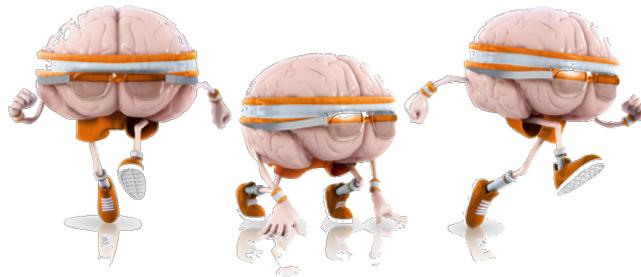
Brain Training

In the same way that physical fitness improves when we exercise the body, brain training (or cognitive training) uses mental exercises to maintain, or improve, brain fitness.

Brain training activities take advantage of the 'plastic' nature of the brain to build new neural pathways, and to strengthen existing ones. This in turn results in:

- Improved cognitive abilities eg. attention, memory and learning.
- **Better problem-solving skills.**
- Faster and more efficient brain processing.
- **Less time being spent studying.**
- **Better performance in tests and exams – and hence higher HSC marks!**
- Reduced risks of age-related dementia and neurodegenerative conditions.

Examples of brain training activities includes logic puzzles, memory exercises, brain teasers and computer games.



Neurobics

Neurobics are mental exercises or activities that force you to think, act and use your senses in unique, unusual and non-routine ways.

Where brain training programs mainly use sight, sound, and some touch, neurobics uses the full range of senses to create new neural pathways. It also takes advantage of the brain's natural tendency to form associations between different types of information, resulting in stronger and more extensive neural connections between different parts of the brain.

"What your brain does most is form associations between different senses. That's what your brain is really good at; that's what it is designed to do."

Lawrence Katz, professor of neurobiology at Duke University Medical Centre

Benefits of neurobic exercises:

The primary goal of neurobics is to improve mental fitness, boost brain activity and reduce cognitive decline. You'll also:

- Stimulate brain growth and build neural connections.
- **Improve creativity, memory, attention, processing speed and problem-solving ability.**
- Improve the endurance, flexibility and the power of your brain.
- **Reduce the time being spent studying.**
- **Maximise academic performance, resulting in higher ATAR 'scores'.**

- Develop a neural structure that enables you to meet challenges more effectively.
- Improve your mood and mindset.
- Fight off the effects of mental aging and reduce the chance of developing a neurodegenerative condition.

Neurobic exercises are more effective than typical brain training programs, and unlike many expensive brain training courses and products, are completely free! Furthermore, as most neurobic exercises don't need specific items or equipment, activities can be easily incorporated into your normal day!

How It Works

Neurobics = Neurology + Aerobics

When performing neurobic exercises, we involve all six senses – not just the dominant ones of vision and hearing.

To be effective, neurobic exercises should do the following:

(a) Use at least one of your senses in a new and different way.

Routine activities become so automatic that they're usually performed unconsciously. These activities require less brain activity and don't challenge or exercise the brain, leading to declining memory, poorer attention, slower processing speed and reduced problem solving ability.

On the other hand, unique activities and thoughts challenge new parts of the brain, resulting in the creation of new pathways, and strengthening existing neural connections.

For example: Writing with your non-dominant hand.

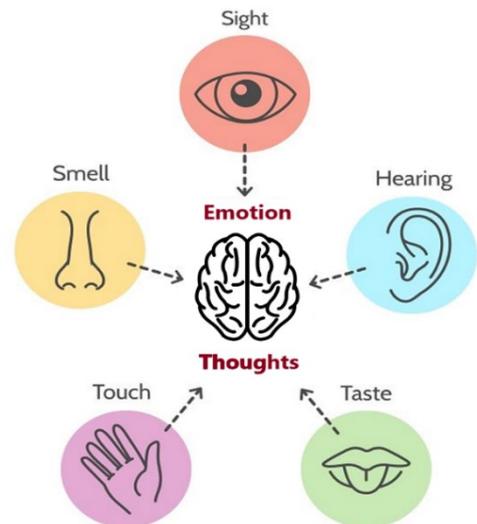
If you're right-handed, when you change to writing with your other hand, the large network of connections and circuits, which are normally rarely used, become highly activated.

Note: Research studies have shown that using multiple senses at the same time results in stronger and more extensive neural connections being formed. You should therefore perform neurobic activities that use multiple senses simultaneously, and as often as you can.

