Pearson Edexcel Level 1/Level 2 (9–1) GCSE Psychology

Topic Guide 2
Memory – How does your memory work?

CONTENTS

Memory – How does your memory work?

Specification requirements

This topic is a compulsory topic and will be examined in Paper 1.

Candidates are expected to demonstrate and apply the knowledge, understanding and skills described in the content.

To demonstrate their **knowledge**, candidates should undertake a range of activities, including the ability to recall, describe and define, as appropriate.

To demonstrate their **understanding**, candidates should explain ideas and use their knowledge to apply, analyse, interpret and evaluate, as appropriate.

Candidates will be expected to demonstrate their understanding of the interrelationships between the core areas of psychology and **issues and debates** within them.

Candidates may be asked to consider the following issues when **evaluating** studies:
- validity
- reliability
- generalisability
- ethics
- objectivity
- subjectivity.

Candidates may be required to **apply** their understanding – for example, by responding to scenarios that are drawn from the topic area and/or associated research – and in doing this they should use psychological concepts, theories and/or research from within their studies of memory.

Opportunities for practical activities

Candidates should gain hands-on experience of carrying out ethical, investigative activities to aid their understanding of this subject. To help centres identify opportunities for carrying out these activities, studies that can be replicated have been marked with an asterisk.

Research methods are delivered in Topic 11. However, as a way to aid candidates in evaluating the studies, centres can encourage them to consider the methodology of the key studies as they progress through each individual topic. For example, candidates could consider the ecological validity of a laboratory experimental method in testing human memory and recall when studying Peterson and Peterson (2.2.2).

Although candidates will not be directly assessed on practical activities, the experience they gain will give them a better understanding of this subject and may enhance their examination performance.

Guidance

2.1   Content

2.1.1 Know the structure and process of memory and information processing:
    a. **input**
    b. **processing**
    c. **output**
    d. **encoding**
    e. **storage**
    f. **retrieval**

2.1.2 Understand the features of short-term and long-term memory, including:
    a. **duration**
    b. **capacity**

The structure and process of memory, including how information is processed, underpins the core areas of the memory topic.

Candidates may benefit from starting their learning with basic descriptions and definitions of these key features, and then making links to the **multi-store model of memory** (2.1.5) in order to understand how the key features are evident within psychological theories and explanations.

Candidates should be able to define the key terms and know the features of these. Candidates may benefit from using diagrammatic models to explore the path information follows from **input** (2.1.1a) through to **output** (2.1.1c), including how it is **processed** (2.1.1b). They should be able to describe the meaning of **encoding** (2.1.1d), such as the modality, differences in **storage** (2.1.1e), such as the **capacity** (2.1.2b), and **duration** (2.1.2a) and **retrieval** (2.1.1f), such as sequential scanning.

Application of these concepts to stimulus materials would benefit candidates. Centres could develop scenarios and examples from which candidates can identify the key features, structures and processes of memory that are evident and describe them in relation to the key concepts.

Rhianna is read a list of 11 items to buy from the shop for her mum. When her mum finishes reading the list of items to her, Rhianna has forgotten the first three items on the list. Why might Rhianna have forgotten the first three items?

2.1.5 Understand the structure and process of memory through the multi-store model of memory (Atkinson and Shiffrin, 1968), including strengths and weaknesses of the theory:
    a. **sensory register**
    b. **the capacity of short-term memory**
    c. **the duration of short-term memory**
    d. **the capacity of long-term memory**
    e. **the duration of long-term memory**
    f. **the role of attention in memory**
    g. **the role of rehearsal in memory**

To develop their comprehension of the main concepts from 2.1.1 and 2.1.2, candidates could make the connections between these underpinning ideas and the **multi-store model of memory** (2.1.5). It may benefit candidates to begin this model in a diagrammatic form, where they can label the distinct components as they begin to understand the key features of each.

Providing supporting evidence for the components of the **multi-store model of memory** (2.1.5) will help candidates develop psychological skills such as drawing on evidence and research to support their points. The **sensory register** (2.1.5a), for example, could be supported by Sperling (1963) who provided evidence of limited duration but a large capacity in the sensory register. Candidates can also discuss the differences between iconic, echoic and haptic sensory input.

The concepts of **short-term memory (STM) duration** (2.1.5c) and **capacity** (2.1.5b) could be explored through practical activities. To highlight the limited capacity of STM, candidates could be asked how many items they can recall from a range of images displayed. This could lead into a discussion of the evidence from Miller (1956) who claimed the 'magic number' of 7 plus/minus 2 items indicated capacity. STM duration tests could be conducted by replicating the work of **Peterson and Peterson (1959)** (2.2.2) which would provide candidates with an understanding of STM duration whilst also leading into one of the key studies in this topic. Centres may wish to deliver this at this point.

