

**Lesson
Nine****Forgetting****Aims**

The aims of this lesson are to enable you to

- distinguish between accessibility and availability
- compare and contrast theories of forgetting
- understand the difference between proactive and retroactive interference
- be able to use studies of amnesiacs and other evidence for either anterograde or retrograde amnesia
- provide answers as to why we forget, with specific reference to the lack of retrieval cues

Context

Forgetting is the flip side of remembering. We would be unable to cope if every single thought that we processed continually came to mind. Is forgetting therefore an inevitable part of memory or can all memories be retrieved? What happens if the brain is damaged? Can memories be relearnt? These interesting questions are the subject of this lesson.



Lawton & Willard: *AQA A-level Psychology Book 1*, pp. 76-85.



Oxford Open Learning

Forgetting

Forgetfulness seems to be a design fault in human beings. Even though we have more powerful brains than any other living creature, we still find ourselves forgetting all the time. What is the capital of Tanzania? Where did I put that pen? Did Uncle Derek send me a present? What colour are the curtains in the bathroom? The annoying thing is that we are aware that we *used to know* the answer to a lot of questions like this but at some point, the memory has “gone”.

In other words, even when information has been carefully stored in Long Term Memory and retrieved on previous occasions, there is no guarantee that it will still be retrievable next time we need it.

But from work you have done already, you will see how necessary forgetting is if we are to avoid information overload, at least in the Sensory and Short Term Memory. Less is known about the amount of information that can be processed, retrieved or forgotten in the Long Term Memory, because it is impossible to know. We cannot trace a single person throughout their lifetime, or know all the influences that will affect their memory during their lifetime. We can usually only examine Long Term Memory when it is clear that it is failing.

The AS and A level AQA Specification only requires you to know **in detail** about **Proactive and Retroactive Interference** and **Cue-Dependent Forgetting**. However, there are many other explanation of forgetting that you will read about in your textbooks, so we will summarise a few of them here, and you can use this information in a question that requires you to discuss why we forget.

Availability vs Accessibility

It is important to understand the distinction between **availability** and **accessibility**. More is *available* (i.e. stored in Long Term Memory in the first place) than *accessible* (retrievable at a particular moment in time from Long Term Memory). This is particularly noticeable in some older people who might be searching for a word, knowing that they know it, but they cannot retrieve it. You may have had a similar experience yourself when you are very tired or when you have had too much alcohol, so this is not just a feature of getting old!

We have seen that all information is initially **available** to our Sensory Memory and that we select information to attend to, or it is selected automatically on our behalf by our autonomic nervous system. We also saw in Sperling’s work that we can remember more

than we can physically remember seeing, so how much information is lost from sensory memory is difficult to tell.

Assuming there are two further memory stores as in the multistore model, this leads on to two important questions:

- what prevents information staying in Short Term Memory long enough to be transferred to Long Term Memory?
- what stops us finding information that is stored in Long Term Memory?

We will look at each of these problems in turn.

Of course, we do have a very big problem when studying forgetting. How do we know what we have forgotten if we cannot remember it? If it is never recalled, we still cannot be certain that it is not available. It simply is not **accessible**, not at that moment. It may become accessible another time but it cannot be retrieved right now. So, knowing the true capacity of memory is as difficult as to gauge or to know what was truly been stored, or not!

Forgetting from Short Term Stores

Three basic ideas have been put forward to explain the disappearance of information from Sensory and Short Term Memory before it can be transferred to “permanent” storage. These answers are (1) trace decay, (2) displacement, and (3) interference. Trace Decay occurs from Short Term Memory and displacement and interference from Long Term Memory.

Trace Decay

We have already touched on the idea that learning leaves some sort of “trace” on the brain, a combination of physical or chemical changes or marks that were not there before. Following on from this, we can say that forgetting is due to a spontaneous weakening or erosion of the neural memory trace, the **engram** as time goes by. This applies specifically to the Sensory Memory. For a memory trace to be stamped indelibly into the Short or Long Term Memory requires further explanation. Some argue that once a memory is in the Long Term Memory it is never completely extinguished.

Study of forgetting from short term memory – Waugh & Norman (1965)

Aim: To investigate forgetting in short term memory.

Method: Participants were presented with a list of 16 digits auditorily. In the first condition, the list was presented at 1 word per

second (16 secs total). In the second condition, the list was presented at 4 words per second (4 seconds total).

After the presentation of the words, participants were given a cue to tell them which sequence of words they had to recall.

Results: There was no significant difference between the number of correct answers in the two conditions.

Conclusion: The study does not support the idea of trace decay, as the researchers expected that those in the condition that took the longest would have a poorer recall. So, those in the first condition should have had poorer results, but they did not.

