Lesson Three Memory

Aim

The aims of this lesson are to enable you to:

- describe the different types of memory: episodic, semantic and procedural memory and the processes of encoding, storage and retrieval
- describe and evaluate the multi-store model of memory: sensory, short term and long term
- understand the features of each store: coding, capacity and duration
- explore the primacy and recency effects in recall
- describe Murdock's serial position curve study
- discuss the theory of reconstructive memory and Bartlett's War of the Ghosts study

Context

Memory is studied within the branch of Psychology called Cognitive Psychology. This is the study of mental activity such as thinking, reasoning, remembering and perception. 'Cognitive' is derived from the Latin word 'cognition' meaning to understand. Memory is the first of the four major topics prescribed for Paper One: Cognition and behaviour.

Although it is not compulsory, you are advised to read the following textbook chapter alongside this module, attempting all exercises:

Flanagan et al: *AQA Psychology for GCSE: Student Book*, Chapter 1: Memory.

Types of Memory

There are three main types of memory: episodic, semantic and procedural. All of these are part of our long-term memory (**Tulving 1967**).

1. **Procedural Memory** does not involve conscious thought and is responsible for knowing how to do things. A good example of this is riding a bike. Once we have this knowledge it becomes a procedural memory and we can do this automatically and unconsciously.

2. **Semantic Memory** is responsible for storing information about the world. This can include our general knowledge as well as knowledge about the meaning of words. They are facts not unique to us. For example, knowing that the capital city of France is Paris. We are conscious of these thoughts.

3. **Episodic Memory** is responsible for storing information about events (i.e. episodes) that we have experienced in our lives. They are autobiographical memories and based on our own personal experiences. This is also conscious. An example of this would be having memories of your 10th birthday.

Cohen and Squire (1980) also drew a distinction between these three types. Both Semantic and Episodic memory are declarative meaning that we there is some degree of conscious effort to recall this information. The information is consciously brought to mind and "declared." Procedural Memory is not declarative as we do these things without little or no awareness of the skills involved – such as cleaning your teeth.

Evidence of this distinction comes from research conducted on patients with **amnesia**. Typically they find it very difficult to retain both semantic and episodic information following the onset of amnesia. They can often remember events and knowledge that happened before the onset of symptoms but are unable to retain any declarative information – such as any new events or knowledge. However, their procedural memory often remains intact – they can recall skills they have already learned and can also acquire new skills such as learning to drive.

Ways of Investigating Memory: Types of Recall

When cognitive psychologists carry out memory experiments, the dependent variable is often the number of items recalled. There are several ways of asking for recall: these include **free recall**, **recognition recall** and **cued recall**.

In *free recall* the researcher simply asks the participant to repeat back or to write down as many items as they can remember.

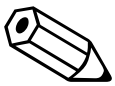
In *recognition recall* for a list of words, the researcher would give the participant a larger list of words, including the words on the original list as well as a similar number of words that were not on the list. The participant then has to pick out which words they recognise from the list learned. In this condition, recall is usually significantly better than free recall.
Cued recall is linked to a method of learning. In **paired-associate learning** the participant is asked to learn words in linked pairs, for example:

TALL – BUILDING
BRIGHT – GREEN
PAPER – CUP

Participants are later asked to recall the words by being given the first word in each pair:

TALL – _____?
BRIGHT – _____?
PAPER – _____?

and asked to respond with the paired word. In this case the first word acts as a retrieval cue. Recall in these conditions is also better than free recall.

Self-Assessment Test 1	Which type of recall is illustrated by each of the following examples? 1. The police ask a crime witness to describe an offender's appearance from memory. 2. A child who has been learning the names of the capital cities of various European countries is tested by being asked, 'What is the capital of Spain?', 'What is the capital of Denmark?' and so on. 3. The police set up an identity parade and ask a witness if they can pick out the offender.
	

A Definition of Memory

Memory is not something that is concrete and quantifiable or that can be separated from the overall cognitive processes of which it is part, so we need to be careful in specifying exactly what we mean when we are considering memory.

For this reason, it seems safest to define memory as the **retention of learning or experience**. Memory is the storing of information over time. It involves the processes of registering information, storing it and retrieving it when needed.

Three Memory Processes of Encoding, Storage and Retrieval

Any information-storage system, including our own memory, must do three things. For the exam you must understand the flow of information in memory.

1. **Encoding**: this means putting information into storage.

2. **Storage**: this means keeping stored information.

3. **Retrieval**: this means getting information back out of storage when required.

Encoding

Any experience we have, any information that comes our way, may be encoded. But in fact a lot of it is lost because we do not attend to it – it does not get encoded.

You can have a conversation with someone and pay attention to what they say but fail to notice what they are wearing. If so, you are more likely to encode and put into storage what was said.

We can make an effort to help this encoding process by doing something to the information that makes it more likely to be stored.

Activity 1	Someone tells you their telephone number. You don't have pencil or paper handy. How might you improve your chances of putting the number into memory storage?
	

All sorts of techniques can help us to encode information. The simplest is to repeat the information to ourselves over and over again. You could just keep saying the telephone number to yourself. This is called **rehearsal**.

Storage

Some information is stored in memory over a very long period. For example, old people may be able to remember events from their childhood.