The concepts of **long-term memory (LTM) duration** (2.1.5e) and **capacity** (2.1.5d) could also be explored through practical activities. Candidates should be aware of the difference between STM and LTM and how the capacity and duration of these two stores is said to differ in the multi-store model of memory. It may be beneficial to give candidates a task where they are asked to recall items immediately and then in their next lesson to highlight the differences. Again, the use of supporting evidence will help candidates think in a scientific and critical way; for example, Bahrick et al. (1975) provides evidence of long-term memory recall. Centres may also wish to draw on case studies of brain damaged patients, such as HM or Clive Wearing, to highlight the distinctions between the stores and to lead into studies of **amnesia** (2.1.3).

Candidates should be able to understand the role of **attention** (2.1.5f) in memory, and how the attention given to information can affect the processing of that information. This can be delivered alongside the role of **rehearsal** (2.1.5g), however centres may have embedded the role of rehearsal in their teaching of the study by **Peterson and Peterson (1959)** (2.2.2), especially when referring to the second part of the experiment. Practical activities can be used here to highlight how memory could be affected if attention is diverted or if rehearsal is prevented.

Application of this explanation of memory to stimulus materials would benefit candidates. Centres could develop scenarios and examples from which candidates can identify the key components of memory that are evident and explain them in relation to the theory.

> *When Rhianna arrives at the shop, she can only recall eight of the items on the list. According to the multi-store model of memory, why might Rhianna only be able to remember eight of these items?*

The multi-store model of memory can be evaluated through comparisons to other models, theories and explanations, such as whether reconstructive memory may be a more realistic explanation than the multi-store model. Supporting evidence can be used where available, such as **Peterson and Peterson (1959)** (2.2.2). Equally, supporting evidence can be used where it shows that the theory or explanation may be inaccurate – for example, by drawing on **Bartlett's (1932)** (2.2.1) study to show that memory may be more complex than an input–process–output system.

Candidates can also judge how useful the theory or explanation is, such as whether there is an application to society, for example, helping children to revise in school or to learn their multiplication tables through rehearsal. Some candidates may benefit from being extended by drawing on the concepts delivered in the 'issues and debates' content, where themes such as reductionism or nature versus nurture could be used to evaluate explanations.

2.1.3 Understand retrograde and anterograde amnesia, including:
a. the term 'retrograde amnesia'
b. the term 'anterograde amnesia'
c. the symptoms of retrograde amnesia
d. the symptoms of anterograde amnesia

Candidates should understand the terms **retrograde** (2.1.3a) and **anterograde** (2.1.3b) **amnesia**. They should be able to demonstrate understanding of what each of these forms of amnesia means, perhaps by identifying which type of amnesia someone has using stimulus materials. When delivering these, centres should include the **symptoms** of each type of amnesia (2.1.3c and d). Candidates may benefit from comparing each type of amnesia to highlight the key differences. Candidates could draw on examples of case studies, such as the case of HM, to make connections between amnesia as a memory problem and how this could be researched in the field of psychology.

Application of this explanation of amnesia to stimulus materials would benefit candidates. Centres could develop scenarios and examples from which candidates can identify the key components of amnesia that are evident and explain them in relation to the key concepts in this topic.

> *Tina has recently fallen and sustained a head injury. She can no longer recall where she lives or where she goes to school. Tina can make new memories and remembers what she had for lunch. What type of amnesia could explain Tina's memory problems?*

2.1.4 Understand the active process of memory through the Theory of Reconstructive Memory (Bartlett, 1932), including strengths and weaknesses of the theory:
a. how schemas are formed
b. how schemas influence memory

Candidates should understand that reconstructive memory provides a more holistic view of memory processes than the multi-store model of memory, in that memory is considered to be a process that can be changed and amended in light of new experiences. Candidates should be able to discuss what is meant by **schema** (2.1.4a) in terms of how they are formed, how they develop and how they provide structure to memory processing. They should also understand how **schemas can influence memory** (2.1.4b), such as how memory can be altered by new information. Centres may want to draw on the key study by **Bartlett (1932)** (2.2.1) at this point, and can help to develop practical skills by encouraging candidates to learn the 'War of the Ghosts' story themselves before looking at the study in detail.

Reconstructive memory can be applied to a number of contexts and is commonly used to explain errors in eye witness recall. Candidates may find it interesting to review the application of reconstructive memory in this context, which would also provide them with additional evidence to support evaluations of the theory and study; for example, Loftus and Palmer (1974) or Saachi et al. (2007), both of which could be partially replicated for a practical lesson in order to develop skills.