This suggests that decay may still be a factor but that other factors are involved in remembering and forgetting.

Evaluation of trace decay theory

- 1) It is very hard to say categorically that trace decay exists. It is very hard to investigate when the time spans are so short.
- 2) Most studies are laboratory investigations, which do not take account of the other activities going on in the background in real life.
- 3) It does not address the question of how people manage to recall events and episodes from years past, or how a memory suddenly pops into your head. These should have been lost according to trace decay.
- 4) On the other hand, Sperling's work that we looked at in Sensory Memory in Models of Memory, does lend support for trace decay.

Consolidation

There is some evidence to support the idea that there is a **process of consolidation** before a memory is firmly recorded, or 'fixed'. The term 'consolidation' means 'to make more solid'. There is a time component during which information is labile and not yet fixed, rather like a jelly has to set in its mould before it can be called a jelly. So, if the gelling or consolidation process is disrupted the memory will not form correctly or may be lost altogether. This may account for partial information being remembered.

Some accident victims who have suffered concussion or other kinds of brain damage find that they cannot remember anything that has happened in the last week, say, but they have a full memory of events before the time of their accident (anterograde amnesia).

Others are unable to remember anything immediately before the accident (retrograde amnesia). The argument is that new memories cannot be consolidated because the hippocampus (a region inside the brain) becomes damaged. Memories prior to the event are stored away from the hippocampus in the neocortex, so if they have already been stored they will be remembered. If lack of consolidation is a feature of retrograde amnesia, this suggests that at least some types of memory take time to be consolidated and not just a few seconds.

Findings have shown that we cannot store new memories for faces, facts, and surroundings without an intact hippocampus, which again lends support for the need to be able to consolidate.

The hippocampus is now regarded as a temporary memory system that is only used until long-term consolidation is complete (Nadal & Moscovic, 1997).

Therefore it is thought there are at least two distinct areas of the brain responsible for the storage of recent and longer term memories (Squire et al, 1984).

However, is a lack of consolidation really forgetting because it is no longer accessible, or was the information *ever* available?

Interference

This is a very important concept. Rather than a decay of neural traces, interference theory suggests that we forget more as time goes by solely because of growing interference from competing memories, especially if they are similar.

So, what happens between learning and recall is critical to what we remember.

It is fairly easy to test the idea of interference. We can ask a willing participant to memorise a list of some kind, then some time later (e.g. a minute), we can ask them to perform a different memory task. Then at a set time, we can test them on the first list they have learned. How much can they recall? Such results need to be compared with those of a control group who have rested or performed an unrelated task, while waiting the same period of time before their recall is tested. Naturally, we would expect this control group to perform better, but by how much?


You could also try varying the level of similarity of the two memory tests. They could both involve lists of words, or one could be words, one numbers, etc.

Proactive Interference (RI) occurs when the information you learnt first interferes with information you were presented with afterwards, i.e. you find it harder to remember the recent material.

When you first learn something, it becomes ingrained, especially if it is important, such as learning the UK Highway Code. If you were then asked to learn the Highway Code for another country, the information you first learnt is likely to get in the way of your remembering the information for the new country.

Retroactive Interference (PI) occurs when later information interferes with information you had previously learnt, i.e. you find it harder to remember the former information.

Let's say you are learning two languages. Yesterday you had to learn 20 French words and today you have to learn 20 Italian words. The words you learn today will be easier to recall, but the French words may get mixed up with the Italian words.

<p>Activity 1</p>	<p>You have just bought a new mobile phone, but decide to keep the old mobile phone in case the other one gets damaged. Explain how both retroactive interference and proactive interference might occur with this purchase.</p>
	

Study: Postman (1960) - Retrograde Interference

Aim: To investigate how retroactive interference affects learning.

Method: Using a laboratory experiment, participants were split into two groups. Both groups had to remember a list of randomly paired words – e.g. cat – tree, jelly – moss, book – tractor. The experimental group also had to learn another list of words where the second paired word was different; e.g. cat – glass, jelly – time, book – revolver. The control group were not given the second list. All participants were asked to recall the words on the first list.

Results: The recall of the control group was more accurate than that of the experimental group.

Conclusion: This suggests that learning items in the second list interfered with participants' ability to recall the first list. This is an example of retroactive interference.

We have come across studies of **anterograde amnesia** in relation to Henry Mollison, who died in 2008, which is a form of proactive interference. His hippocampus was removed to try to alleviate his epileptic fits. The result was that he was unable to transfer any new information into his long term memory. He forgot any news the minute he heard it, and he could watch the same TV programmes again and again because he did not remember having watched them.