Information can be lost from storage, particularly if the person has an accident or illness that causes brain damage.

Retrieval

Retrieving information from storage may or may not require some effort. Sometimes we try to remember something and only succeed after a struggle. At other times information comes to us without difficulty. Also we sometimes retrieve information even when we are not trying to – memories just come to us.

You could compare the three processes described above with what a person does when they use a diary.

- They **encode** information by writing in the diary. If they do not write something down, it will not be stored.
- They **store** the information by keeping the diary in a safe place and preventing damage.
- They **retrieve** information by looking up the relevant date and reading the entry.

This example shows that human memory is similar in some ways to other methods of storing information.

Self-Assessment Test 2

Which memory process is likely to have failed in the following examples of forgetting?

Someone introduces you to a stranger. 'This is Andrew Lee'. You have a short conversation with him. A few minutes later you realise you have forgotten the stranger's name.

Someone asks you where you went on holiday last year. You can visualise the place, the name is on the tip of your tongue, but you just cannot remember it.

Every weekday evening a wife describes to her husband the main events of her working day. One day, driving home from work she has a car accident and hits her head. She is not seriously hurt but is kept in hospital overnight. Her husband visits her, but she is unable to remember the events of the day up to her accident.

Three Forms of Storage

Psychologists divide memory storage up into three kinds:

1. **Sensory memory**
2. **Short-term memory (STM)**
3. **Long-term memory (LTM)**

We will look briefly at each of these.

Sensory Memory

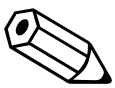
Sensory memory is a short-lived but accurate record of sensory information received from the environment. The sensory store is made up of inputs from your senses – vision, hearing, smelling, taste and touch. With a visual input, for instance, we retain an image for approximately 0.5 seconds. Thereafter, any information that is not processed further is forgotten. So it is true that there is not a big difference between registration and sensory memory.

Because sensory memory is gone so quickly, it does not create a store of information that is of much use to the individual. But we could describe sensory memory as the basic level of consciousness, and it is possible that something like 1% of all the sensory information that impinges on us reaches this level of consciousness, the other 99% being already filtered out.

Short-Term Memory

Short-term memory (STM) is like a very limited and temporary store that we use to deal with events as they happen. If someone tells you their telephone number, you can probably repeat it back immediately, because it is temporarily stored. If they ask you to recall it after an interval of one minute, it is likely to have been lost from storage. Short-term memory helps us to understand speech, because we can still remember the beginning of a sentence while we are listening to the end of it.

STM is limited in two ways: **duration** and **capacity**. Duration means how long information lasts in STM. Research by Atkinson and Shiffrin (1971) suggests that we can hold information in STM for between about 15 and 30 seconds. Of course, if we keep repeating the information, we keep renewing the storage and so we can extend the duration. But without this rehearsal, duration is very short. Capacity means how much information STM can hold. The following activity will help you to find this out.

Activity 2	Read out these rows of digits to a friend. After each row, get them immediately to repeat the digits to you. You will find that they can easily repeat a four-digit number – but what about a ten-digit number? Row 1: 8 3 1 6 (now get your friend to repeat them) Row 2: 5 7 2 9 4 Row 3: 1 6 2 3 8 5 Row 4: 7 1 9 5 2 6 3 Row 5: 4 8 3 1 5 2 7 5 Row 6: 6 2 7 9 5 1 3 6 8 Row 7: 3 8 5 6 3 1 7 9 6 2
	

This test measures what is called **digit span**.

You probably found that your friend could not repeat back the longest sets of digits. This is because the capacity of STM is very small. **Miller** (1956) found that most people can remember about seven items (digits or letters).

Miller also pointed out that the capacity of STM could be increased by organising the material into **chunks**.

For example, row 6 of the digit span test above is easier to recall if the digits are grouped into threes like this:

6 2 7 9 5 1 3 6 8

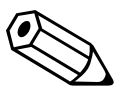
If the material to be remembered can be grouped in a meaningful way, the effective capacity is extended still more. For example, most people would not have a letter span of 12 letters. They could not recall from STM the letter sequence:

B Z N T R W A J H U A L

But they might easily recall the sequence:

U S A P L C V I P B B C

They could divide it up into four three-letter chunks, each of which is meaningful (USA, PLC, VIP, BBC).

Self-Assessment Test 3	1. What technique can be used to extend the capacity of STM? 2. What technique can be used to extend the duration of STM?
	

Long-Term Memory

By definition, long-term memory (LTM) has a very long duration. Most people can remember events, scenes, sounds, smells and faces many years after they were first encountered.

The capacity of LTM also seems to be very large. People never complain that they cannot learn any more because their memory is full! In comparison, the memory storage capacity of computer disks is quite limited.

You may be asked in your exam to distinguish between STM and LTM – the easiest way to do this is to compare capacity, duration and encoding.

