

AQA Psychology A-level

Topic 2: Memory

Notes



Part 1 – Coding, Capacity and Duration of Memory:

- Coding refers to the format or ‘type’ of information which is stored in each memory store. Coding is acoustic in short-term memory, and semantic in long-term memory, as demonstrated by Baddeley (1966), who found that more mistakes are made when recalling acoustically-similar words straight after learning them, whilst more mistakes are made when recalling semantically-similar words 20 minutes after learning them (LTM recall).
- Capacity refers to the volume of information/data which can be kept in any memory store at any one time. For example, the capacity of STM is thought to be 7 ± 2 items (Miller), whilst the capacity of LTM is unlimited. This is based on Miller’s idea that things come in groups of 7 (e.g. 7 days of the week), suggesting that we are predisposed to remembering this quantity and that such a ‘chunking’ method can help us recall information. Jacobs also demonstrated that the mean letter span was 7.3 and the mean digit span was 9.3 (i.e. the number of letters or digits we can recall after increasing intervals).
- Duration refers to the amount of time that information can be stored in each memory store. The duration of STM is 18-30 seconds, as demonstrated by Petersen et al (1959), who found that increasing retention intervals decreased the accuracy of recall of consonant syllables in 24 undergraduates, when counting down from a 3 digit number (preventing mental rehearsal). The duration of LTM is unlimited, as shown by Bahrick et al (1975), who found that photo recognition of graduating classmates of the 396 participants decreased from 90% to 70% between 15 years and 46 years of graduating.

– A key issue with historical psychological research, particularly concerning Jacobs, is the lack of standardisation and appreciation of scientific methods. For example, the current laboratory experiment methodology produces highly reliable and valid data through controlling and so removing the effects of extraneous and confounding variables. The same is unlikely to be said of Jacobs, where confounding variables such as a noisy room or difficult word lists, may have had a greater influence on accuracy of recall, leading to unreliable results.

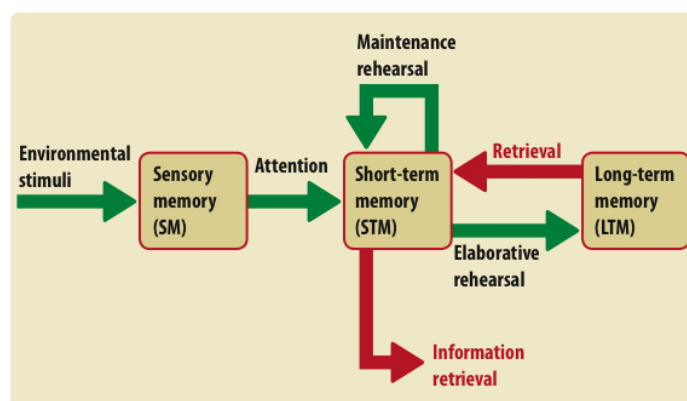
+ A particular strength of Bahrick et al’s 1975 study is the use of meaningful stimuli, and a methodology which is high in mundane realism. This suggests that the findings have high ecological validity because they can be easily generalised to real-life, due to the stimuli reflecting those which we would often try to learn and recall in our day to day lives: information with personal and meaningful value!

– Conversely, the key issues with the Petersen et al and Miller et al studies is that they feature methodologies with low mundane realism, thus producing findings with little ecological validity. This is due to the use of artificial stimuli which has little personal meaning to the participants, and so does not accurately reflect everyday learning experiences. This therefore limits the generalisability of such findings.

– More recent research has suggested that Miller may have over-exaggerated the capacity of STM, and that the capacity is more similar to 4 chunks as opposed to the original 5-9 limit. This may reflect the outdated methodologies adopted by Miller and specifically, the lack of control over confounding variables which may have contributed to this inaccurate estimate.

Part 2 – The Multi-Store Model of Memory:

- The multi-store memory model (MSM) represents how memory is stored, transferred between the different stores, retrieved and forgotten.
- There are 3 stores: the sensory register, short-term memory and long-term memory.
- The sensory register contains one sub-store for each of the 5 senses e.g. an echoic store for auditory information. Since it receives information for our senses, the sensory register has a huge capacity, but a duration of less than half a second.



Therefore, information will only pass from the sensory register to the short-term memory store if we pay attention to it.

- STM is described as being acoustically encoded (Baddeley), having a capacity of 7 ± 2 items (Miller) and a duration of 18-30 seconds (Peterson). Maintenance rehearsal occurs when we repeat the new information to ourselves, allowing the information to be kept in the STM. Prolonged maintenance rehearsal allows the information to pass into the LTM, whilst a lack of such rehearsal causes forgetting.
- LTM is described as being semantically encoded, having an unlimited capacity and a very long duration (over 46 years, as shown by Bahrick et al). In order to remember information, 'retrieval' must occur, which is when information is transferred back into the STM, and will continue to pass through the maintenance loop afterwards.

