STUDY SUCCESS



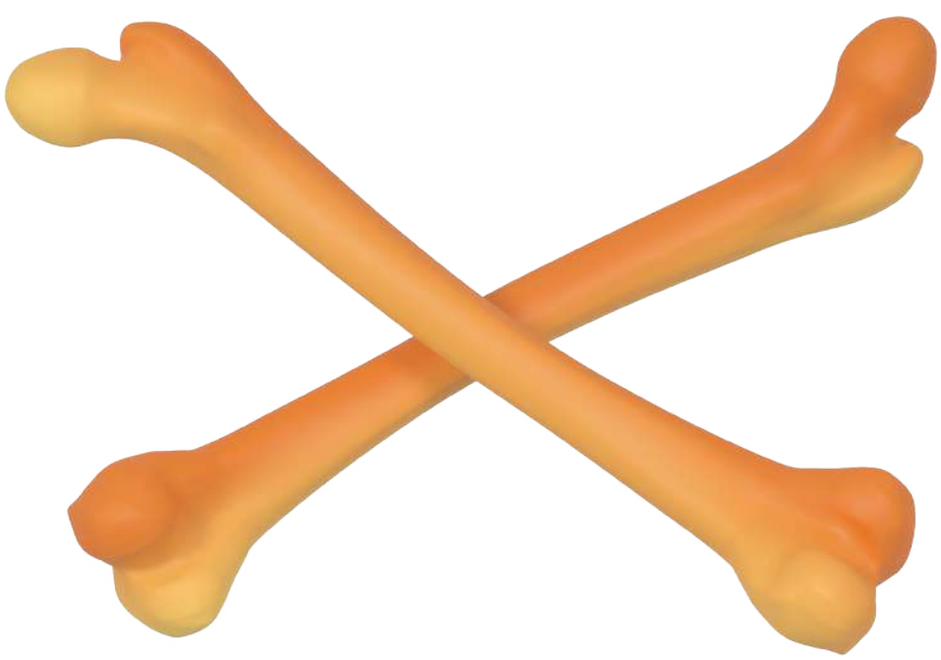
A GUIDE FOR MED STUDENTS

ELSEVIER

YOUR ALL IN ONE GUIDE ON HOW TO BEST LEARN MEDICINE

by Dr Philip Xiu

Medicine is a fascinating, exciting and sometimes challenging subject to learn. To begin with there's a lot of new things to learn, also how you learn is likely to be quite different to how you learned at school. The good news is, you've come to the right place, this guide written for med students like you, is full of practical, helpful advice and great evidence – based strategies for learning medicine.





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HOW LEARNING AT MED SCHOOL IS DIFFERENT AND HOW TO PREPARE

Everyone is smart at med school and that includes you! You didn't get to this point by being bottom of the class! Your ability to learn, retain and evaluate information will stand you in good stead at med school but be prepared for the approach to learning things to be a little different to what you may have experienced to date. Here are some of things to be aware of;

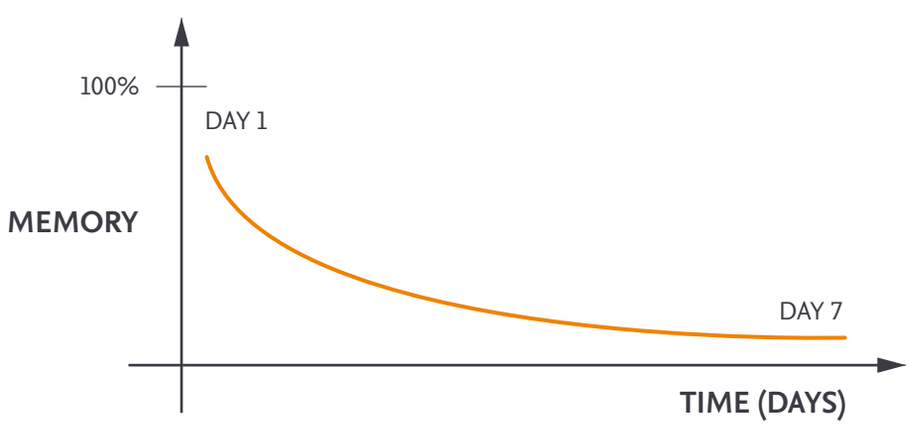
Normal school-life	Medical school-life	Medical student's thoughts
One textbook with all the information we need to learn	Lots of different books all with more or less information	*"Where do I even start trying to learn?"*
A reasonable volume of information to learn	Near-endless amounts of information to absorb	*"How is it possible to learn this much?"*
Purely scientific information needed to be learned	Scientific information alongside clinical information	*"How does this information relate to being a doctor?"*
Ample revision resources including past papers	Conflicting resources without standard past questions	*"How can I test myself at the right level?"*
Set-times to learn your material and homework	Do-it-yourself approach and completely independent learning	*"How should I structure my workload?"*

The good news is that many medical students and doctors alike have had similar thoughts to the above but you needn't join the list... Read on and learn how to maximise your learning, thereby saving time and reducing stress.