STM and LTM differ in a number of ways including:

1. Capacity (How much it can hold)
2. Duration (how long information can be held for)
3. Encoding (the way information is changed so it can be stored in memory)

Capacity	STM has a very LIMITED CAPACITY (7 plus or minus 2 chunks of information)	LTM has potentially unlimited capacity
Duration	STM has very limited duration (a memory in STM does not last very long)	LTM lasts potentially forever
Encoding	Information in STM tends to be encoded acoustically (information is represented by sounds)	Information in LTM tends to be encoded semantically (information is represented by meaning)

Explanations of Memory

The Multi-store Model of Memory

A model of memory is a way of representing or explaining how the process of memory works. This description of memory storage is called a 'model' because it is really just an intelligent guess about how memory is structured. It is not yet possible to explore the human brain to find direct evidence for these stores.

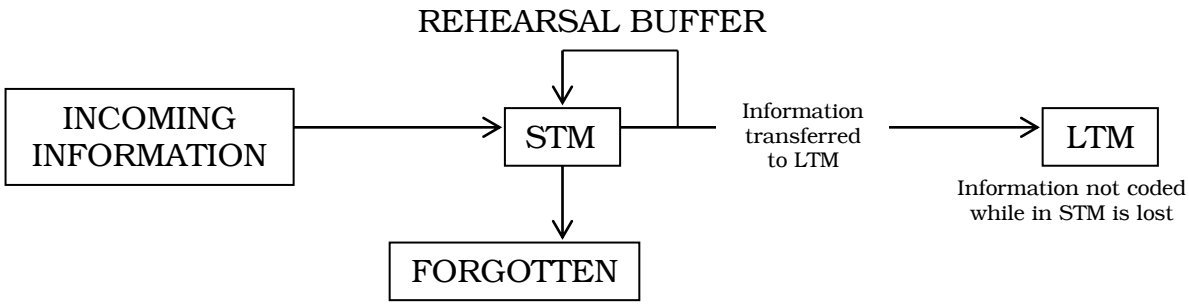
The multi-store model is perhaps the most influential and widely accepted explanation of memory. It was developed by **Atkinson** and **Shiffrin** in 1968. This was the first systematic account of the structures and processes involved in human memory. Atkinson and Shiffrin proposed that memory is made up of three separate stores which we considered above: the sensory store, STM and LTM.

Atkinson and Shiffrin's explanation of memory attempted to describe how information moves from one store to another. Each store has a specific function.

Information is detected by the senses and enters the sensory memory. If we pay attention to this information it enters the STM, otherwise it decays.

Information held in STM is in a 'fragile' state and will disappear quickly if not rehearsed. Material that is rehearsed is passed on to LTM, otherwise it is forgotten. Information can be lost from LTM through a number of ways, e.g. interference.

In 1971, Atkinson and Shiffrin produced the following diagrammatic multi-store model of memory:



According to this model, information held in STM is soon likely to be lost unless it is rehearsed. The simplest way to

rehearse is to repeat the information. They proposed a direct relationship between rehearsal in STM and the strength of the long-term memory. The more the information is rehearsed, the better it is remembered.

Evidence for the Multistore Model

There are lots of studies that support the multi-store model.

Peterson and Peterson (1959)

The role of rehearsal is supported by Peterson and Peterson. They found that if they asked groups of participants (psychology college students aged between 18-21) to remember nonsense trigrams (GRF) from a list but prevented them from rehearsing the trigrams (by giving a delaying task of counting backwards in threes), recall fell from 90% after a 3 second interval to 2% after an 18 second interval.

This suggests that information vanishes rapidly from STM if rehearsal is prevented. This study supports the strength of the multi-store model and its views on rehearsal.

Case Evaluation

Sometimes an exam question may ask you to evaluate a particular study. Evaluation means that you need to describe what was good about the psychological study but also realise what could have been improved. When you are asked to evaluate you can use positive or negative criticism. By evaluating you will indicate to the examiner that you have a good grasp of psychological research.

As you work through the folder, there is plenty of space in the margins for you to write evaluation notes on each of the major studies that is mentioned. We have included some more evaluation at the end of each module, in the answer sections, so you can compare your notes with ours and add anything you may have missed out!

Practising Exam Questions

Here is a possible exam question:

Evaluate the Peterson and Peterson (1959) study.

(3 marks)

Evaluation marks can be earned in a number of ways. You could state three criticisms (positive and/or negative) to get the full marks or you could focus on one or two criticisms and explain why they are either positive or negative.

3 point rule for criticising studies and theories

1. **State your criticism**: Peterson and Peterson's 1959 study was artificial.

2. **Justify this criticism**: It was artificial because they used nonsense trigrams (TOJ) to test memory, which are not like real-life memory tasks. Trigrams have no meaning; therefore the study lacks ecological validity.

3. **Explain why this is a strength or limitation**: This means that you can't generalise the findings to real life.

Some students lose marks when they evaluate because they fail to explain their criticism.

Top Exam Tip!

Always use the marks and the space provided on the exam paper to guide you on how much you need to write.

Some evaluation terms are very easy to remember – lots of them begin with the letter E which is extremely handy! Read the terms below and try to learn them as they will come up again and again. Whenever you are asked to evaluate a study look over these terms and see what is relevant. Some terms you may not fully understand at the moment but they will become clearer as you work through the folder.

After you have read them, your self-assessment test will ask you to evaluate Peterson and Peterson's study. Good luck!

Evaluation Elephants – Never Forget these Terms!

