Revision Guide

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Introduction

- What determines whether a study technique is effective?
- How might you know whether the study techniques you currently use are working, or whether changing these would lead to greater success in exams?
- What new techniques might you choose to develop to make your studying more effective?

This guide is designed to help you to establish great revision and study habits that will serve you well in every exam that you take now and in the future.

From the start, it is important to recognise that the strategies that most students use seldom are the most effective. For instance, students will often use highlighting and/or underlining text to indicate what needs to be learned. But knowing what to learn and learning it are not the same thing.

Similarly, students often leave studying to the last moment and then cram all their study into a short period. This might provide them with sufficient content to pass an exam, but it does not create sticky learning that can be used in the future. This means that students might have to relearn material that they thought they already knew.

But there are study techniques that work to both help create memory for information to be used in exams and that promote long-term learning that will last a lifetime.

This guide is designed to help you to revise in a way that leads to longer and more durable learning before, during and after your exams.

What determines whether a study technique is effective?

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What Needs to Happen in the Brain for Effective Revision

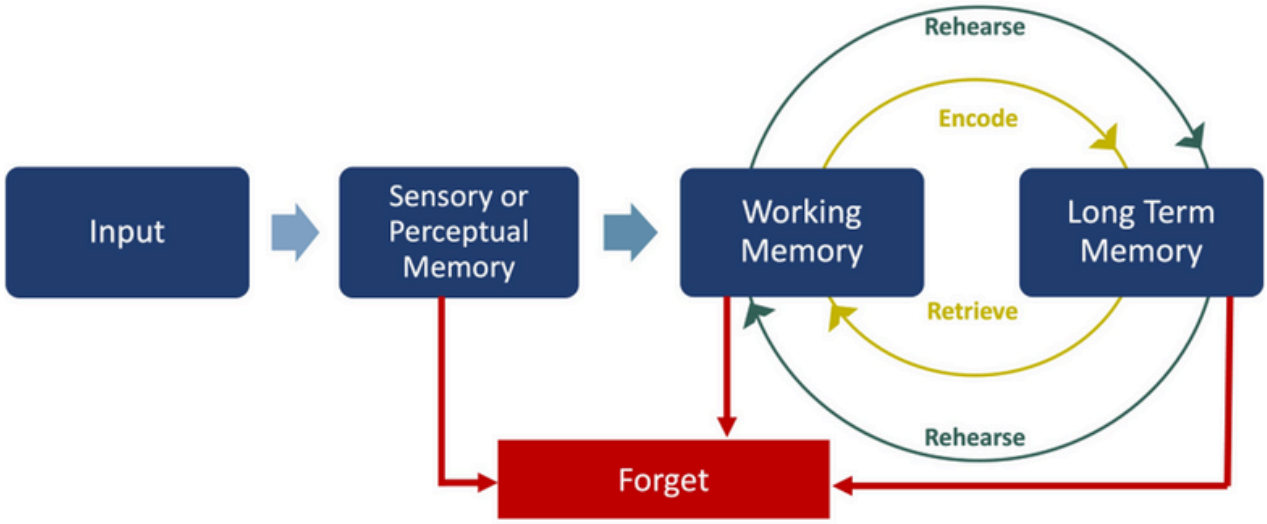

Figure 1: Diagram showing the processes involved when new information is stored in long term memory

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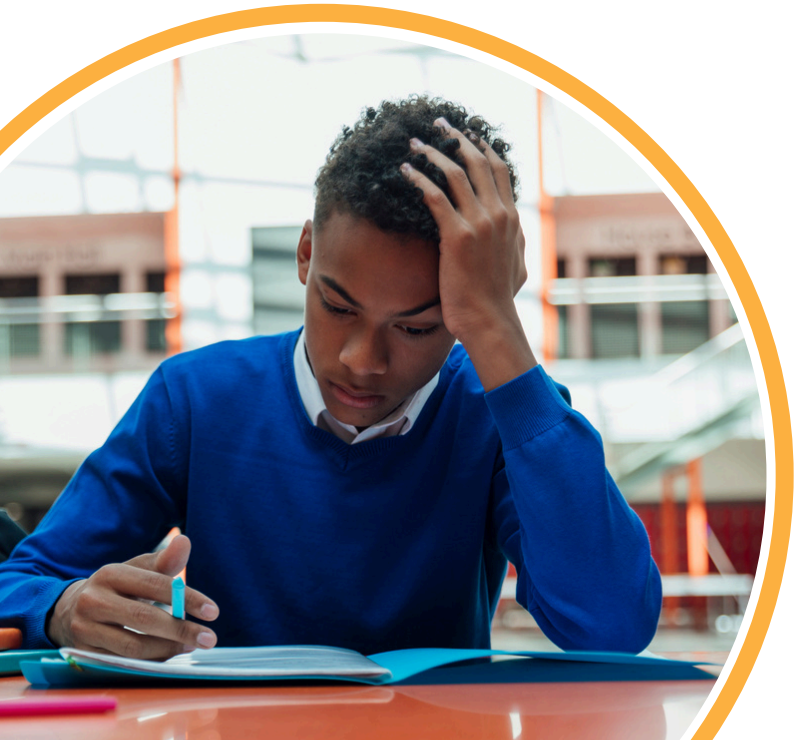
There are several stages of processing that occur in the brain when you are revising. These include:

