Section 1 Cognitive psychology

Topic 1 Short-term memory and long-term memory

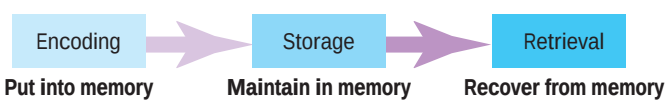
Can you remember what you did yesterday...what you had for breakfast this morning...what you watched on television last night? It is hard to imagine life without memory because, if we were unable to remember, life would be a series of fragmentary, unconnected events. But what is memory and how does it work? Cognitive psychologists try to answer these questions. This section focuses on the stages of memory, the characteristics and structure of short-term memory (STM) and long-term memory (LTM), and the differences between them.

Item 1

The stages of memory

You can probably remember when you first met your psychology teacher. You would have told the teacher your name and in the next class he or she might have remembered it. But how did your teacher remember your name?

Psychologists describe three stages of cognitive processing:



In **stage 1**, when you told your teacher your name he or she transformed the sound of your name and **encoded** the representation into memory. In **stage 2**, your encoded name was **stored** in your teacher's memory until you met in the next class when, in **stage 3**, your teacher **retrieved** your name from memory.

Theories of memory suggest that forgetting is the result of a failure of any one of these three stages. If your teacher did not pay attention when you told him/her your name, it may not have been encoded into memory. Perhaps your teacher had too many new names to learn, resulting in your name not being stored in memory. It is possible that although your name was stored in your teacher's memory, for some reason it could not be retrieved.

Psychologists who study memory try to explain the processes that lie behind these three stages of memory and why these processes sometimes go wrong, leading to memory failure.

Item 2

Short-term memory (STM) and long-term memory (LTM)

Psychologists distinguish between **short-term memory (STM)** and **long-term memory (LTM)**. STM cannot hold much information and has limited capacity, whereas LTM can hold an apparently unlimited amount of information and has a vast capacity. George Miller theorised that the capacity of STM is

approximately 'seven plus or minus two' pieces of information, but that this capacity can be extended by **chunking**, or combining, small pieces of information. For instance, consider this set of 11 numbers: 0 1 7 2 2 5 9 9 2 3 4. This would exceed the proposed capacity of STM, but if chunked into three parts, i.e. 01722 599 234, it makes a more easily remembered telephone number.

Jacobs (1987): a study of capacity in STM

Aim To research the capacity of STM.

Procedures Participants were presented with strings of letters or digits and were asked to repeat them back in the same order. The length of the string was increased, from three to four, five, six etc., until the participant was unable to repeat the sequence accurately.

Findings On average, participants recalled nine digits and seven letters. The average recall increased with age.

Conclusions STM has a limited storage capacity of between five and nine items, but learned memory techniques (e.g. chunking) may increase capacity as people get older. Since there are 26 letters in the alphabet but only ten digits (0–9), letters may be harder to recall.

Criticisms The research is artificial. In real-life settings people do not usually need to remember strings of meaningless numbers or letters, and the research therefore has low ecological validity. If the information to be remembered has more meaning, it might be remembered better.

Another difference between STM and LTM is that information in STM does not last very long — STM has short duration, possibly less than 30 seconds, whereas information in LTM has long duration and may last a lifetime.

Bahrick et al. (1975): very long-term memories — a study of duration in LTM

Aim To study very long-term memories in a real-life setting.

Procedures There were three tasks:

1 In a free recall test, 392 people were asked to list the names of their ex-classmates.
2 In a photo recognition task, participants were shown photographs of their ex-classmates and asked if they could remember the names.
3 In a name recognition task, participants were given names of their ex-classmates and asked to find the matching photographs.

Findings Within 15 years of leaving school, participants were 60% accurate in the free recall task and could recognise 90% of the faces and names. Within 48 years of leaving school, participants were 30% accurate in the free recall task and could recognise 75% of the faces and names. Free recall memory had declined more than photo and name recognition memory.

Conclusions The study shows evidence of very long-term memories in a real-life setting. Since recognition was more accurate than free recall, there may be information stored

in memory that can only be accessed when we are given an appropriate cue.

Criticisms This study was undertaken in a real-life setting and the memories were meaningful to the participants, so it has high ecological validity. It is also a useful study as it has application in real life. For example, carers could show elderly people photographs of their colleagues in arms in the Second World War in order to engage them in conversation. In real-life settings, however, variables are hard to control (such as how long a participant had attended the school), leading to less reliability than in laboratory studies.