ECOLOGICAL VALIDITY: Can findings be generalised to real-life environments? Is the study true to real-life experiences and can it be generalised to the wider population?

EXPERIMENT: Psychological research mainly involves laboratory studies which take place in an academic environment. Experiments have scientific validity yet they lack ecological validity.

ETHICS: Does the research follow ethical guidelines? Does it break guidelines? Does it use deception or does it invade a person's privacy? Could it be repeated in a more ethical way?

ETHNOCENTRISM: Is the theory/study biased? Does it look at people from a restricted cultural viewpoint? Intelligence and personality tests are notoriously culturally biased.

DATE OF STUDY: Is it very old or out of date? Is the theory/study outdated?

EMPIRICAL EVIDENCE: Is the theory/study well supported by empirical evidence? Is there a lot of conflicting research? Are there any other possible explanations which the theory/study overlooks?

SAMPLE: Many studies use a restricted sample. Many use white, middle class, psychology students. Is this group representative?

Self-Assessment Test 4	Now evaluate Peterson and Peterson (1959).
	

Other Evidence for the Multi-store Model

We shall look at some other evidence that also gives some support to the multi-store model. First we shall look at the **serial position effect** and then evidence from **brain-damaged patients**.

Activity 3

Ask a friend to try to remember as many of the following words as they can. You should read out the word list to them once, taking about 30 to 40 seconds altogether.

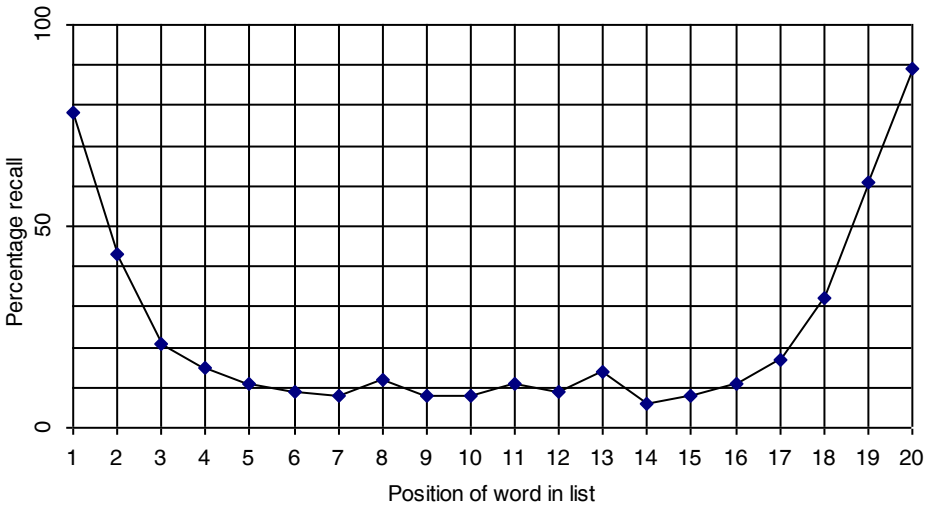
FACTORY
HEDGE
STATUE
VERDICT
PARALYSE
LEAF
TROUBLE
MARKING
CLOVER
CUTLERY
RISK
BUILDING
PIANO
RATIONAL
STEAM
TORTOISE
MUSTARD
ARMCHAIR
MEDICINE
JUGGLER

Activity 3 (cont)

Immediately afterwards, get your friend to write down as many of these words as they can remember – in any order.

Murdock (1962) presented participants with a list of words at a rate of about one per second. Murdock found that most participants recall words from the beginning and the end of the list (positions 1, 2, 3 and 18, 19, 20).

Your friend is quite likely to have done the same. If this test were done with a large sample of participants and plotted on a graph, the following pattern would result:



Graph showing the serial position curve.

Try to decide why it is that people tend to remember the last few words.

A likely explanation is that these words are remembered because they were the ones most recently heard. They are still in STM because the time delay between hearing them and repeating them is so short. This is called the **recency effect**.

It is more difficult to understand why the first words are also remembered. If STM was the only store involved, these words are the most likely to be forgotten. Your friend might be able to tell you how they managed to remember words early in the list.

The usual explanation is that when people hear the first few words they make an attempt to attend carefully to them, and perhaps rehearse them. But as more words follow, this strategy breaks down and people are not able to rehearse the previous words while listening to the new ones. The result is that only the first few words are properly encoded in such a way that they will be stored in LTM. Remembering items presented first is called the **primacy effect**.

The serial position curve seems to show the operation of two distinct memory stores. The first peak shows the effect of LTM and the second peak the effect of STM.

Another type of evidence supporting the multi-store model comes from the study of brain-damaged patients. A patient known as H.M. was described by Barbara Milner in 1966. Following brain surgery to cure him of epilepsy, the patient suffered damage to his memory. Given some information, he could remember it for as long as he attended to it. His short-term memory was normal. However, he seemed unable to store new information in long-term memory. For example, he failed to recognise people he met after his operation. Although Milner studied H.M. for some years, she always appeared to be a stranger whenever they met. The inability to store new information in LTM after brain damage is called **anterograde amnesia**.

This suggests that the brain damage had affected LTM but not STM, in which case the two stores must be separate and distinct.