MEMORY MATTERS, HOW TO MAXIMISE YOUR RETENTION AND RETRIEVAL

Let's take a look at the infamous Ebbinghaus forgetting curve[1]. This curve shows us what typically happens to our memory of something in the week after you have learned something new. As you can see, it is pretty steep! As a medical student, you'll be taking in new information every day so anything that you can do to help keep new concepts in your memory for longer will improve performance and in the long run make things a whole lot easier.

The infamous Ebbinghaus forgetting curve.[1]



Ultimately, we want to reduce the effects of the forgetting curve and be successful at storing and retrieving lots of medical information! As such, the strategies that we will cover focus on maximising semantic memory: our understanding and memory of facts. Sounds easy enough...

LEARNING STRATEGIES TO GROW YOUR MEDICAL KNOWLEDGE

The following evidence – based techniques were designed with success in mind and the good news is that they can be easily assimilated into revision routines. Read on to learn more...

1. Spaced practice: spreading out your learning works!

If you are used to the binge and purge way of learning, that is cramming at the last minute for exams, you may want to reconsider your strategy.

This method might in the past, have been effective for passing exams, but you are a life – long learner now and you need more effective methods. Evidence shows that studying your material in several sessions spread out over a long period, rather than repeatedly learning stuff in a short period, really helps to retain the material.[2]

Why is spacing out your practice better? Because it means you get a more gradual accumulation of knowledge rather than overloading your brain with information that you may find hard to retain. It has even been thought that using this method can potentially double the amount of information that is ultimately remembered, compared to other methods.

So we've learned that spacing out your study sessions helps, but how far should you spread your sessions out?

Interestingly, it all depends on how long you want to retain the information for. For a test in a weeks' time, the optimal inter-study gap should be between 20 to 40%, but for a test in a year time, the optimal study gap should be between 5 to 10%. The timing of these learning sessions has powerful effects on your retention and the table below gives some recommendations to help you plan.

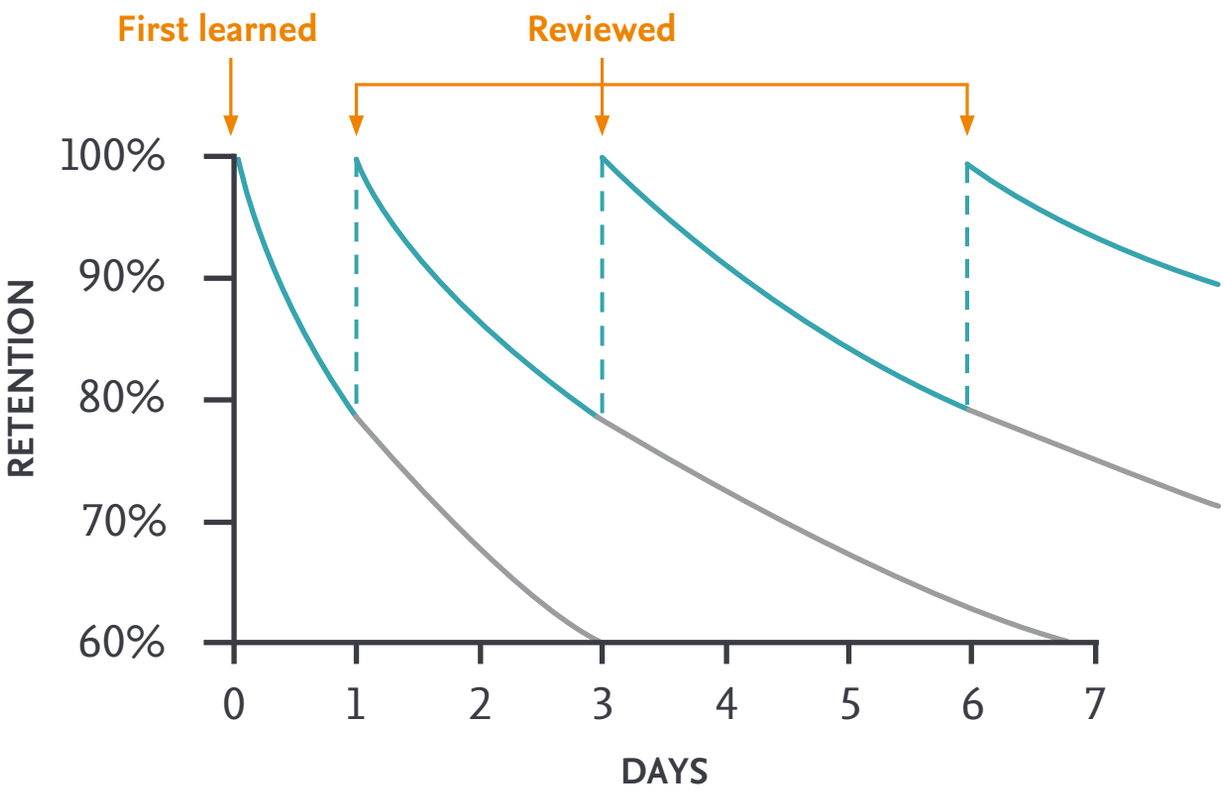
Exam time is showtime! Plan your study sessions using the table below for maximum benefit