1. Selecting the material that you want to revise. This forms the input that you would like to store in your memory. (Input)
2. Using your senses (vision, hearing, movement and emotion, smell and taste) to encode the information that you wish to remember (sensory or perceptual memory). This might include reading a text (vision), listening to a podcast (hearing), watching a video (hearing and vision), The more senses you use when encoding new information, the easier it will be to retrieve the information later.
3. Selecting parts of the sensory input to transfer to working memory (working memory). Sensory memory has a larger capacity than working memory and so you will need to choose the most important parts of the learning to store here. You can do this by creating a song, rap or poem, thinking about how this information might be useful to you in the future, or any other technique that helps you to summarise the important parts of the information you want to remember.
4. Rehearsing the material to be remembered so that you form a strong memory for this (encode in long-term memory). The more often you rehearse, the stronger the long-term memory will become.
5. Rehearsing accessing or retrieving the information from long-term memory (retrieving from long-term memory). The more often you rehearse this, the easier the memory will be to recall when you need it.
6. Checking that you are not forgetting important information by testing your recall (preventing forgetting).



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Which Revision Techniques Work?

Here are four key elements that will make your revision as effective as possible:

1. *Plan your studies*

Plan when you will study and what topics you need to cover well before the start of the exams allows you to be in control of your revision. Make sure to build in time off to see friends and family, time to exercise and time to think.

2. *Make tables, lists, mind maps or flash cards*

Summarise the information you want to learn in tables, lists, mind maps and flash cards. This technique requires you to understand the topics so that you can select the key information to revise. This personalises the information and makes it more memorable. This will help you to select the material you want to remember so that it is held in working memory.

3. *Test yourself on your tables, lists mind maps and flash cards*

Ask a friend or family member to test you on the content of your tables, lists, mind maps and flash cards. This will help you to encode the information in long-term memory and gives you a chance to check that the material is not forgotten. Becoming proficient at recalling this information is important in building your confidence that you remember everything and will be able to recall this when you need it.

4. *Practise past papers*

Use past papers to test yourself on how well you can apply all the information you have learnt in an exam situation. This allows you to be sure that you can remember the information under exam conditions. Put all your revision materials away and set a clock for the time that you will have in the exam. Then sit the paper as if you were taking the exam.

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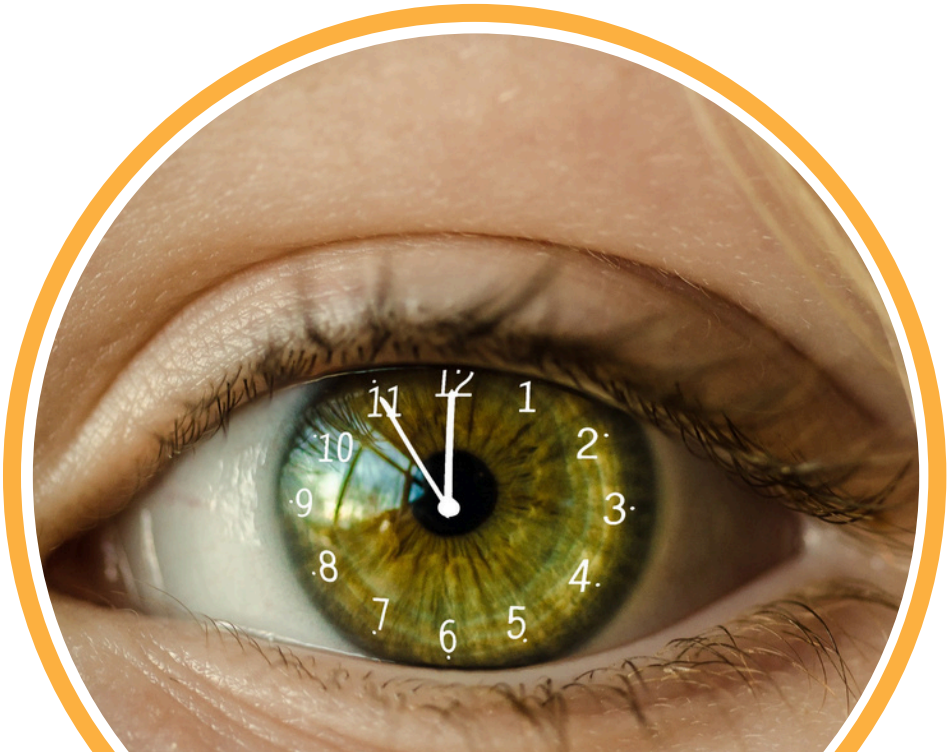
When is the best time to revise?