Criticisms of the Multi-Store Model

The model is **oversimplified**. It assumes that STM and LTM are individual stores made up of one component each but later research, e.g. the working memory model proposed by Baddeley and Hitch has shown that it is possible that STM actually consists of many different components.

It is also a simplistic view of memory as it does not take into account strategies used to aid memory. In everyday life we don't always remember information by rehearsing, sometimes we just remember something because it is interesting or funny.

Many people would also argue that it lacks ecological validity (relevance to everyday life). This is because the evidence for the model comes mainly from experiments carried out in a laboratory using meaningless verbal data. As the data are exclusively from laboratory studies of memory they might only apply to a particular kind of memory, and not other things like remembering how to ride a bicycle.

The **case study** by Milner (1966) provides us with unique insight into one person's experience but can we generalise to

the wider population? It is always difficult to make generalisations from a case study of one or a few individuals. It is especially true in the case of brain-damaged individuals as we don't know how 'normal' their brain abilities were before the damage occurred.

Practical Application - Revising for exams

The multi-store explanation of memory says that *rehearsal* allows information to be transferred from short-term memory to the long-term memory. To achieve success in your exams ensure that you rehearse thoroughly!

The Reconstructive Explanation of Memory

We have already looked at the multi-store model of memory. This model suggests that from the bombardment of sensory data, a little bit becomes sensory memory. A little of that goes into STM, even less to LTM and only a certain proportion of LTM can be retrieved some time after. But the tiny piece of memory that comes out of this long 'sausage machine' is, at the least, directly related to what went in in the first place.

But what if there is no such connection? Maybe each 'memory' is a fresh creation, based only *indirectly* on what happened in the past? This brings us to the reconstructive model of memory. This model was developed mainly by a famous psychologist called **Elizabeth Loftus**. One of her most important experiments is considered in the next lesson.

Loftus's work on reconstructive memory in the 1970s owes much to some earlier work by **F. C. Bartlett** in the 1930s.

Sir Frederic Bartlett a British psychologist carried out pioneering research in 1932 into why people recall events inaccurately. His book *Remembering* (1937) has been described as one of the three most influential publications in the psychological study of memory (Kintsch, 1997).

Bartlett proposed that memory is an **active process**. He claimed that we do not record memories passively, he believed we need to make what he called **effort after meaning**- in order to make sense of the event.

Bartlett suggested that we only store some elements of new experiences in memory, and, when we remember the events, we reconstruct them, filling in missing information with information from learned schema, such as stored opinions, prejudices, expectations or stereotypes. Bartlett used the term **schema** to describe a building block of information about an event that helps us reconstruct our memory for an event.

Bartlett was interested in the ways stories were passed on from one person to another or even from one generation to another (**serial reproduction**).

Bartlett selected stories that would be unfamiliar to his participants. His most famous study (1932) involved a story called 'The War of the Ghosts', a folk tale taken from Red Indian Culture. This was a strange story for people from a Western Culture to understand as it contained supernatural concepts and an unusual structure.

Bartlett set up a chain of people that were all asked to pass on the story exactly. Person A told the story to B, B to C, and so on. Similar to the childhood game Chinese Whispers. As the chain got longer, he found that:

(1) The story became shorter (down from 330 to 180 words after six or seven reproductions);

(2) The story became more coherent (ordered, logical), even where it disagreed with the original;

(3) The story became more conventional and clichéd.

The third point, in particular, suggests that we reconstruct the past by trying to slot it into our existing schemas or expectations. If bits don't make 'sense', we cut them out. At some level we work out what 'could' or 'should' have happened and tidy up accordingly.

Bartlett also looked at the way one person will tell the same story over a period of time (**repeated reproduction**). His aim was to discover how the individual's memory of these stories altered over time. Did it stay the same? What kinds of alterations were made to the original?

Findings: he found that if there were long gaps between the retellings, the story would become increasingly transformed. Participants interpreted stories within their own frames of reference.

People changed unfamiliar information to fit their individual cultural schema and cultural expectations. The stories were again shortened.

Phraseology changed to language and concepts from the participant's own culture.

Self-Assessment Test 5	1. In Bartlett's experiments, what is the difference between serial and repeated reproduction? 2. Name a story that Bartlett used.
	

It is not difficult to copy Bartlett's experiment on serial reproduction. If you can find a few willing participants and a suitable short story, you could carry out your own test.

Self-Assessment Test 6	Using your evaluation elephant terms- evaluate Bartlett's study!
	

Practical Application

The idea that memory is a reconstructive process is widely accepted in psychology. Most importantly, the idea of reconstructive memory has proved invaluable in understanding inaccuracies in EWT, especially the effects of post-event information. One problem is that the whole idea of reconstruction is highly cognitive. It neglects the importance of other factors in remembering, for example, the emotional.

The Levels of Processing Explanation of Memory

Here we need to mention Craik and Lockhart's 1972 **levels-of-processing** (LOP) theory. This explanation does not describe a number of memory stores: Craik and Lockhart emphasise the cognitive processes, rather than the structure of memory. Whether we remember something or not depends on how the information is processed.