— There are different types of LTM, as proposed by Tulving et al i.e. procedural, semantic and episodic. The MSM does not represent this because it sees LTM as a single, unitary store. This also does not represent that some types of LTM can be retrieved unconsciously (e.g. procedural) whilst others must be retrieved consciously (e.g. semantic), which is not reflected in the universal process of information being consciously transferred to the STM during the process of retrieval.

— The MSM suggests that the amount of maintenance rehearsal determines the likelihood that the information will pass into the LTM, whereas Craik and Watkins (1973) suggest that it is the type of rehearsal which is more important. They suggest that elaborative rehearsal, instead of prolonged rehearsal, is needed to transfer information from the STM into the LTM, by making links with existing knowledge.

+ The MSM acknowledges the qualitative differences between STM and LTM by representing them as separate stores. For example, STM is encoded acoustically, whilst LTM is encoded semantically and has a much longer duration. Therefore, the MSM portrays an accurate view of the differences between the two types of memory, as supported by Baddeley and Miller.

— The MSM incorrectly represents STM as a single, unitary store. For example, Shallice and Warrington found that their amnesiac patient KF had poor STM recall for auditory stimuli, but increasingly accurate recall for visual stimuli. This, alongside KF being able to differentiate and recall both verbal and non-verbal sounds, suggests that there may be multiple types of STM.

Part 3 – Types of Long-Term Memory:

- There are 3 types of long-term memory: episodic, semantic and procedural.
 - Episodic memory describes those memories which have some kind of personal meaning to us, alongside details as to when and how these events occurred, as well as the associated people and places. An example would be the memory of a wedding or the first time meeting a partner.
 - Semantic memories describe our memories of the world and the associated knowledge e.g. an understanding of what words, themes and concepts mean. An example would be the ability to use information related to one concept to help us understand another.
 - Procedural memories describe our memories of 'learned skills', such as swimming or driving.
 - Episodic and semantic memories must be recalled consciously, whereas procedural memories are recalled unconsciously.
- + Peterson et al. demonstrated that semantic memories were recalled from the left prefrontal cortex, whilst episodic memories were recalled from the right prefrontal cortex. This supports not only the idea that there are different types of LTM, but shows that they each have a different neurological basis because they are recalled from different parts of the brain.
- + There is a practical application in being able to differentiate between different types of LTM. For example, Belleville et al notes that mild cognitive impairments most commonly affect episodic memories and so an increased understanding of episodic memory, alongside the differences between different types of LTM, may lead to improved, increasingly targeted treatments for mild cognitive impairments.



+ **Cohen and Squire drew a distinction between declarative and non-declarative memories.**

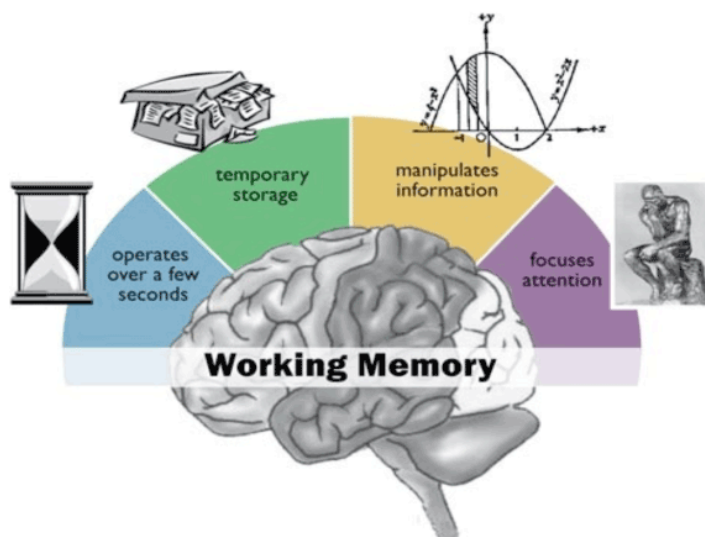
Declarative memories must be recalled consciously (i.e. episodic and semantic), whilst non-declarative memories may be recalled unconsciously (i.e. procedural). However, this is a different classification and organisation system as the one used by Tulving, suggesting that his depiction of LTM is not entirely accurate.

+ **The cases of HM and Clive Wearing show how one type of LTM may be impaired (episodic in their cases), but the other types of LTM will be unaffected (i.e. procedural and semantic).** For example, Clive Wearing was still able to skillfully play the piano and understand the concept of music (procedural and semantic) but was unable to remember his wife visiting him 5 minutes previously (episodic). This gives strong support to the idea that different areas of the brain are involved in the different types of LTM, and confirms the classification of different types of LTM as separate.