Application of this explanation of memory to stimulus materials would benefit candidates. Centres could develop scenarios and examples from which candidates can identify the key components of memory that are evident and explain them in relation to the key concepts in this topic.

> *Sue and Nicole were chatting in a café when a woman passing by fell to the floor clutching her arm. Sue said she saw the woman trip over, but Nicole says she saw her being pushed. How can reconstructive memory explain these different accounts?*

Reconstructive memory could be evaluated through comparison to the multi-store model of memory, such as whether reconstructive memory explanations may be more valid than the multi-store model. Supporting evidence can be used where available, for example, by drawing upon **Bartlett (1932)** (2.2.1). Equally, supporting evidence can be used where it shows that the theory or explanation may be inaccurate, such as Yuille and Cutshall (1986) who found that eye witnesses were in fact quite accurate and memories were not reconstructed in the way that Bartlett may claim.

Candidates can also judge how useful the theory or explanation is, such as whether there is an application to society, for example, the application of reconstructive memory to criminal justice and police interviews. Some candidates may benefit from being extended by drawing on the concepts delivered in the 'issues and debates' content, where themes such as reductionism or nature versus nurture could be used to evaluate explanations.

2.2 Studies

Candidates should understand the aims, procedures and findings (results and conclusions), and strengths and weaknesses of:

*2.2.1 Bartlett (1932) War of the Ghosts
*2.2.2 Peterson and Peterson (1959) Short-term Retention of Individual Verbal Items

Study One

Bartlett (1932) War of the Ghosts.

Aim(s)

To investigate whether the memory of a story is affected by previous knowledge.

To find out if cultural background and unfamiliarity with a story would lead to distortion of memory when it was recalled.

To test if memory is reconstructive and whether people store and retrieve information per expectations formed by cultural schemas.

Procedure

Sample: 20 British participants (7 women, 13 men). The participants were not told the aim of the study; they believed they were being tested on the accuracy of recall.

Bartlett used repeated reproduction, which is where participants hear a story or see a drawing and are asked to reproduce it after a short time and then to do so again over a period of days, weeks, months or years.

The story used was a Native American story called 'The War of the Ghosts' which was unfamiliar to participants and contained unknown names and concepts. The story content was also unfamiliar. The story was selected because it would test how memory may be reconstructed based on cultural schema.

Each participant read the story to themselves twice. The first reproduction happened 15 minutes later. There was no set interval beyond this and participants recalled the story at further intervals from 20 hours to almost 10 years.

Results

Bartlett found that participants changed the story as they tried to remember it. This happened in the early stages (15 minutes) and throughout the further reproductions.

Overall, the participants preserved the order of events and main themes in the story.

The reproduction of style was often changed, with reproduction of the story often being transformed.

Seven of the 20 participants omitted the title and 10 of the participants transformed the title – for example, 'War-Ghost Story'. Other transformations included changing 'canoes' to 'boats' and changing the names of the characters.

Much of the content was rationalised by the participants, who changed material so that it was more acceptable to them (Bartlett called this 'effort after meaning'), such as 'the young man did not feel sick but nevertheless they proceeded home'.

Conclusions

Accuracy in reproduction of the story is an exception rather than a norm of memory.
Style, rhythm and precise story construction is very rarely reproduced.
After repeated reconstructions, the form of, and items within, the story become stereotyped and do not change much after this occurs. However, with infrequent reproduction, omission of detail, simplification and transformation continues indefinitely.

There is a significant amount of interference with the story from reconstructing it. The details are altered to fit the participant's own tendencies and interests.

In all recollections of the story, rationalisation reduced material to a form that was more accessible or common to the participant. This could be because the material was initially connected to something else in memory and treated as a representation of this. It reflected the character and individuality of the person recalling the story, and names, places and events were changed to fit with the social group that the participant belonged to.

Candidates may be asked to consider the following issues when **evaluating** studies:
● validity
● reliability
● generalisability
● ethics
● objectivity
● subjectivity.

Information for centres

It is recommended that, wherever possible, centres combine the use of the summary of studies resource with the original study. However, where studies are not freely available or easily accessible, the summary resource is designed to help provide key starting points to enable teachers to deliver the content.

Study Two

Peterson and Peterson (1959) Short-term Retention of Individual Verbal Items.

Aim(s)

Peterson and Peterson first aimed to see if retention of items was affected by interference during recall intervals. In the second part of their study, they investigated whether silent or vocal rehearsal would affect recall of items.