Examples include:

Listening to a specific piece of music while smelling a particular aroma.
[Two senses have been engaged]

Both music and smells are powerful stimuli that evoke different emotions. However, we don't normally listen to music in the context of odours or vice versa. The repeated pairing of these two stimuli will therefore make your brain create powerful links between the two, increasing the number of pathways available for storing or accessing memories.



Showering with your eyes closed.
[Multiple senses have been engaged]

*When you don't use the sense you'd normally use for some activity, particularly a dominant sense like sight, the less dominant senses become more active, stimulating neural pathways that you rarely use. Showering with your eyes closed engages several senses simultaneously, especially your sense of touch. It will also challenge your brain to **relate spatially** to the areas in the shower.*

While gardening, breathe in the fragrance of fresh flowers, and taste some edible plants that you've been nurturing. Close your eyes and listen to the birds, and observe how the insects react as you top up your garden beds with fresh soil.
[All five senses have been engaged]



(b) Engage your full attention, at least briefly.

Research has repeatedly shown that social deprivation has **severe negative effects on mental health**, as well as overall cognitive abilities. So, involve your friends in some of your neurobic sessions as often as you can. And don't forget to regularly change some aspect of an activity so it doesn't become repetitive or boring. Just as long as you avoid routine or everyday type events – there are no restrictions as to how you choose to make your activities different, surprising, or unusual, and as much fun as possible!

(c) Break your routine in an unexpected and significant way.

Novelty: The quality of being new, original or unusual.

Brain imaging studies show that novel tasks activate large parts of the brain. Once activities become routine or automatic, activity levels across many areas drop substantially. Therefore, add unexpected and unplanned elements to routine activities.

For example:

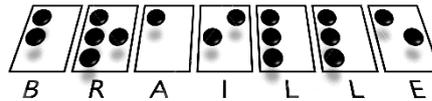
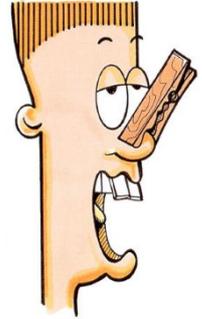
Turn a book upside down and read one or two pages. This forces the opposite side of your brain to take over (the right-hand side) – using completely different neural pathways, while it tries to interpret the new images, shapes, colours and relationships. As a result, your brain flexibility is increased.

- Try to pick up items with your toes rather than your fingers.
- Work through unfamiliar examination-style questions.
- Take a different route to school.
- When dressing, put your clothes on in a different order.
- Sit at different desks and next to different people at school.
- Vary the order in which you execute your normal routines (e.g., get dressed after breakfast).
- Change the setting on your radio alarm, or tune into a morning TV program you never watch.
- When you're having a debate with friends, assume the opposite position to that which you'd normally take. You'll find that you'll need to use every bit of creativity and as many different neural pathways if you're to come up with intelligent and persuasive arguments to support your points of view!



Mixed Neurobic Activities:

- Study in different locations.
- Take up a new leisure activity such as yoga, dancing or boxing.
- Wear a patch over one eye while you're cleaning, gardening or doing an activity which needs you to regularly change your position. The patch over your eye will cause you to lose depth perception, and your brain will need to rely on different cues to be able to execute that activity.
- Hold your nose as you try different foods. You won't be able to recognise many of the flavours! Holding your nose forces you to focus on your different taste buds and the textures in your mouth. As a result you use and strengthen different neural pathways.
- Balance on one leg.
- After every hour or two, recollect the activities you were involved in and the order in which they occurred.
- Start a new hobby, but choose something you've never done before.
- When we create art, we use thought processes that are very different from the logical, linear thinking that occupies most of our waking hours.
- Participate in treasure hunts.
- Learn braille or sign language.
- Try out a new recipe from an unfamiliar cuisine.
- Communicate a thought or idea to someone without using your voice eg. by playing charades.
- Read topics that you're not familiar with. This will give you a new perspective on life and force your brain to adapt to new ideas and concepts.
- Engage in activities that challenge your brain on many levels, such as learning a new language, mastering a new musical instrument and games such as chess and Stratego. Not only will this force you to think in new and novel ways, many games also require that you think very quickly, improving the efficiency of cognitive processes.
- Engage in activities that require you to strategise and interact socially at the same time. Games of this type also require higher level visual-spatial thinking – weighing up dozens of possible moves, attempting to visualise the consequences of each one before selecting the move that offers the best strategic advantage.
- Write with a pencil instead of a pen (or visa versa).
- Wear your watch on the other hand.
- Solve puzzles, crosswords and regularly attempt brain training activities, such as those included in our "Braining Training Activities" booklet that was uploaded with this study tip. These activities will strengthen your problem-solving skills, and improve your ability to recognise and process minor details.
- Regular brainstorming helps your brain create new connections and associations. It also challenges your brain to think uniquely and get beyond the norm. Ideas beyond the norm create stronger memory pods and are more memorable.
- Mentally rotate an image of an item around your brain. This will help you develop high level spatial skills that will improve your processing skills, and enable you to visualise complex scenarios.