Table 1: The effects of interference on memory

Type of Memory	Early information before an event occurred	event	Later information after the event occurred
Retroactive Interference	Forgotten		Remembered
Retrograde Amnesia	Forgotten		Remembered
Anterograde Interference	Remembered		Forgotten
Proactive Interference	Remembered		Forgotten

Study: Schmidt et al (2000) - Retroactive Interference in Real Life

Aim: To explore the concept of retroactive interference in a real life situation.

Method: Participants were asked to complete a questionnaire, which included a map of their childhood home town. All the participants grew up in the same area. They were asked to write down as many names of roads as they could remember.

There were several other questions asked about their personal history in the area, how long they lived there, and if they had moved house and on how many occasions. This last question was a key question, although the participants were not aware of that.

Results: Participants who had moved house frequently could recall fewer road names than those who had remained in the area as a child. Those who hadn't moved at all could remember 23 names on average, whereas those who had moved more than 8 times recalled 10 street names on average.

Conclusion: Recall was affected by moving house which created retroactive interference.

Evaluation of Interference Theory

- 1) This is a compelling theory as we all experience new information interfering with the old, and vice versa in real life. It is what we would call a 'common sense' theory, which will be useful to remember when thinking about debates and issues in psychology later on. It has value because we know as human beings that this happens.
- 2) The question is, do studies of interference really tell us anything? Well, yes, studies of amnesia tell us that damage to the brain can affect what we can remember, especially if the hippocampus is damaged. And, no, the studies alone do not tell us what happens and how a memory just disappears biologically.
- 3) The majority of research into the role of interference in forgetting has been carried out in a laboratory using lists of words, a situation which is likely to occur fairly infrequently in everyday life (i.e. low ecological validity). As a result, it may not be possible to generalize (draw conclusions that can be applied to society as a whole) from the findings.
- 4) Laboratory studies by their nature eliminate as many external variables as possible, but in real life they are around all the time, influencing what we remember and forget. In essence, we live with permanent interference!
- 5) Real life events that have been studied (which are not experiments, but often surveys) do provide evidence for both retroactive and proactive interference.
- 6) Interference theory tells us little about the cognitive or biological processes involved in forgetting.
- 7) Baddeley (1990) states that the tasks given to subjects are too close to each other and, in real life these kinds of events are more spaced out. Nevertheless, recent research has attempted to address this by investigating 'real-life' events and has provided support for interference theory. However, there is no doubt that interference plays a role in forgetting, but how

much forgetting can be attributed to interference remains unclear (Anderson, 2000).

Activity 2

There are many other studies that you will come across in textbooks and online that look at interference. For instance, Baddeley & Hitch's study of "Rugby Players", and Jenkins & Dallenbach 'Sleep and Awake' study. See if you can find more studies that both support or refute interference theory and make short notes on them that you can use in an exam.



Cue-Dependent Forgetting (Retrieval Failure or Lack of Retrieval Cues)

We said earlier that long-term memory incorporates a whole host of ideas and concepts, from visual and verbal memories to procedural memories, based on experience and learning. This would indicate that we form associations as we store incoming information, so that we match any new experiences we have with what we have experienced in the past, which can be as simple as a word or as complex as the memory of a month long holiday. Effectively, we can jog our memory into action, through repeated exposure and consolidation.

Sometimes, memories come back to us unbidden, often called **flashbulb memories**. It is questionable whether these memories do come out of the blue or whether we have made an unconscious or subconscious association between something in our present and something in our past.

Brown and Kulik interviewed people about ten major events, for example the assassination of President Kennedy in 1963. They found that memories for these events were vivid, detailed and long-lasting. It is as if a flash photograph was taken at the very moment of the event and every detail was indelibly printed in the memory. How accurate these memories are, is questionable (McCloskey,

Wible and Cohen, 1988). It is hard to evaluate the effect of new bulletins and new information acquired after the event.

Cue-dependent forgetting, or forgetting due to an absence of cues addresses this issue.

An easy example is in the use of multi-choice questions in helping us to remember. If you watch ITV's *The Chase*, the first question is general knowledge and participants often make many mistakes as they have to search their brains for the answers in a very short time. It is not clear whether they know the answers or whether they have failed to retrieve the information in the time available. Once they meet the Chaser, they are given the option of three answers per question. Quite frequently, participants find the answer by making an association or thinking around the options they are presented with. The same is true in the BBC's *Eggheads* programme. In both cases they are making links.