Months away from your exam	The minimum time you should space out your learning sessions
1 month	Every 6 days
2 months	Every 10 days
3 months	Every 15 days
4 months	Every 17 days
5 months	Every 18 days
6 months	Every 18 days

As we can see, the optimally efficient gap between study sessions depends dramatically on when you are being tested.

Importantly, it is better to overshoot the duration between your revision than to undershoot. For example, for an exam that is 2 months away, a minimum of 10-day intervals for restudying the material is recommended, meaning 12 days is fine, but not 8. This is because if you keep the gap between sessions too short, it can give you a false perception of a high level of mastery, which You may find that not have retained of a high level of mastery that might not pay off when it comes to the exam.

Spaced repetition can turn the forgetting curve into the remembering curve!



Typical forgetting curve for newly learned information



2. Interleaving: why it's good to mix things up!

One strategy for learning new material has been to practice one skill at a time, or learn one topic at a time before moving onto the next thing. Something like: "I'll get good at this first, and then I'll move on". At medical school, the equivalent to this may be that you learn neuroanatomy one week, then you cover neuropharmacology the next week and embryology the week after that.

This type of learning is known as "blocking," and because it seems so common-sense and easy to schedule, blocking is used in schools, training programmes and some medical school (at least this is how my medical school taught me back when I was studying).

However, there is an alternative strategy that you can use which has shown to give improved results. It is called interleaving.[3]

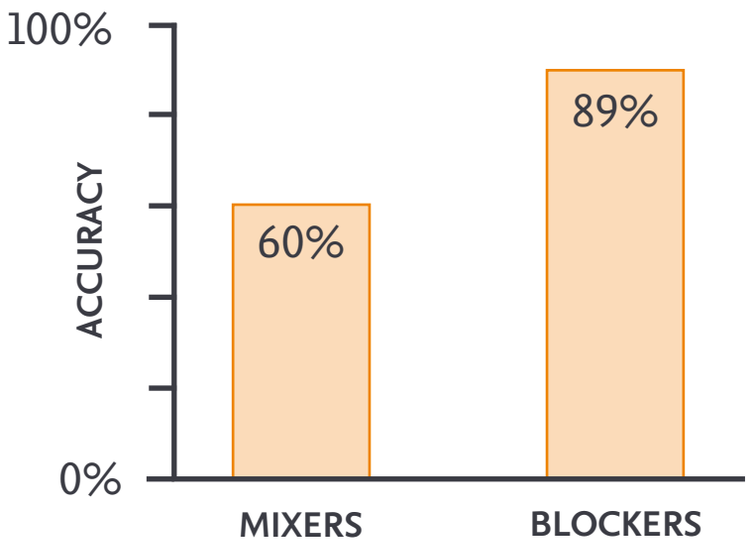
Where blocking involves practising one thing at a time before the next (e.g. learning topic A, before topic B, before topic C - forming the pattern AAABBBCCC), in interleaving you mix the several topics together (forming the pattern "ABCABCABC").

So blocking would be "AAABBBCCC" e.g. anatomy, anatomy, pharmacology, pharmacology, embryology, embryology. However, interleaving would be "ABCABCABC" e.g. anatomy, pharmacology, embryology, anatomy, pharmacology, embryology.

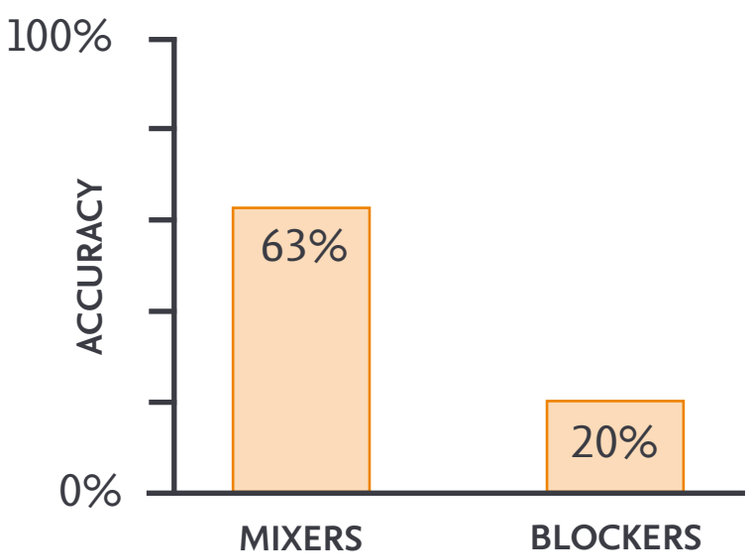
Switching between ideas during a study session and reviewing them in different orders can help!