Research has demonstrated that students who revise during the day (larks) outperform those who revise in the evening (owls) (Preckel et al., 2013).

After matching students for a range of characteristics, these researchers concluded that owls perform worse at school as a result of synchrony effects - that is, people tend to excel when tested at the time of day that is optimal for them. This gives larks an advantage since they are alert and awake during school hours, while owls come to life later in the day when school is over.

Ideally, this would suggest that you should revise during the school hours as this is when your examinations will be! However, this will be more challenging for owls than for larks.

There is hope however since being a lark or an owl might depend as much on our habits as our genetics. Research during COVID suggests that, when schedules changed, many people moved from being larks to owls. Thus, it is also possible to train committed owls to become more lark-like. The table below shows the steps you might take to do this. Please remember that you are creating a new habit. Consistency is key to this – the more reliably and often you repeat the steps, the more likely it will be that you will create a new habit.



Target	What to do
Waking Up	Try to wake up between 7 and 8 am every day. Keep the same waking time (+/- 15 minutes) every day. including weekends and non-school days.
Going to Bed	Try to go to sleep between 10 and 11 pm every night. Keep the same bedtime every day including weekends and non-school days. Stop revising at least 3 hours before bedtime whenever possible. Have a bath before bedtime for relaxation. Keep your bedroom cool (between 15-19 degrees Celsius) if possible.
Light exposure	Maximise outdoor light exposure during the morning hours. Stop using devices at least 2 hours before bedtime to limit blue light exposure in the evenings. Keep the bedroom as dark as possible. If your curtains are not lightproof, wear a sleep mask.
Eating Habits	Keep to the same mealtimes every day. Eat breakfast as soon after waking up as possible. Eat lunch at the same time every day. Eat dinner before 7 pm every evening.
Caffeine	Do not drink coffee after 3 pm.
Napping	If tired, take 20-minute power naps in the morning or early afternoon. Do not nap after 4 pm
Exercise	Have a regular exercise schedule including high aerobic exercise. Schedule regular exercise in the morning.

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Where should I revise?

It used to be thought that it was important for pupils to have a single, structured environment for revision – a desk in their bedroom, or space at a table. And having somewhere comfortable to study is still a good idea. However, another important factor when studying is how to separate the information from different subjects so that it is easy to remember. One way that this can be achieved is by studying different subjects in different locations. Then, when you are in the exam, you can retrieve all the information about e.g., English or History by remembering where you were when you studied this.

Often, this can be highly impractical, but it is still possible to add different contexts in other ways. For instance, you might use different coloured pens, paper and folders for each topic, or schedule revision of each topic at the same time each day, e.g., English in the morning, History over lunch and Maths in the afternoon.

You might also want to become accustomed to the place in which you will sit the exams. Wherever possible, practise doing exams in the same place and conditions you are going to be takingthem. This helps to take some of the uncertainty out of the exams and so will help you to be less anxious and more relaxed when you walk in to take your exam.

If possible, also spend some time revising in the rooms that your exams will be. If this is not possible, at least go and have a look around so that you know what the room is like. You might even take a photo so you have a picture of this whilst sitting past papers in a spare classroom, the library, or your kitchen table at home!

Would changing your technique

lead to greater success in exams? ...