On an examination paper, you might be given (most probably *will be* given at some point) a list of possible answers and you have to choose the correct one. You have to match the word or phrase with a concept to get the right answer. This is a **recognition test**, which is slightly easier than having to recall information entirely from your memory. The words act as 'cues' to jog you into remembering more information that is held in your Long Term Memory. When you were learning the material, if you are given practice in this, you will form associations right from the word 'go' and you will be more likely to pull information from your Long Term Memory.

If you think about the examples above, if you take away the options (the cues) then the task becomes much harder. Whether you have truly forgotten the answer is debatable and back to the issue of whether it was stored in the first place or not.

A cue can be visual, verbal, smell, touch, even another memory. It is something that sparks our memory into recalling some information. We need these in everyday life, so that we know how to operate the cooker or the TV, which is why remote controls have the same colours for certain actions, such as red=record.

When memory starts to fail, a common practice is to tell people to write lists or to have prompts, or to set an alarm for instance, in other words to create cues for themselves.

Some cues are internal (e.g. our psychological or physiological state) and some are external (linked to the environment or context in some way). There are also a variety of links with other pieces of information which are already stored in our memories.

Activity 3

What other Retrieval Cues can you think of? Write down as many as you can think of and then check against your textbook, and add in any others that you had not thought of.



Study: Albernethy (1940) – Location (context) as a retrieval cue

Albernethy got one set of participants to learn a number of things and try to recall them in the same room, while a second set, was asked to change rooms between the learning and the recall. The first group was able to recall more successfully, as though similarities in the environment made recall easier. It seems that what we learn is linked inextricably with such cues as how, when, where and why we learnt it. If any of those cues can be recreated at the time of recall, it gives us a better chance of remembering successfully.

The other side of the coin is that where none of the cues has been accidentally (or deliberately) recreated or echoed, we are very likely to forget a particular piece of information.

Some very famous studies were carried out in the latter half of the 20th century, showing that the **location** makes a difference, so if you are doing an exam it is useful to see the room you will be in, as it will be familiar to you. One researcher tests people for learning underwater and even in that extreme condition where you might think they had other things on their mind, remembering was better when they had to remember under water rather than on land - that might be very useful knowledge if you are a diver repairing oil platforms for instance.

Another study by **Tulving & Pearlstone** (1966) asked two sets of people to learn a selection of words Group A were given category headings under which they should write their answers. Others were given the same words in a random fashion and no cues. They found that the people who **categorised** the information recalled 60% of the words, compared with the people who used free recall, who

remembered 40% of the words. The category heading acts as verbal cues.

Study: Bower et al (1969) – Organisation as a retrieval cue

Aim: To see if organizing information in a hierarchy would improve the recall of minerals.

Method: A list of minerals was presented in a random order to a group of participants, with no logical sequence to them. In the experimental condition, the group were presented with the same material in a meaningful way, as in the form of a table, with two headings – ‘metals’ and ‘stones’. These headings were subdivided further into other categories, and the minerals placed in the appropriate section.

Minerals				
Metals			Stones	
Rare	Common	Alloys	Precious	Masonry
platinum	aluminium	bronze	sapphire	limestone
silver	copper	steel	emerald	granite
gold	lead	brass	diamond	marble
	iron		ruby	

Results: Those in the first group recalled on average 19% of the words; those in the second group recalled on average 65%.

Conclusion: This study produces seemingly overwhelming evidence that organizing material improves memory and therefore supports the concept that a lack of retrieval cues causes forgetting.

Evaluation: Organisation clearly works by organizing your mind. You know how difficult it is to find something in an untidy bedroom, when stuff is thrown all over the place. Similarly, with memory retrieval, it is difficult to find things in an untidy mind. When you tidy up, you work on the material, deciding where to put it, and whether you want to keep it or throw it away.

Not only does this study support the importance of retrieval cues to prevent forgetting, but it lends support for the semantic nature of memory, and the effect of rehearsal which gives added meaning to information. It therefore supports models of memory theory.

Activity 4**Testing out retrieval cue theory**

You could try a simple activity for yourself. Find a couple of friends to try this out on, who are non-scientists.



You need a copy of the periodic table.

Condition 1: Write out all the elements in a random list so that there is no connection between the elements.

Condition 2: Write out the elements (using the same font and size of letter) in tabular form as presented in the periodic table.

Give friend 1, Condition 1 and friend 2, Condition 2, and give them both a blank sheet of paper and a pen. Tell them they can't write anything until you tell them to. Allow them to look at it for 1 minute (you need to time this).

Then take the sheets or tell them to turn the paper over, and then write down as many elements as they can remember. Give them say 3 minutes to do this.

Then take away their sheets and add up the number of correct answers. You might also like to note down incorrect answers, as these are always interesting.