In Hyde and Jenkins' (1973) levels-of-processing study, participants were presented with lists of words for three seconds and were asked to complete *one* of the following tasks:

1. Rate the word for pleasantness.
2. Estimate the frequency of use of the word.
3. Detect the presence of particular letters in the word
4. Identify the part of speech (noun, verb, adjective, etc).
5. Make decisions as to whether the word fits into sentence frames (e.g. it is the …… it is …..).

Each of these is a different **type of encoding** or way of organising the same set of data.

Hyde and Jenkins argued that conditions (1) and (2) meant that participants had to consider the meaning of the words (i.e. semantic processing) while the others did not. Because of this, participants would remember more words than those following instructions (3), (4) or (5). Their results supported this prediction.

The theory suggests that the deeper the level of processing, the stronger the memory trace. What are the levels of processing (or types of encoding)?

They propose three levels of processing:

1. **Iconic**: what information looks like - the visual characteristics of the information.

2. **Acoustic**: What information sounds like - sound of words, rhythm and rhyme.

3. **Semantic**: What information means - meaning, use and context of words.

In terms of processing, iconic is shallow, acoustic is deeper and semantic is the deepest. The more information is processed, the better it is remembered.

While there are a number of studies which support the LOP theory, **Eysenck** (1986) has argued that it is of limited value because there are too many other general factors at work which are just as important:

- The nature of the task given to the subject
- The type of material to be remembered
- The individual knowledge of the subject
- The nature of the test used to measure memory performance (e.g. recall or recognition)

Craik and Tulving (1975) took the view that although the LOP approach was a good one, **elaboration** of processing was also important. Elaboration is the amount of processing of a particular kind. They varied the complexity of a sentence frame from simple ("she cooked the _____") to complex ("the great bird swooped down and carried off the struggling _____"). Recall was twice as high for words accompanying the complex sentences. Since both are on the same level of processing (semantic), some other factor must be involved, i.e. elaboration.

But surely it is the *kind* of elaboration which matters? "The great bird swooped down and carried off the struggling _____" creates a striking image and is probably more memorable than a sentence such as "a mosquito is like a racoon because they both have heads, legs and jaws" even though the latter has three elaborations.

Therefore a factor that can influence how well we remember information is the extent to which we **elaborate** it. To elaborate information is to add to it, possibly to restructure it. You might be surprised that adding *more* information will aid recall, but sometimes it will.

Elaboration is a feature of some useful mnemonic techniques using rhymes or acronyms.

Activity 4	If someone asked you how many days there were in April, how would you retrieve this information? How do you remember the colours of the rainbow?
	

One way some people remember how many days there are in each month is by using this rhyme:

'Thirty days has September,
April, June and November;
All the rest have thirty-one,
Excepting February alone,
And this has twenty-eight days clear,
And twenty-nine in each leap year.'

This is an example of elaboration. Instead of just remembering the basic information, we remember a more elaborate version of it.

Some people remember the colours of the rainbow (red, orange, yellow, green, blue, indigo, violet) by using the first letter of each word to make the acronym ROYGBIV and then elaborating it into a sentence with words starting with those same letters. A common elaboration of this is 'Richard of York gave battle in vain'.

Besides elaboration, **organisation** and **distinctiveness** have also been shown to be significant factors affecting memory trace.

Organisation

It is no surprise to find that the more organised a set of items to be remembered is, the more likely we are to remember them

all. To be more specific, *our ability to remember depends on the degree to which new information conforms to patterns of organisation that we have already learnt.*

There is a principle called the 'degree of organisation' principle (proposed by Restle, 1974): the better we can organise new material (relate it to existing material), the better it will be retained.

Activity 5

Look at the two word lists below. You could try reading each list out to a friend at different times.

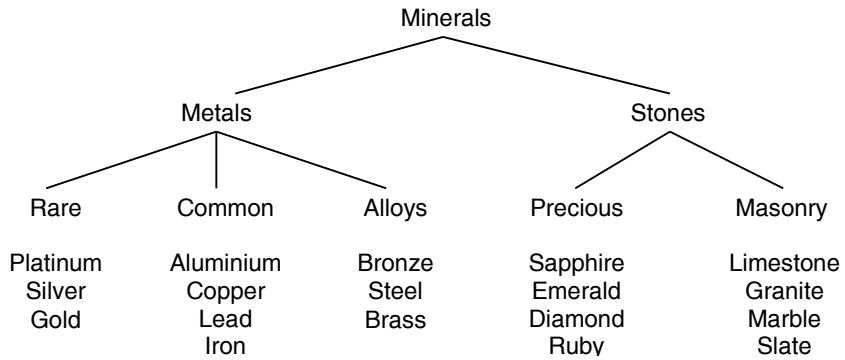
List 1	**List 2**
DAISY	BIRCH
TULIP	LOCK
ROSE	SHOWER
LILY	PILLOW
ZEBRA	COFFEE
HORSE	NEEDLE
TIGER	GREY
RABBIT	PENCIL
GREEN	SHARK
YELLOW	STAPLE
PURPLE	WHEEL
BROWN	CLOUD

Which list do you think is easier to remember, and why?

Most people find the first list easier to remember, because the words are already organised into meaningful categories. The words in list 2 don't fit into meaningful categories in any obvious way.