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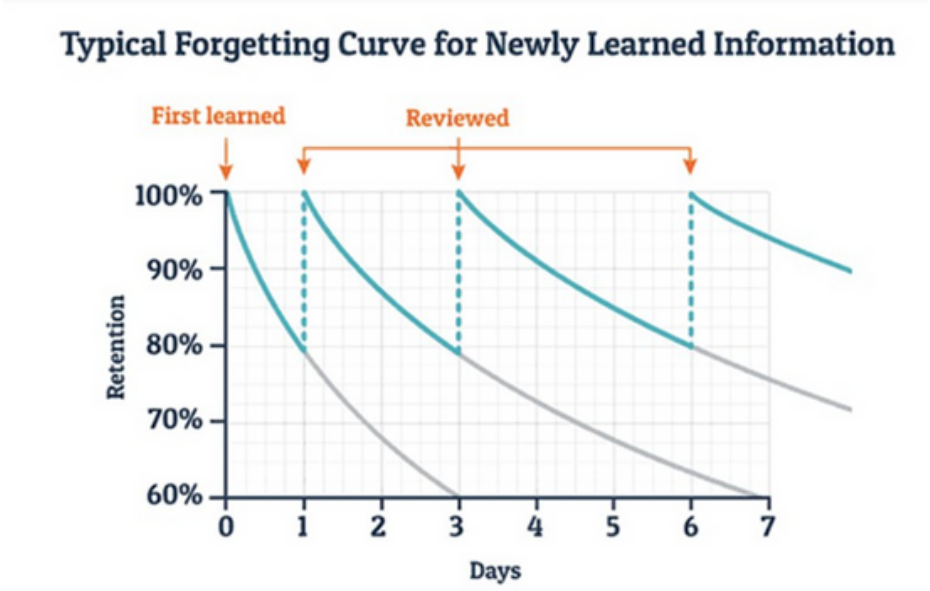
How should I revise?

In this next section you will find a range of different research evidence-informed techniques that will help you to make the most of the time you spend revising.

Spaced Practice



he brain cannot store and recall a lot of information effectively in a short period of time. If we encode information, and then do not recall it again for some time, we forget what we have learnt.

When we encode the information again some time later, this increases the strength of the memory. Therefore, if we want to remember something over a long period of time, it is better to forget it and then come back to it again. Reviewing the information as we begin to forget it helps us to form stronger memories. (Dunloskyet al., 2013; Dunlosky & Rawson 2015).

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Understanding how memory works provides some strong suggestions for how you can make the best of your brain when revising.

1. Cramming is not effective: 5 hours spread over 5 days is better than 5 hours in one day. Interleave your studying by revising several different subjects per day.
2. Leave some time to forget the information you have been taught before going back to review it. This will revive the memory after it has begun to be forgotten, thus increasing its strength
3. Revisit information you were taught days, weeks or months before in progressively longer intervals to increase the effort required to recall it. Start with three days, then one week, then three weeks and so on. If you look at the forgetting curves in the diagram above, it can give you a good idea of the length of time you should leave before revisiting the material.

Retrieval Practice

Cognitive scientists refer to retrieval practice as the 'testing effect'. Taking the time to regularly test yourself using short quizzes and practice questions improves learning (Karpicke & Blunt, 2011). This works by providing feedback on what learning has stuck and what has been forgotten. Knowing this can help you to use your time more effectively by reviewing material that is not yet sticky more often than the material you now know well.

Researchers in the field of memory have coined the term "desirable difficulties" to refer to the idea that memory works better when we make it harder to remember. This includes allowing material to start to be forgotten before reviewing it, coding material in ways that are personal to us including creating tables, mind maps, lists, mnemonics, etc., and testing ourselves on material that we have not yet fully mastered.

Here are some techniques that you might use to do this:

1. Make learning a challenge for yourself by testing what you think you know; even if you don't get the answer right, the process of trying has a significant impact on your ability to remember the information. We often remember the times we were wrong more clearly than the times we were correct.
2. Find ways to make the information personal to you. This might be thinking of ways you will use it in the future, making up stories, poems, raps or drawing pictures to represent new information, or summarising in your own words. Material that is personal to us receives a boost in memory through the self-reference effect. We remember information about ourselves better than information that relates to others.
3. Try using different ways to test yourself, such as flash cards, an app like Quizlet, or completing past papers under exam conditions.
4. Teach the information you are trying to learn to someone else. The act of explaining the material to someone else helps you to remember it. You have to fully understand the information to teach it, so this helps you to personalise the content in ways that are meaningful to you.

Interleaving

You might feel that you want to spend the entire day studying the same topic but the research shows that this is not the most effective way to revise. Interleaving involves mixing up the subjects you want to revise so that you spend a shorter period on each subject but cover multiple subjects during one complete day of revision (Birnbaum et al., 2013).