- If a bagel and coffee is your daily fare, try something else like hot oatmeal and herbal tea.
- Rearrange your bedroom every month or two. Spatial forces in your visual and somatosensory areas will reactivate as you readjust your mental maps.
- Use your non-dominant hand to brush your teeth, comb your hair, lock or unlock a door, unbutton your shirt and even to eat!
- Go wandering through a market. This activity has it all: novelty, associations between different shapes, colours, smells, tastes, noise, as well as social interaction
- Try to move around your home by memory and feel alone. This will definitely require your full attention, and will help to develop your spatial awareness, coordination and memory. Your brain will also become much more aware of textures and sounds. As an added challenge, try to recall where each piece of furniture is located. Keep away from stairs and take special care when doing this activity.



CHALLENGE ACCEPTED



- Vary the scent of shampoos and soaps.
- Make up your own television programs.
- Stimulate your visual senses by preparing meals using as many different coloured foods.
- Rearrange your desk and/or study. Changing the location of your study tools that you'd normally reach for without thinking challenges your brain to change, and reactivates spatial awareness. In addition, your perceptions of touch and pressure are enhanced.

- Read out loud with a friend or your partner, alternating the roles of reader and listener.
- Listen to different music. After listening to the same songs for a while, our brain begins to ignore or automatically process that auditory information. Changing songs, bands or genres on a regular basis will enable you to form new brain circuits and connections.
- Watch TV or video recordings with the volume muted, and try to work out what the characters on screen are saying. Alternatively, ask a friend or two to join you, and make up your own dialogue based on what you see the characters doing. Not only is this activity fun to do, it also stimulates creative thought.
- Grab as many herb and spice containers as you can, and try to identify each one by using smell alone.
- Distinguish coins using only your sense of touch. Once you've mastered this exercise, try to distinguish different paper notes by touch alone.
- **Taste and identify the ingredients in a dish.**
- Wear gloves when cleaning. The lack of sensory connections between your hands and the various surfaces in your home results in the activation of different brain pathways and skin receptors, creating a totally unique experience.

**SMELL
N' TELL**



Use it or Lose it

Although it takes a bit of time and effort to develop a nice set of muscles, they disappear very quickly if we don't exercise them on a regular basis.

Like body builders, students spend considerable time developing the muscles (or memory) in their brain, as they learn and revise topics for their school assessments. However, once these assessments are over, the majority of students don't revisit what they've learned until they're preparing for their end of year exams.

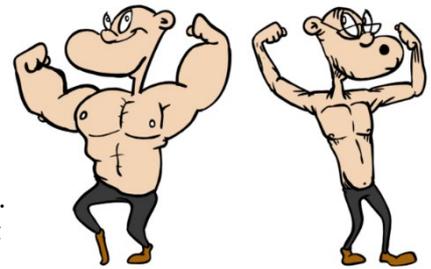
But just like muscular strength, memory is a "use it or lose it" proposition, with up to 80% of learnings being forgotten within a 4 to 6 week period! These students then have to go through the same painful and time-consuming learning process before their exams, when short regular reviews would've taken a fraction of that time!

And so, if you're prepared to exercise your brain on a regular basis:

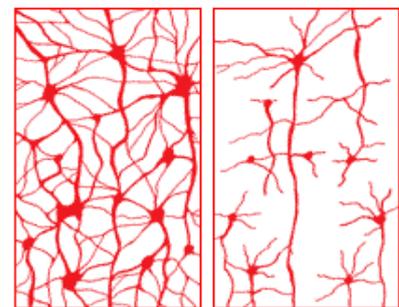
- Neural pathways will become stronger.
- Larger numbers of neural pathways and connections will be created.
- You'll be able to store more information in long-term memory.
- Your memory will improve significantly.
- You'll spend less time completing homework and memorising examinable materials.
- You'll decrease the time you spend studying.
- It will become easier and take less time to apply set skills and to complete tasks and activities.
- You'll be able to process and apply information more effectively in tests and exams, and at a considerably faster rate.
- You won't need to waste valuable time relearning materials before your exams.
- You can spend more time working through additional past examination papers.

And of course, you'll achieve much higher HSC marks!

Happy exercising!
TSFX



Brain Cell Connections



Use it

Lose it