Bower, Clark, Lesgold and Winzenz (1969) asked participants to learn sets of 28 words. There were four sets altogether, making a total of 112 words. Participants in one

condition – the experimental group – were presented with the words arranged into a meaningful hierarchy, as follows:



You can see that this kind of organisation should help memory, because category headings like 'precious stones' tend to cue recall of words like 'diamond' and 'emerald'.

Participants in another condition – the control group – were just given each list of 28 words arranged in a random order. All participants were asked to learn the words. Participants in the experimental group recalled on average 73 words out of 112, whereas the control group recalled only 21 out of 112.

You should expect to be able to describe classic studies like this in your exam. Do not worry about trying to remember the names Bower, Clark, Lesgold and Winzenz. Studies carried out and reported by several researchers are often referred to by the first name, so you can call this study 'Bower *et al.*'. ('*Et al.*' is a commonly used Latin abbreviation meaning 'and others'.)

Practical application

You could use something similar to the method of presentation in the Bower *et al.* (1969) study to help organise material in a way that will help you retrieve it.

This method is called the **spider diagram**. Spider diagrams include the main topics linked together. You can revise for your exam by drawing a spider diagram including all the sub-topics. Then you learn the diagram until you can reproduce it from memory. Examples of spider diagrams are included at the end of several lessons in this course.

Distinctiveness of Information

You go to a concert and afterwards you are asked to recall the hair colour of the different members of the orchestra. How much would you remember?

It is likely that you would only remember the hair colour of those individuals who gained your attention for some reason– the soloist, the first violinist and those individuals whom you found most physically attractive. But if one of the players had *green* hair, it is likely that that would also stick in the memory. This is because we do not expect hair to be green. Normally, there is no useful reason for remembering the hair colour of all the people who come into our line of vision, but we are likely to notice and remember those observations which are strikingly at odds with our normal expectations.

The *degree* of distinctiveness is particularly likely to play a part when we are not actively trying to remember something. When our brains are working on some other task (e.g. appreciating the music at the concert), there is still part of the brain passively monitoring the environment, alert to any major departures from the norm. It is this alertness which helps human beings and other creatures to survive.

Practical Application

We can use distinctiveness to aid memory by deliberately trying to link some information with a bizarre, unusual (and therefore distinctive) situation. For example, if you wanted to remember the Bower *et al.* (1969) study, you could imagine yourself looking at a garden and seeing an enormous bower bird building a nest and collecting all kinds of coloured minerals to put in it. The bird glances up at you and snaps its beak in a menacing way. 'Just needs a bit of organisation', it chirrups.

Evaluation of the Levels of Processing Explanation

- This explanation can be applied to improving memory. If you find it hard to remember someone's name, don't just repeat it over and over again – elaborate the name or make the memory distinctive. These techniques will enhance the depth of processing and hopefully help you remember information better.

- Has Face validity: it makes sense that the more we think about something the more likely we are to remember it

- Ignores any distinction between STM and LTM: yet a wealth of evidence suggests that distinction of these types exists.

- Practical application: This explanation has been applied to memory for faces. Shallow processing of faces- like shallow processing of words- leads to poor recall.

Sporer (1991) showed that participants recognise a greater number of photos of faces, if they have to make judgements about whether a person is honest, rather than which gender they are, or what colour eyes a person has. Therefore, being asked to make character judgements results in the face being looked at longer and with more eye-movements. In these circumstances more features may be encoded, with consequently superior recall. Another explanation is that they are encoding the face more holistically, rather than in terms of isolated features.

Practice Test (Lesson Four): Memory

(a) List three processes that are essential for a person to be able to remember information. (3 marks)

(b) If you read out a list of words to someone and *immediately* ask the person to recall them, which memory store are you testing? (2 marks)

(c) What aspect of STM can be measured using a test of digit span? (2 marks)