Experiment part 1

Procedure

Sample: 24 students from an introductory psychology course at Indiana University, USA were selected. As part of their course, the students were required to take part in research experiments.

Each participant was given a standardised set of instructions which explained the process of the experiment. This included explaining the 'black box' in front of them and what to do at each of the light signals:

• The green light meant that the trial was ready to begin.

• The red light meant to stop counting and recall the trigram (three-letter consonant).

Participants had two practice trials in order to ensure the instructions had been fully understood.

At the beginning of each trial, the experimenter would spell out a trigram followed by a number from which the participant had to count backwards in either 3's or 4's, e.g. CHJ 506. In half the trials, participants counted backwards in 3's (e.g. 506, 503, 500 and so on) and in the other half they counted backwards in 4's (e.g. 312, 308, 304 and so on). Participants counted backwards in time with the ticking of a metronome. This was a task that would minimise rehearsal behaviour between presentation and recall. Once the red light came on, the participant had to immediately verbally recall the trigram, e.g. CHJ. The next trial would then begin 15 seconds later, signalled by the green light.

The responses given by the participant during their 15 second interval were recorded.

Each participant was tested eight times at each of the following six recall intervals: 3 seconds, 6 seconds, 9 seconds, 12 seconds, 15 seconds and 18 seconds.

Results(s)

Results indicated that the the percentage of correct responses dropped significantly as the recall interval increased to 18 seconds.

Peterson and Peterson first presented data showing how many correct responses were eventually given after each interference interval. This fell from approximately 80% with the 3 second interval to approximately 10% with the 18 second interval.

For statistical modelling they also analysed those responses which were given less than 2.83 seconds after the interference interval ended (the mean latency, or delay). Approximately 50% of trigrams were correctly recalled after 3 seconds within this time period, falling to approximately 5% after 18 seconds.

Conclusion

Information decays rapidly from short-term memory, with accurate recall of the trigrams decreasing rapidly over the duration of 18 seconds, and very little accuracy shown in

recall in 15 second and 18 second trials. Therefore, short-term memory has limited duration.

Experiment part 2

Procedure

Sample: 48 students from the same university programme.

In this procedure, half of the participants were instructed to repeat the stimulus of a three-letter trigram aloud in time with a metronome. This group was the 'vocal' condition. They were then stopped by the experimenter and instructed to count backwards from a number.

The other half of the participants were not instructed to repeat the stimulus trigram aloud, but they were given interval time before being asked to count backwards from a number. This group was the 'silent' group.

Both groups were tested on various rehearsal interval periods of immediate recall, 1 second and 3 seconds. This was completed for three interference conditions of counting backwards for 3 seconds, 9 seconds and 18 seconds.

Results(s)

Participant recall in the 'vocal' group improved with repetition, with longer repetition leading to more accurate recall. Participant recall in the 'silent' group did not improve with longer repetition.

Conclusion

Only in conditions where the repetition was vocal and controlled did accuracy of recall improve.

Overall conclusion

The rate of forgetting from short-term memory depends on the amount of rehearsal undertaken.

Candidates may be asked to consider the following issues when **evaluating** studies:
- validity
- reliability
- generalisability
- ethics
- objectivity
- subjectivity.

Information for centres

It is recommended that, wherever possible, centres combine the use of the summary of studies resource with the original study. However, where studies are not freely available or easily accessible, the summary resource is designed to help provide key starting points to enable teachers to deliver the content.

2.3 Issues and debates

2.3.1 Understand the reductionism and holism debate, including:
   a. the terms 'reductionism' and 'reductionist'
   b. the terms 'holism' and 'holistic'
   c. the use of content, theories and research drawn from human memory to explain the reductionism and holism debate

The issues and debates content in each compulsory topic, including research methods, is designed to enable candidates to understand the wider issues in psychology that underpin psychological knowledge and research. These are delivered within specific topic content. Candidates can, however, draw upon issues and debates in their evaluations and extended open essays across each topic area (compulsory and/or optional), and while this is not an expected feature of responses, it may – if appropriate, accurate and relevant – be creditworthy in examinations. For example, if they chose to evaluate a biological explanation of addiction drawing from an accurate understanding of reductionism then this can be an acceptable response.

Issues and debates will be specifically assessed in Paper 1 through an extended open-response question.

Reductionism and holism (2.3.1) has been included in this topic because some explanations of human memory can be seen to reduce memory to simplistic processes, while others view memory in a more holistic way that accounts for individual differences and personal experience.

Candidates should be able to explore the key terms in this debate, including what is meant by **reductionism/reductionist** (2.3.1a) and **holism/holistic** (2.3.1b). From this, they should develop their understanding through the application of the concepts to the content they have learned within this topic.