Recency and primacy effects in STM and LTM

You may have discovered that when you revise for exams you tend to remember information you have learned most recently. This is called the **recency effect**. Glanzer and Cunitz (1966) researched the recency effect in free recall experiments in which people who were asked to memorise lists of words were then asked to recall the words in any order. Usually, the last few words on the list were remembered more frequently, possibly because they could be retrieved from STM. Glanzer and Cunitz also found a **primacy effect**, in that the earliest words were also remembered more frequently, possibly because they had been rehearsed more and had been transferred to LTM. Perhaps when teachers have long lists of names to remember they are more likely to remember the first and last few names they hear.

Item 3
Encoding information in STM and LTM

When we **encode** information in memory we store it in a way that ensures it will be remembered. Sometimes information is encoded **acoustically** (what the information sounds like), sometimes **iconically** (what the information looks like) and sometimes **semantically** (what the information means).

Psychologists suggest differences in the ways in which information is encoded in STM and LTM. In STM, it is often the sound of the information that is encoded, resulting in acoustic code. If you look up a telephone number, you may repeat the number again and again; in effect you rehearse the sound to enable acoustic encoding in STM. In LTM, however, it is the meaning of information that is encoded, resulting in **semantic** code.

Baddeley (1966): investigating encoding in STM and LTM

Aim To look at the effects of acoustic and semantic encoding on recall from STM and LTM.

Procedures Participants were given four sets of words from the following groups:

- acoustically similar (e.g. ban, bad, bat)
- acoustically dissimilar (e.g. sad, pit, bet)
- semantically similar (e.g. big, huge, large)
- semantically dissimilar (e.g. sad, hot, cow)

They were asked to recall as many words as possible, either immediately or after 20 minutes.

Findings In the immediate recall situation (recall supposed to be from STM), participants had more difficulty remembering the acoustically similar words.

In the delayed recall condition (recall supposed to be from LTM), participants had more difficulty remembering the semantically similar words.

Conclusions The difference in the difficulty suggests that STM relies on acoustic encoding while LTM relies on semantic encoding.

Criticisms The research is artificial. In real-life settings people do not usually need to remember strings of short words, and the research therefore has low ecological validity. Miller and Jacobs both agree that if information can be 'chunked' into meaningful segments, it may be remembered better. Also, in addition to **semantic memory**, where the meaning of information is remembered, psychologists have proposed several other ways in which long-term memory can be categorised, which this study does not consider. These include:

- **episodic memory** — memory of specific events, for instance last Christmas or a special occasion
- **procedural memory** — memory of knowing how to do things, such as how to swim or ride a bicycle
- **declarative memory** — where we store learned facts, such as knowing that Paris is the capital city of France

Positron emission tomography (PET) scans of brain activity have found that different areas of the brain may be involved when different types of memories are retrieved.

Summary: STM and LTM

Memory is complex. In order to learn, we must encode, store and be able to retrieve information from memory. The table below shows some of the ways in which STM and LTM are different.

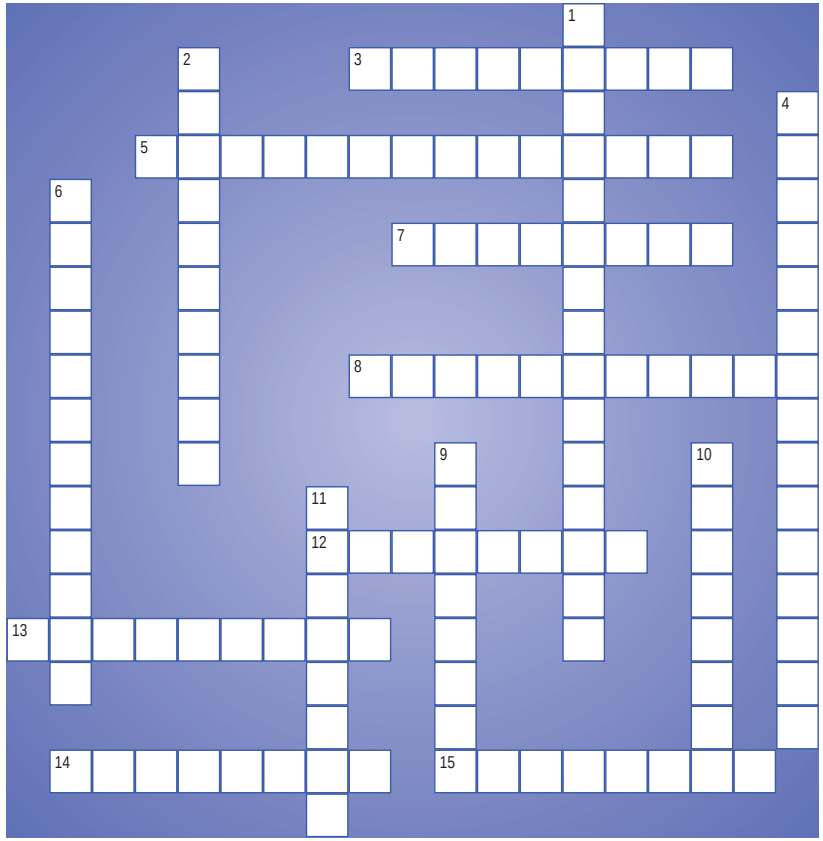
Comparison	Short-term memory (STM)	Long-term memory (LTM)
Capacity	Limited (7 +/– 2 chunks)	Potentially unlimited
Duration	Short (seconds only)	Possibly lifelong
Encoding	Acoustic (sound)	Semantic (meaning) Episodic (events) Procedural (knowing how) Declarative (knowing that)
Order effect	Recency Last information recalled	Primacy First information recalled