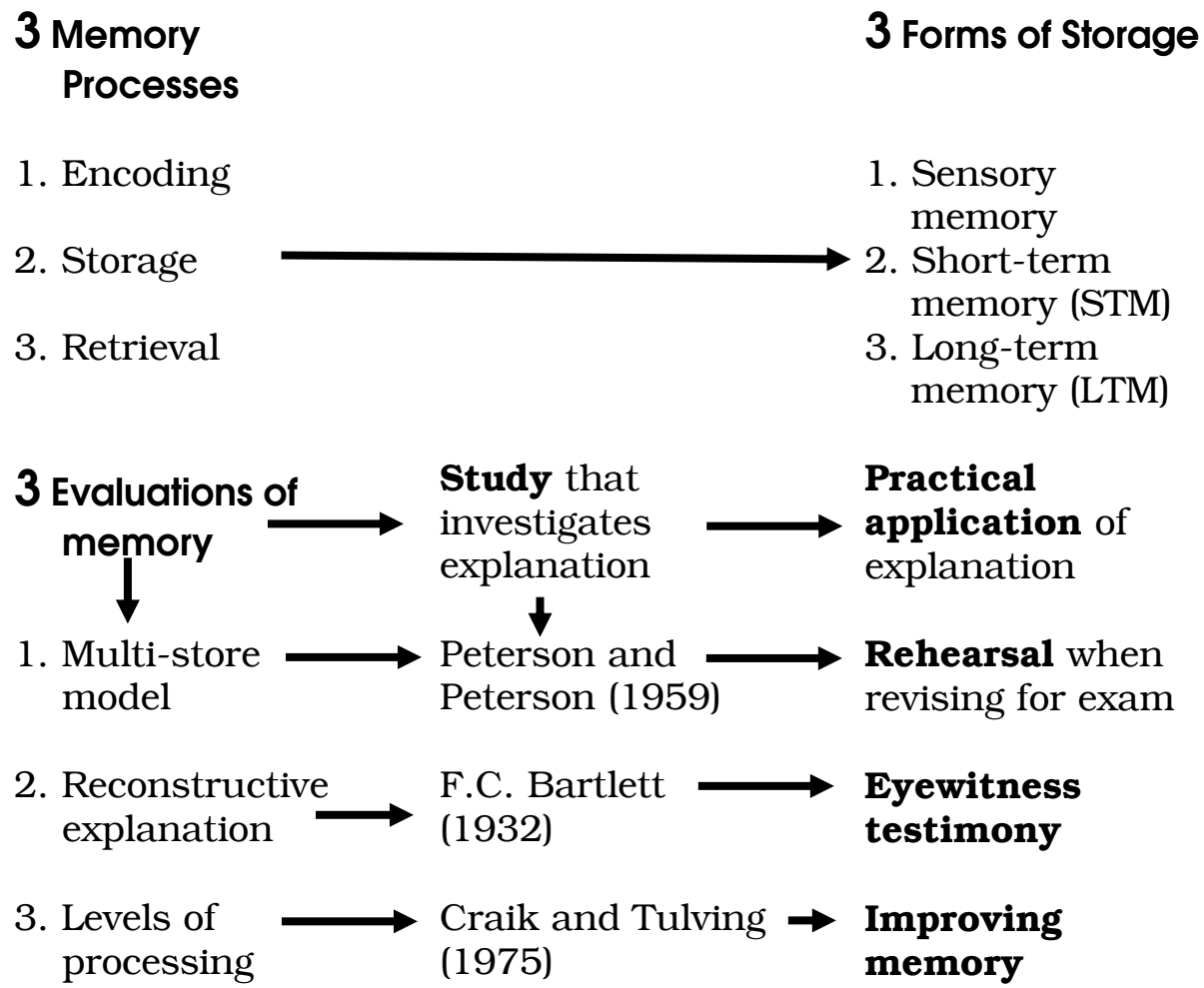
(d) Sometimes schoolchildren are made to learn multiplication tables by chanting them repetitively: 'One times three is three, two times three is six...' and so on. Why might this help learning, according to the multistore model? (3 marks)

(e) How could you try to ensure that you only measured recall from LTM (i.e. not STM) in a list-learning task? (3 marks)

(Total: 13 marks)

Summary

This should jog your memory on what you need to know about memory!



Suggested Answers to Self-Assessment Tests

SAT 1

1. Free recall.
2. Cued recall. (Capital cities are almost always paired with their countries when being learned.)
3. Recognition recall.

SAT 2

1. Failure to encode.

2. Failure to retrieve.

3. Failure of storage.

SAT 3

1. Grouping can extend the effective capacity of STM.

2. Rehearsal can extend the effective duration of STM.

SAT 4

Lacks ecological validity.

Perhaps only investigates one type of memory.

Biased sample- just used students. Students differ from the general population in a number of ways:

- Stronger need for peer approval
- Self concept not fully formed
- More egocentric
- Higher level of intelligence
- More developed memory

SAT 5

(a) Serial reproduction is the way stories are passed on from one person to another. Repeated reproduction is the way one person will tell the same story over a period of time.

(b) The War of the Ghosts.

SAT 6

Criticism: Bartlett's studies and theory have made an enormous contribution to our understanding of memory. However, he has been criticised for using folk tales- assumed they would be less meaningful to people of other cultures but he had no objective measure of meaningfulness.

1. His ideas are seen as vague.
2. Research is seen as unscientific.
3. Outdated study (1930s) now in a society with more access and awareness of different cultures and ideas- lacks temporal validity.

Suggested Answers to Practice Test

(a) List three processes which are essential for a person to be able to remember information. (3 marks)

_____

Encoding, storage and retrieval.

(b) If you read out a list of words to someone and immediately ask the person to recall them, which memory store are you testing? (4 marks)

_____

Short-term memory.

(c) What aspect of STM can be measured using a test of digit span? (2 marks)

_____

The digit span test measures the capacity of STM.

(d) Sometimes schoolchildren are made to learn multiplication tables by chanting them repetitively: 'One times three is three, two times three is six…' and so on. Why might this help learning, according to the multistore model? (3 marks)

_____

The repetition is a simple form of rehearsal, and rehearsal is likely to result in the information being stored in LTM.

(e) How could you try to ensure that you only measured recall from LTM (i.e. not STM) in a list-learning task? (3 marks)

_____

You could ask participants to recall after a delay of at least 30 seconds. During the delay you would try to prevent them from rehearsing the list. One way of doing this is to ask the participant to count backwards in threes starting with 256.

(Total: 15 marks)