The evidence to back this up is quite amazing.[3] In one study, a group of students had to learn four types of maths problems. One group of students learned the four types of question in a mixed way i.e. using the interleaving method whereas the other group learned the four types of question together i.e. blocking. How did the different strategies affect their learning?

Initially blocking came out better;



However, when the groups were tested second time at a later date, the group who used the interleaving method, meaning that they mixed the material when learning were way better than those who had used blocking.



So, what does this mean for you? Mixing up the topics when learning may seem like it is a little harder as it can take a bit longer to learn the material. However, the added effort of mixing can generate better and longer-lasting results! It is important to note that when using the interleaving method, you shouldn't switch between subjects too often, it's all about getting the balance right.

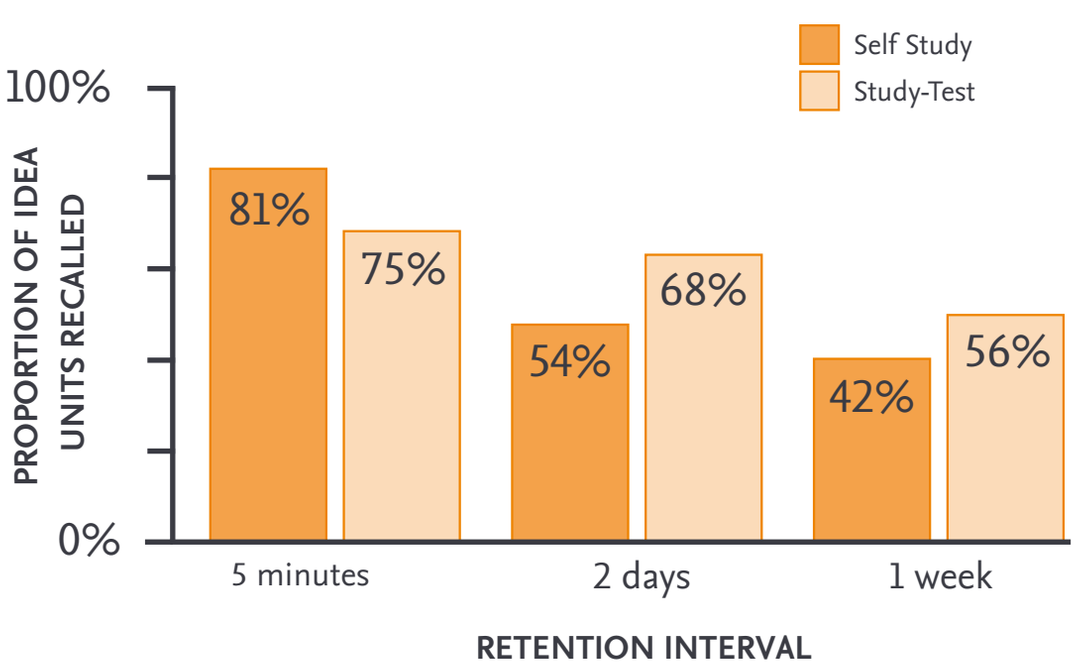
3. Retrieval practice; testing yourself regularly will improve your performance.

As the saying goes; “practice makes perfect” or put another way, acquiring skills and knowledge takes time and effort. The only way to know if your practice is working is by testing yourself.

As it turns out, evidence shows that testing is one of the most important contributing factors to aid your revision and it can drastically improve your memory. Answering questions strengthens your memory as you are retrieving the must – know information through testing with proper feedback.

The data speaks for itself. In one experiment,[4] two groups were given some information to study One group studied the information and then reviewed it some more. The other group studied the information and were then tested on their knowledge. What were the results? Quite surprising actually!