Cognitive Load Theory

The process of learning requires effort to hold information in the limited part of memory known as your 'working memory' before it is transferred into long-term memory (Leppink 2017). Rehearsing both the encoding of information through interleaving and reviewing information, and rehearsing the retrieval of information through spaced practice and testing are required to make strong long-term memories from the information held in working memory.

Here are some other tips that increase the ability to move information from working to long-term memory:

1. Working memory has very low capacity and can therefore become overloaded quite easily. To prevent this, break down tasks into more manageable, smaller chunks. For instance, you might set a task of e.g. completing the practice questions on cell division in this next 30 minutes, rather than trying to cover everything in biology!
2. Making meaningful chunks for your study requires more planning. Think through what you have to learn and plan this so that you have created small chunks for different subjects that you can interleave.
3. Have regular breaks in between your studying sessions to give your working memory a chance to recover and refresh. The brain consolidates memories when we are relaxed or sleeping so putting in short periods of relaxation (10-15 minutes is enough), and making sure you sleep well, helps to improve your memory.
4. Scaffold your revision. Begin by revising the information that you feel most confident in so that this can then support you when you move to the more complex material.
5. Avoid distractions and multitasking. The working memory can only do so much at any time so do not dilute it by trying to add other distractions to your studying. Put away your mobile phone and shut off social media during revision sessions and only check these as a reward during your breaks.

Be Curious

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Intelligence and effort and intellectual curiosity are all important determinants of overall academic performance (von Stumm et al. 2011). Curiosity activates the reward system in the brain so that we feel rewarded by either knowing the answer to a question or learning the answer to something that we did not previously know.

We can use natural curiosity and the reward it brings by:

1. Instead of accepting answers to questions at face value, think about 'why' the answer is correct (or not). Be critical of the information you receive and try to understand the steps which resulted in your answer. The more we involve ourselves in new information and the processing of learning, the more effective the learning becomes.
2. Feeling curious about topics can boost your memory even when it comes to information you find less cognitively stimulating. Find those subjects which really interest you and revise them along side less 'interesting' subjects.
3. Take time to reflect on your learning as this has the potential to give you a good indication of your abilities and what areas you need to work harder on.
   a. What have you remembered easily and what has been harder to remember?
   b. What might be different between your attitude, motivation or learning approach to topics that would create differences in the effectiveness of your learning?
   c. How might you use the more effective techniques you have developed for the topics you find easier to learn those that you currently find harder?

Mentally preparing for your exams

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How do I keep myself calm before, during and after the exams?

Exams can be a source of stress and anxiety with some people finding this more stressful than others. It is perfectly normal to get nervous before your examinations. Butterflies, feeling sick, needing to go the toilet more than normal-these are all ways that your body reacts to the fight or flight response. This response kicks in because you care about your examinations- use these feelings to remind yourself about the hard work you have put in and embrace this feeling.

Both being anxious and stressed are important emotional signals. Knowing what they are signalling and how we might react to this can help us feel calmer in exam situations.

Feeling anxious is a signal to inform us that there is something coming up for which we need to prepare. It is often caused by uncertainty about what will happen. This is why preparing for exams by studying and testing yourself under exam conditions, even in the place where the exam will be held, is useful since it reduces uncertainty. You now know what it is like to walk into the exam room and what you will do when you are there.

Feeling stressed is a signal that there is a source of potential threat for which we should prepare. In this case the threat is psychological (fear of failure, fear of the unknown, etc.) rather than physical. Changes in the body and brain occur when we are stressed: our heart rate and blood pressure rise, so that more blood is pumped to the muscles and brain. This increases oxygen to the brain making it more effective. In addition, there are increases in the level of activity in the hippocampus (long term memory storage and retrieval) and the prefrontal cortex (decision making). Thus, a little stress is great for improving access to memories and our ability to decide what to write and how to plan this. Some stress will improve your exam performance.

However, when the feeling of anxiety and/or stress become too great, our ability to remember and decide is impaired so it is important to have strategies to help yourself control your level of stress if you need them.

In this section are a selection of different strategies that you can try before, during and after the exams to control your nerves and help to remain calm and in control throughout.