1 Read Items 1, 2 and 3 and then complete the crossword on STM and LTM. It should take you about 10 minutes.

Answers

Across

3 The process by which information in STM can be retained for longer. (9)
5 Memories of childhood can be stored in this part of your memory (begins with 'L'). (4-4, 6)
7 This is limited in STM and begins with 'C'. (8)
8 This type of memory concerns 'knowing that…', e.g. 'I know that Christmas Day is on 25 December'. (11)
12 The first process by which a memory is stored. (8)
13 The process by which we recover stored memories. (9)
14 This type of memory is for specific events and begins with 'E'. (8)
15 How the capacity of STM can be increased. (8)



Down

1 These effects might be demonstrated when people try to remember lists of words. (7 & 7 — *do* include the ampersand)
2 This type of memory concerns how we remember how to do something, e.g. 'I know how to drive a car'. (10)
4 Where information might be stored initially (or sensory memory). (5-4, 6)
6 The person who proposed the capacity of STM to be 'seven plus or minus two'. (6, 6)
9 This type of encoding takes place when information is stored according to its sound. (8)
10 A word beginning with 'D' meaning how long memories last. (8)
11 This type of encoding takes place when information is stored according to its meaning. (8)

2 Read Items 2, 3 and 4. Use all 12 words in the list below to fill in the blanks in the story:

- chunked
- Miller
- 30 seconds
- remember
- capacity
- capacity
- rehearsed
- short-term memory
- repeated
- duration
- chunked
- acoustic

3 Read Items 2, 3 and 4 and the relevant sections of your textbook and complete sentences a, b and c.

2 Daphne ran to answer her phone but as she picked it up it stopped ringing. She dialled 1471 and listened to the recorded voice telling her that the call came from number 016367456899. Not recognising the number, Daphne ..... the number over and over again so that it would be retained in her ..... . As she ..... the string of numbers she ..... them into three sections as 01636 745 6899. George ..... proposes that the ..... of STM is 7 plus or minus 2 digits. If this is correct, unless the 12-digit telephone number is ..... into smaller units it will exceed the ..... of Daphne's STM. Since Daphne did not write down the number she had to use a process of ..... encoding to store it in STM. However, just as Daphne began to dial the number her postman arrived and two letters dropped through her letterbox. She picked them up and put them on the hall table. Oh no! Now she could not ..... the telephone number. Perhaps that was because the ..... of information in STM is less than .....

3a When we **encode** information in memory we .....

b When we discuss the **capacity** of memory we are talking about .....

c Information in short-term memory has a short **duration**, which means that .....

4 Read Items 1, 2 and 3. Describe *two* ways in which STM differs from LTM.

4

5 Read Item 2. Outline the aims, procedures and findings of any *one* study of capacity in STM.

5

6 Read Item 3. Outline the findings and conclusions of any *one* study of the duration of memories in LTM.

6

7 Read your textbook and Items 1, 2 and 3. Using the table, summarise the aims, procedures, findings, conclusions and criticisms of *two* research studies into the capacity and duration of STM and LTM.

	Study 1: researcher(s)	**Study 2: researcher(s)**
Aim (AO1 skill)		
Procedures (AO1 skill)		
Findings (AO1 skill)		
Conclusions (AO1 skill)		
Criticisms (AO2 skill)		