Testing yourself after studying can be better than studying more



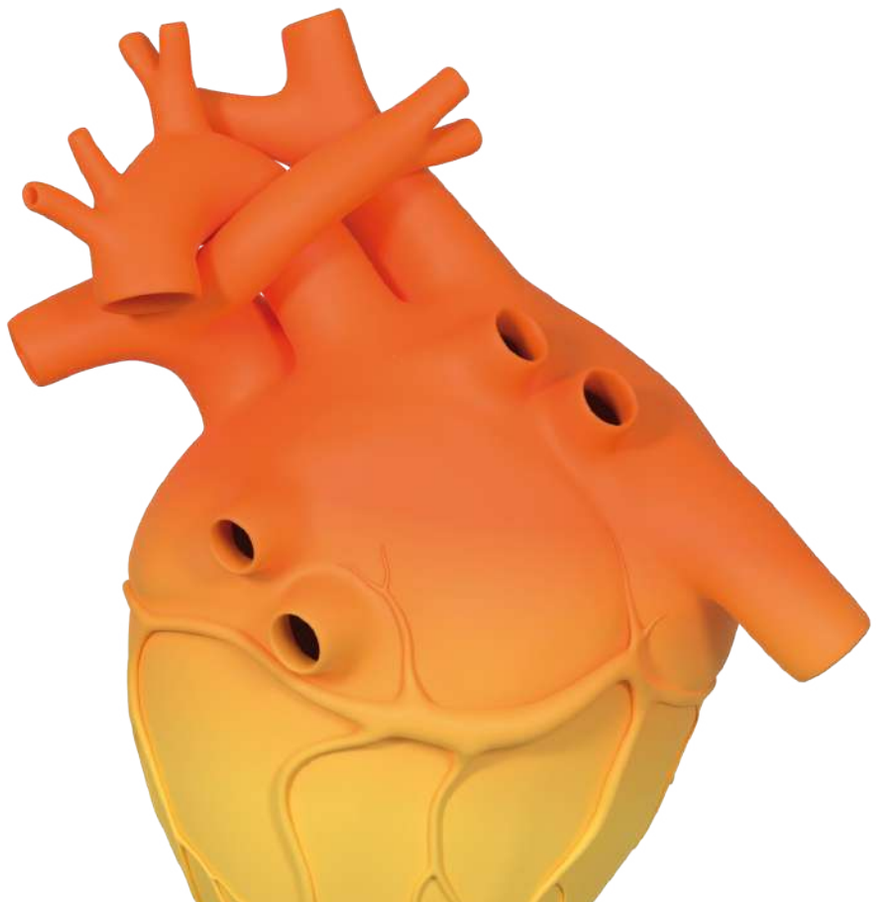
While initially, it may seem better to study more, over time you are much more likely to retain the information if you test yourself. This is even true if the tests are given without actual feedback. This surprising phenomenon is called the testing effect!

So how can you implement this in your revision? Firstly, identify the critical knowledge that you want to learn. It could be the Krebs cycle or the pathophysiology of atherosclerosis, you name it. Once you have established the vital bits you want to learn, you'll need to test yourself on it. Then you can check yourself in spaced intervals. This not only will help you learn (as per the testing effect) but it will also give you more motivation to study as you'll see how you are learning along the way! Additionally, it will get you more used to answering questions so that you feel more prepared when it comes to the exams.

Some ideas on how you can test yourself:

- Flashcards
- Practice questions online
- Questions in textbooks
- Getting friends to quiz you in a study group
- Past papers

So, when in doubt, test!



4. Elaboration: connecting new information to existing knowledge.

This strategy is a little bit more subtle and is something you can think about when trying to take in new material. Elaboration is where you enhance the information of the learning material by relating it to other information that you already know so that you think about it differently.[5]

Mixing ideas in your mind in relation to other things is a great way to remember. An example of elaboration that I have used in the past to great effect, is to imagine a patient in front of you experiencing the pathology that you are learning about. Then think about what you are learning and how you would explain it to them and what you would do.

So, for example, if you are learning about myocardial infarction, imagine you are on the ward with a colleague, and one of your patients has just had an MI.

- How would you explain what has happened to the patient's family member?
- How would you treat the patient there and then? Why?
- What would you see on the ECG and on the blood results?
- How would you explain all the drugs you will be starting the patient on afterwards?

This strategy makes you ask more in-depth questions about how and why things work; deepening your semantic understanding. Instead of just facts on a piece of paper, it connects what seems quite abstract to a real scenario! You'll find that by doing this you are linking ideas, and this will help to improve your memory.



5. Link information to expand your memory!

It seems common-sense that when we are learning new information that we do not want this to interfere with what we have previously learned. If this happens, it is called retroactive interference - and is the bane of long-term memory learning![6] In other words, later learning interferes with prior knowledge, where new memories disrupt old memories.

When this happens, a memory that you have stored previously, for some reason, cannot be retrieved. This is frustrating because you've put in all that effort to learn something only to then not be able to bring it up when needed! Somehow, your memories are disrupting one another.

This is also more likely to occur when the memories are similar, for example: confusing old and new telephone numbers. This is especially relevant for us medics, as evidence shows that students who study related subjects at the same time can often experience this interference.[6]

So, what can we do to reduce this? When learning new information, try and make sure you are learning it in a fundamentally different way to how you learned other similar material - such as using the elaboration method we discussed earlier! Try and keep the information separate, using new cues, and you won't experience any of this interference.