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Conditioning

One simple technique that you can use is to have a quick way to feel calm. We create a calm habit by repeatedly pairing a feeling, smell or taste with feeling calm. To do this you can:

1. Choose a feeling that you would like to be able to reactivate before and during an exam. This might be a feeling of calm, contentedness, confidence or any other feeling that you think might be useful to you when you are stressed or anxious.
2. Remember three or more times when you have felt this. Replay each memory and decide which is the strongest.
3. Replay the memory and, when the feeling you want is strongest, pair this with a trigger. This can be either a physical action such as squeezing your ear or a sensation such as the smell of a lemon (Rescorla & Wagner,1972).
4. Spend 5 minutes a day repeating the memory with the trigger. This helps to build an association between the trigger and the feeling you want to have.
5. On the day of the exam use your trigger to activate the feeling. By touching your ear or smelling a lemon, you will invoke the feeling that you have associated with it allowing you to carry these positive emotions with you into the exam.

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Sleep

Sleep serves two main functions that are particularly important for learning.

1. It is required to refresh the cells in the brain, flushing out the chemicals that are brought into the cell during the day and increasing the efficiency of our neurones.
2. Sleep is vital for creating strong memories. When we sleep the brain sorts through the new information that we have been exposed to during the day (Born & Wilhelm, 2011). It determines which new information is important and adds this new learning to memories that we already have.

This is why it is critical that you are giving yourself enough time to sleep during your exams. One way you can do this is to build a good sleep routine. Set yourself a 'sleep gate' so that you finish work no later than 9pm in the evenings to allow for some wind-down time before going to sleep

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Breathing and Posture

We indicate to the brain that we are feeling stressed and anxious by our heart rate, breathing and posture. Often, when you have been stressed and anxious in the past, your heart rate and breathing rate has increased, your muscles have tightened and your posture has changed. This has become a reliable cue to tell your brain that you are feeling stressed. Changing your breathing and posture can therefore change the signal to your brain, making you feel less stressed.

Simple things like taking a long, slow, deep breath, rolling back your shoulders, straightening your back, lifting your head high, and even adopting the pose you would have when you have just won a race or competition, are all ways in which you can calm the physical stress response in the body. Each of these changes is not only an indication that you are not stressed, but also suggest that you feel confident. This can be sufficient to make you act more confidently too. Once you have calmed the physical reaction to stress, you will begin to feel more mentally calm, less nervous and better prepared to take your exam.

Thinking Positively

Just as our brain uses posture and breathing as a measure of our mental state, the language we use also can affect the way that we feel. It is easy to focus on the things that might go wrong in an exam which can make you feel anxious. Often, however, there are many things that can go right too. If you only imagine what goes wrong, you make yourself more anxious than you need to be which might make your expectations come true. Imagine not just the worst-case scenario (e.g., you might not do as well as expected but you won't die), but also the best-case scenario (you might do better than you expect) and the most likely scenario (you have prepared as well as you can and if the questions you want come up, you will be able to answer them). This has been termed having a "WoBbLe" (Worst, Best and most Likely scenarios) and it is a more effective way to manage anxiety before an exam.

It is also a good idea to avoid people might put you off by worrying unnecessarily or asking last minute questions that you haven't prepared. Go into each exam having prepared as well as you can and keep reminding yourself that you have prepared thoroughly and are ready to give this your best shot.

You can also try some self-affirmation before you go into the exam. Think of two or three times when you have been proud of your achievements. You can imagine each of these clearly by following the format below:

Where were you when you were proud of your achievement?

e.g. I did this at school

What did you do when you were proud of your achievement?

e.g. I acted in the school play

What skills have your learnt that allowed you to do this?

e.g. I learned how to act and remember lines

What beliefs or values do you hold that allowed you to do this?

e.g. I valued being conscientious in learning my lines and believed that hard work would allow me to do this.

What version of you was able to do this?

e.g. the version of me that believes that I can do anything I put my mind to.

By reminding yourself of just what a capable and all-round brilliant person you are, you can bring your best self to the exam. This simple process can even improve your memory since it is likely to make you feel less stressed and anxious. So, try this out before you step into the exam hall.

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Give yourself time to relax to prevent burnout

Throughout your exams, it is important to schedule time to revise *AND* time to relax.

Sport and exercise are excellent ways to take your mind off your studies and therefore feel more chilled. Indeed, the old cliché “healthy body healthy mind” has some truth in it. When we exercise, we release a chemical in the brain (brain-derived neurotrophic factor or BDNF) that increases our ability to make the new neurones and connections between the neurones that we need to learn.

When you have finished an exam, do not spend time dwelling on any mistakes. By focusing your attention on the negative you are likely to increase your anxiety and this can have a negative impact on any remaining exams. Instead, think about anything you might do to make your next exam more successful – which might improve your future performance.

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