Candidates should be able to use this debate to address the **content of topic 2** (2.3.1c) and they may benefit from taking each core explanation and addressing the underpinning assumptions of the explanation, perhaps by classifying features to determine if it is reductionist or holistic; for example, whether the multi-store model of memory reduces human memory to a storage system or whether reconstructive memory more holistically accounts for the role of individual differences in how memory is formed, changes and develops.

Reductionism and holism can also be applied to the key studies within this section. By addressing the methodology and chosen measures of memory used by **Peterson and Peterson (1959)** (2.2.2) and by **Bartlett (1932)** (2.2.1), candidates could determine whether the studies and evidence they have presented demonstrate reductionism or holism.

Some candidates may also attempt to judge whether reductionism or holism is a more appropriate standpoint when investigating human memory. They may benefit from being extended by drawing on themes such as reductionism and holism to evaluate the core explanations, theories and studies.

Resources and references

Studies

*2.2.1 Bartlett (1932) War of the Ghosts

http://pubman.mpdl.mpg.de/pubman/item/escidoc:2273030:5/component/escidoc:2309291/Bartlett_1932_Remembering.pdf

https://msu.edu/~henrikse/cep909/warofghosts.htm

*2.2.2 Peterson and Peterson (1959) Short-term Retention of Individual Verbal Items

http://labs.la.utexas.edu/gilden/files/2016/03/1545ca4cdad4f480f2fab8fd505a5b7f7603.pdf

http://www.uniview.co.uk/pdf/newpetermerge.pdf

Resources for memory

Sources suggested here are additional guidance for centres to aid with teaching resources and ideas. These are not compulsory components and centres should select delivery content as appropriate to their candidates. Centres can draw upon any research evidence to support evaluations and explanations of topic areas. This list is not exhaustive.

Multi-store model of memory

Sperling (1963) A model for visual memory tasks
http://www.cogsci.uci.edu/~whipl/staff/sperling/PDFs/Sperling_VM_Model_1963.pdf

Miller (1956) The magical number seven, plus or minus two; some limits on our capacity for processing information
http://www.psych.utoronto.ca/users/peterson/psy430s2001/Miller%20GA%20Magical%20Seven%20Psych%20Review%201955.pdf

Bahrick et al. (1975) Fifty years of memory for names and faces: A cross-sectional approach
http://psycnet.apa.org/journals/xge/104/1/54/

Reconstructive memory

Loftus and Palmer (1974) Reconstruction of an Automobile Destruction: An example of the interaction between language and memory
https://webfiles.uci.edu/eloftus/LoftusPalmer74.pdf

Sacchi et al. (2007) Changing history: doctored photographs affect memory for past public events https://webfiles.uci.edu/eloftus/Sacchi_Agnoli_Loftus_ACP07.pdf

Yuille and Cutshall (1986) A case study of eye witness memory of a crime
http://psycnet.apa.org/journals/apl/71/2/291/

Amnesia

Case study of Patient HM https://bigpictureeducation.com/brain-case-study-patient-hm

Teacher resource sharing:

Further suggested resources can be found in the 'Getting Started' publication, where a scheme of work has been provided.

http://www.psychlotron.org.uk
http://www.psychteacher.co.uk
http://www.resourcd.com

Teacher and student resource sites:

http://www.simplypsychology.org/ – this website gives an overview of many of the key areas.

https://www.psychologytoday.com/ – this is an online magazine (with an option to subscribe) that brings psychological theories into modern, contemporary issues.

https://play.google.com/store/search?q=psychology%20free%20books&c=books&hl=en – this site has a number of free short books about key areas of psychology.

http://www.open.edu/openlearn/body-mind/psychology – The 'OpenLearn' programme offers freely accessible resources provided by the Open University.

http://allpsych.com/ –a useful site with books, articles and summaries of some of the key concepts.

https://www.youtube.com/playlist?list=PL8dPuuaLjXtOPRKzVLY0jJY-uHOH9KVU6 – Psychology 'Crash Course' is a YouTube channel that provides 40 short overviews of psychological issues.

http://www.bbc.co.uk/programmes/b008cy1j – 'BBC Mind Changers' is a series of radio episodes (that can also be downloaded) about key psychologists, their work and the development of psychology over time.

http://www.bbc.co.uk/programmes/b006qxx9 – 'BBC In the Mind' is a series of radio episodes that focus on the human mind using the application of psychological concepts and theories.

All weblinks included here have been checked as active at publication, however the nature of online resources is that they can be removed or replaced by webhosting services and so it cannot be guaranteed that these sites will remain available throughout the life of the qualification.