For example, we talked earlier about our MI patient. Imagine now you have a diabetes patient instead. Imagine this person with entirely different physical characteristics and then run through a story in your head much like what we did earlier.

Funnily enough, Derren Brown advocates for this type of memory technique! You should check out his linking system here.[7] In short, he suggests that when trying to learn seemingly unrelated items - you should join them together. For example, an orange and a house, coffee beans and a chair and so on. Take what you want to learn and create a story that links them. Consider connecting the second object of each pair to the next object pair you're looking to memorise in a bit of a story. The more wonderful and nonsensical the story is, the more likely you are to remember it.

For our purposes, for each of the topics you're trying to learn - make a story in your head about it. Run out the scenario and practice this over and over again. It really works! And, you shouldn't experience interference because you are learning information in entirely new ways. Try it out!

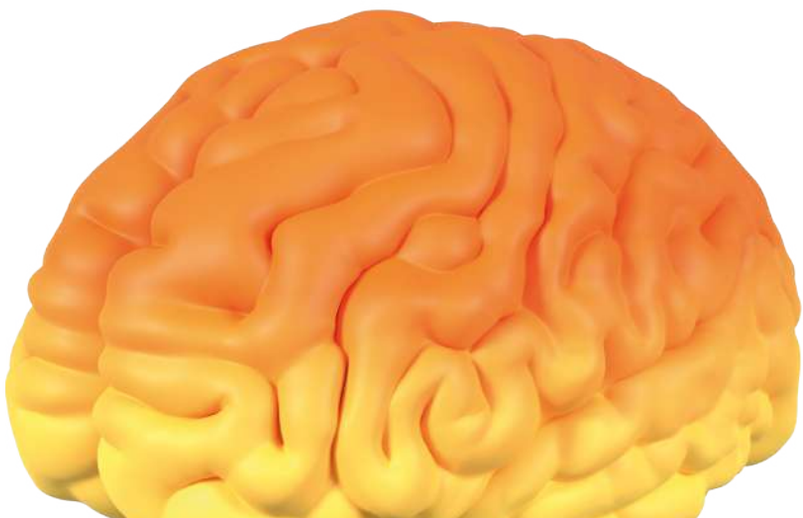
6. Stay curious to learn more.

This seems obvious, but if you are curious about something, you are much more likely to learn it. You are also more likely to retain that information for the future. However, some fascinating experiments have shown something further than this - which is that when you are in a state of curiosity, you are more likely to learn incidental material that isn't really related to what you were initially curious about![8]

So, what can we take from this? Stimulating curiosity creates more effective learning experiences. This means that the more interested or curious you are about something, the better.

One way to improve your own curiosity may be to find videos online of people affected by the conditions you are learning. This will change your ideas about what the topic is and will help you appreciate things from a different angle.

If you find a topic boring, try and link the topic in your mind to something that you do find interesting. For example, if you are interested in diabetes but hate learning about the anatomy of the peripheral nervous system, try to think about how the nervous system would be affected by diabetes and how you would explain it to one of your future diabetic patients. Thinking in these terms can really change how you feel about a topic, and consequently how well you end up learning it!



COMMON PITFALLS AND HOW TO AVOID THEM

When studying we may well overlook some obvious things which can have an impact on our ability to learn. Here are some common pitfalls to avoid:

1. Consider your environment.

With everything else to think about it can be easy to forget your study environment, however, this can have a significant impact on how well you learn!

Take some time to establish a comfortable and relatively quiet area to study in. There's nothing worse than having spent time setting out your revision plan, taking into account the strategies we have talked about, only to find that your study space isn't working for you. If you can, set up a desk in your bedroom with all your resources organised around you in a pleasant atmosphere.

You may work well with some music in the background, or perhaps you prefer complete silence. This really comes down to personal preference. The aim really is to reduce the amount of distractions to maximise learning.