Summary

We have looked in detail at some theories and studies of forgetting. This is not an exhaustive list and you may come across other theories and studies in your background reading, as it is a heavily researched area. It is important to understand the difference between memories being accessible or available. You will need to be able to explain the difference between retroactive and proactive inference and cite supporting studies, including those of amnesiacs.

We have touched on cue-dependent forgetting, which is also referred to as a lack of retrieval cues, with specific reference to the organisation of material, location and context. Information you have learnt in this lesson on forgetting and also the lesson on the models of memory inform our next lesson on Eyewitness Testimony.



Now read Lawton & Willard: *AQA A-level Psychology Book 1*, pp. 76-85.

Practice Test

This will draw on material from Models and Memory and Forgetting.

- Q1. You have just joined a new website called PsychBook and have been asked to enter a password. When you set it up, it allows you to set up a prompt in case you forget the password. In psychological terms this is called a _____ .
- Q2. When given a list of items to remember, people tend to do better at recalling items last on the list. This is known as _____.
- Q3. Jessica started studying Psychology last term, and this term she started Sociology. In her Psychology lessons, she finds she is having trouble remembering the names of psychologists and keeps writing down the names of sociologists instead. What type of interference is she experiencing? _____
- Q4. How many items can people keep in their memory at any one time according to Miller? _____
- Q5. You are walking along the pavement when someone stops their car and asks you the way to the Town Hall. Which part of your Working Memory will be most called into play? _____
- Q6. What part of the brain is involved in enabling people to transfer memories from the short-term memory to their long-term memory? _____
- Q7. What type of memory did Sperling study? _____
- Q8. Which type of memory is it most difficult to bring into conscious awareness? Choose from (Types of memory) - semantic memory, episodic memory, declarative memory or procedural memory. _____
- Q9. Which type of memory has unlimited capacity and can keep information for hours or decades? _____
- Q10. When you look at an image, the retina turns light rays into neural messages, which in turn travel up the optic nerve to the brain for further processing. This is called _____?
- Q11. Is Short Term Memory encoded acoustically, visually or

semantically? _____

Q12. In Working Memory, the name of the store that draws on information from the long term memory and holds it temporarily in the short term memory is called the _____.

Q13. A memory for an event suddenly comes into your head which you thought you had forgotten. Which theory of forgetting does this disprove? _____

Q14. In order to remember a phone number, you repeat it over and over again. This is called _____.

Q15. Explain what is meant by the Serial Position Curve. _____

Q16. What are the two types of rehearsal called?

Q17. You have been asked to be part of a quiz team and have been told the questions will be on general knowledge. The answers to this will involve your _____ memory.

Q18. You are trying to learn your 'models of memory' and 'forgetting' lessons. What retrieval cues could you create to prevent you forgetting a) theories and b) studies?

Q19. Why did Sperling think people remembered so few items held in sensory memory?

Q20. What is meant by 'encoding' specificity'?

Q21. Personal facts and memories of one's personal history are called _____

Q22. Define 'chunking'. _____

Q23. The role of the Central executive in working memory is to control all the other processes. True or False?

Q24. It is called Rehearsal in the multistore model and called the _____ Loop in Working Memory, because it is encoded _____. It is divided into the _____ and the _____ in Working Memory.

Suggested Answers to Activities

Activity 1

When you start to use a new mobile phone, it is likely that you will make mistakes in usage due to previous learning. This is proactive interference. However, over time, it is likely that you will forget how your old mobile used to work and will apply information from your new mobile, which will mean that you make mistakes with your old mobile. This is retrograde interference.

Activity 2

There is no set answer for this, but try to write just a single paragraph with a good title that will give the study meaning for you. The title should also contain the name of the psychologist who carried out the study.

In your paragraph, include either the aim of the study or the hypothesis, and details of what they did and what they found. Aim to write it in about 100 words.

Activity 3

There are many retrieval cues that help us to remember, including

1. State dependent cues
2. Context dependent cues
3. Organisation
4. Emotionality /Stress
5. Sets and schema
6. Repression

Activity 4

This is a good activity to enable you to experience being a researcher yourself. You can ask more people to do your study if you like, so that you have more data.

Note down any problems you experience, or ways you might have improved what you did. Look in details at the answers you obtained. Do you think they support the hypothesis that “Organisation improves recall?” Were there any strange answers? How would you account for them?

Importantly, think about all you have learnt so far about memory, not just forgetting, but about the models of memory too. Which theories jump out at you as a result of your investigation? You may want to look back through the lessons at the various theories to remind yourself what they contained.

The practice test which follows will also help you.