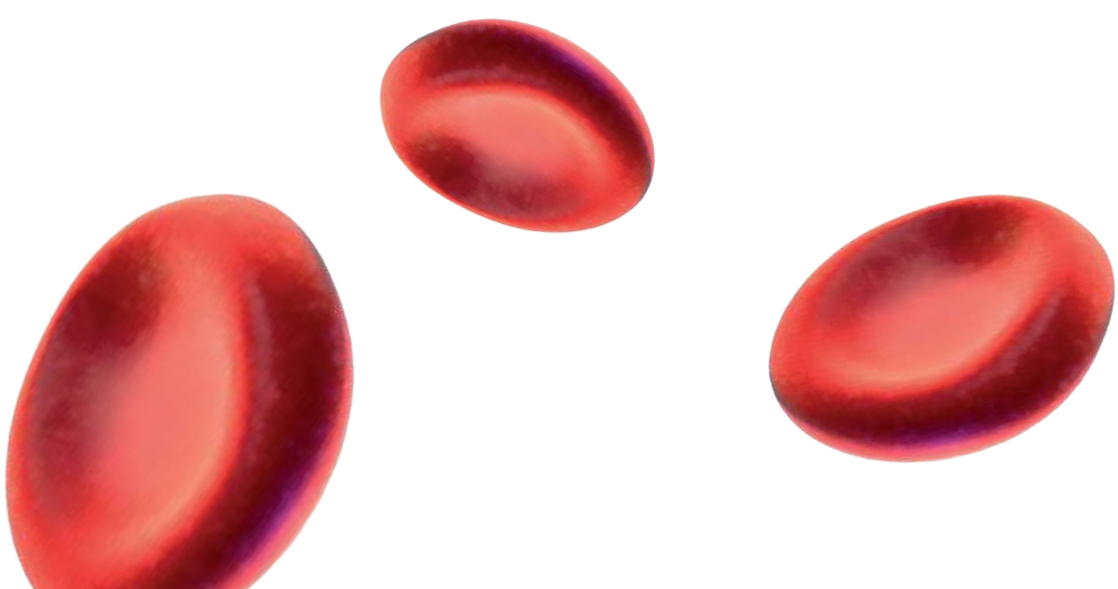


2. Change things up. Differentiate your study routine.

You may also want to vary your study routine for example working on your own versus group work. I have always found that I like to learn the material in a spaced way at least three or four times completely alone, so that I have a good background understanding of the concepts, before I go into a group to discuss the ideas or to have a quiz. This is so that I don't get freaked out if someone else knows lots on a topic that I am yet to have even started! Preparation is key here.

3. AM or PM, when is the best time to learn?

Another thing to consider is when you learn, what time of day works best for you. Evidence suggests that the time of day you hear/see/read something is important, not when you try and remember it![9] Which is good news as you can control when you learn, but not when you get tested. Overall, we are sharpest at short-term & declarative memory tasks in the morning, and more efficient performing semantic processes in the afternoon. So possibly, while in the morning it may be good to review some tests and write reports, the afternoon may be the best time for you to do the really intensive bulk of your revision.[10] However, this is all up to you and your personal style; and life can dictate many of these variables!



4. You can't pour from an empty cup. Why it's important to look after yourself.

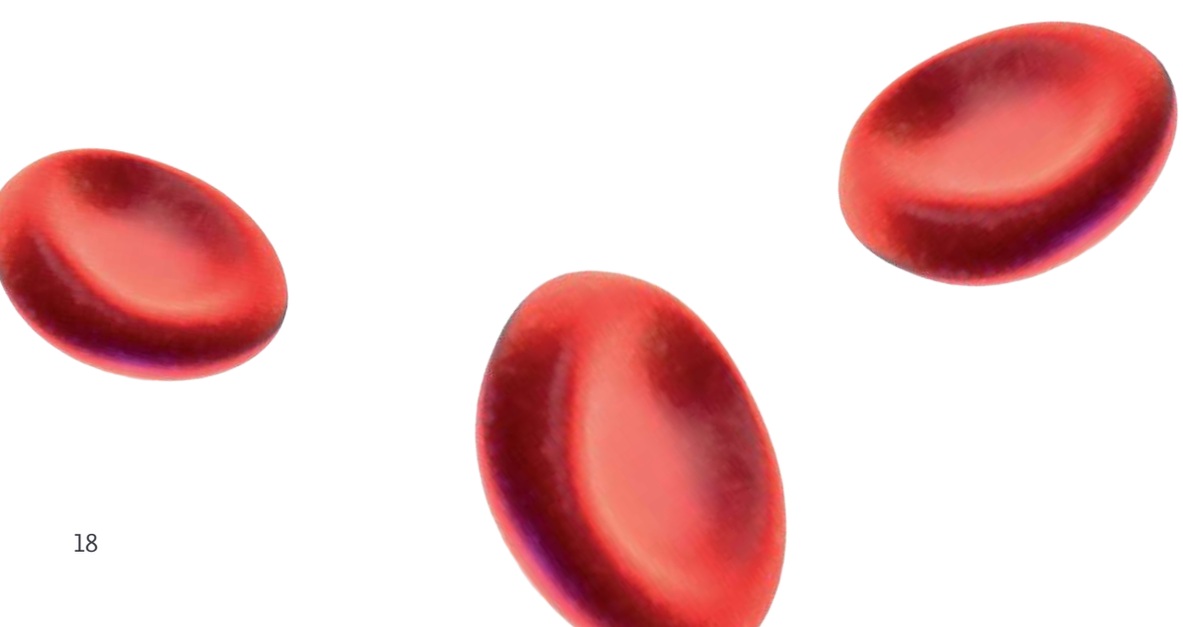
When you look after your body, your body looks after you! If you're physically and/or mentally fatigued, it will make staying alert and learning effectively much more difficult.

Take a break; In short, when you need a break, take a break and make it a real break.

Get some sleep, as much as you can; Sleep is crucial for learning and, more importantly, your general health.[11]

A tip here: ditch the phone! Try and dim the lights in your house around an hour before you want to go to bed to help your body adjust. I highly recommend listening to Prof. Matthew Walker from Harvard University who is an expert of sleep talk about this. He even talks loads about medical students and doctors![12] Unbelievably, if you are a junior doctor, you have a 460% more likely to make diagnostic errors if you are not well rested. So, it is absolutely critical for your general and academic performance; being well-rested means that you'll have better focus when you're studying.

Exercise and eat well; a healthy diet and exercise have been shown to be increasingly essential for your brain's functioning. Treat your body well, and all will fall into place!



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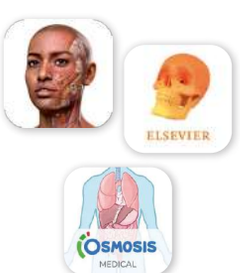
4. Flashcards

Flashcards are a great way to learn and some of our key textbooks have accompanying flashcards, like Gray's Anatomy for Students. Search flashcards here.



5. Questions and video's

Many of our key textbooks have questions in the text but some also have questions and video's as part of the bonus content available with the enhanced digital version. Look out for the words enhanced digital version on the covers of Elsevier textbooks.



6. Apps

Apps are a great way to help you learn and on the go. Take a look at Complete Anatomy the most realistic 3D gross anatomy atlas out there. Also check out SurviveMed With basic anatomy flashcards with on – off labels, over 12,000 medical terms and advice from medical students. Finally, take a look at Osmosis and review faster with 1,700+ expert-reviewed bite-sized medical videos and more than 15,000 flashcards.



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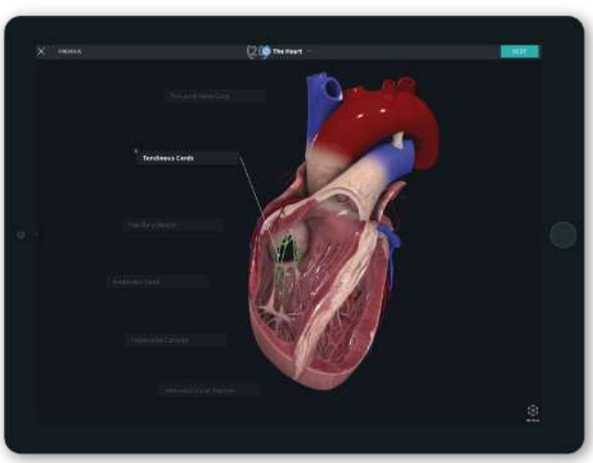
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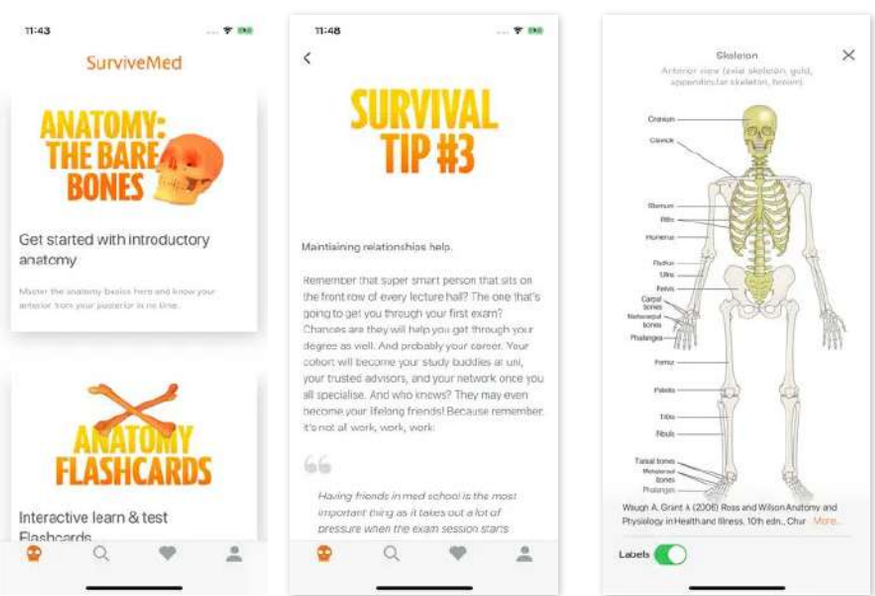
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