Part 4 – The Working Memory Model:

- The WMM suggests that STM is made up of the central executive, the phonological loop, the visuo-spatial sketchpad and the episodic buffer.
- The central executive has been described as an ‘attentional process’ with a very limited processing capacity, and whose role is to allocate tasks to the 3 slave systems (described above).
- The phonological loop processes auditory information and allows for maintenance rehearsal by being made up of the articulatory process (stores the words you hear) and the phonological loop.
- The visuo-spatial sketchpad combines the visual and spatial information processed by other stores, giving us a ‘complete picture’ e.g. when recalling the architecture of a famous landmark. The VSS is divided into the inner scribe and visual cache. The capacity of the VSS is around 4-5 chunks (Baddeley).
- The episodic buffer integrates all types of data processed by the other stores (e.g. auditory, visual, spatial) and so is described as the storage component of the central executive, as well as being crucial for linking STM to LTM.

– **The central executive has not been precisely defined.** For example, the term ‘process’ is vague, and the central executive may be made up of several sub-components or even be part of a larger component itself in working memory. This lack of a comprehensive explanation for each component of WMM draws doubts about the accuracy of its depiction of working memory.



+ **Shallice and Warrington’s study of KF provides support for the WMM because their findings show that KF had very poor STM recall for auditory stimuli, but increased STM recall for visual stimuli.** This suggests that the components of memory which process auditory and visual stimuli are separate (as described in the WMM through the phonological loop and the visuo-spatial sketchpad).

+ **Studies of dual-task performance,** where each participant must undertake a visual and verbal task simultaneously, shows decreased performance for such tasks and so supports the idea that the central executive has a very limited processing capacity (as predicted by the WMM) and that the slave systems are in competition with each other for these tasks and resources.



+ **Neuroscanning evidence**, such as that provided by Braver et al, has demonstrated a positive correlation between an increasing cognitive load processed by the central executive (as marked by increasing task difficulty) and increasing levels of activation in the prefrontal cortex. This supports the idea that the central executive has the role of allocating tasks to slave systems and has a limited processing capacity, as reflected by the increased brain activation levels, thus suggesting that the WMM is accurate in its mechanism of the central executive.

Part 5 – Explanations for Forgetting: Interference:

- Interference occurs when the recall of one memory blocks the recall of another, causing forgetting or distorted perceptions of these memories. Interference can be retroactive (new memories block the recollection of old memories) or proactive (old memories block the recollection of new memories).
- Retroactive interference was demonstrated by McGeoch and McDonald (1931), who found that when participants were divided into 6 groups to recall different lists of words (synonyms, antonyms, words unrelated to the original list, 3 digit numbers, consonant syllables) or no new list (control group), those who'd learnt the synonyms list experienced an average of 3.1 fewer correct items recalled, compared to the control group.
- This supports the idea that the extent of forgetting is larger when the two memories or materials are very similar i.e. a positive correlation between forgetting and similarity.

– **The artificial stimuli used in these tasks**, such as learning lists of random words with no personal meaning to the participants, means that the findings of interference studies are likely to have low mundane realism. This is because in real life, we are likely to learn lists of meaningful information, such as revision topics for psychology, which we draw links upon and also which have personal meaning to us. These factors may also influence the extent of forgetting, rather than influence.

+ **Interference has been consistently demonstrated in several studies, but particularly in lab experiments**. This increases the validity of the theory, due to the use of highly-controlled conditions in lab experiments, standardised instructions alongside the removal of the biasing effects of extraneous and confounding variables.

+ **Baddeley and Hitch** found that, in a group of rugby players who had to recall their last game and the number of games they'd played that season (which would be different for each player), the number of games they'd played since was more important than the total time they'd been playing for. This can be explained in terms of interference, where the more games each player had played, the more likely the memories of these newer games would interfere or block the recall of older games i.e. retroactive interference.

– **A second methodological criticism of interference studies, further suggesting that they lack mundane realism and reliability, is that they are often conducted in very short spaces of time**, with participants recalling their words 1 or 2 hours after they have learnt them. This does not reflect the normal passage of time in everyday life, where we often find that several days pass until we need to recall such information e.g. in the case of an exam. Therefore, this suggests that interference is unlikely to be a valid explanation for forgetting from the LTM.

Part 6 – Explanations for Forgetting: Retrieval Failure:

- Retrieval failure suggests that forgetting occurs when the 'cues' (triggers of information recollection) present at the time of encoding the information are not present at the time of recall. This describes Tulving's 'encoding specificity principle' (ESP).
- Bearing in mind that these cues can be associated with internal or external factors, there are two types of forgetting: context-dependent and state-dependent.
- Context-dependent forgetting occurs when our external cues at the time of encoding do not match those present at recall. This was demonstrated by Godden and Baddeley (1975) who found that with deep-water divers, recall at the 'matching' conditions (e.g. word list learnt underwater and recalled underwater) was significantly larger than the non-matching conditions. Therefore, there were 4 conditions in total, involving underwater and on land encoding and recall.



- State-dependent forgetting occurs when our internal cues at the time of encoding do not match those present at recall. This was demonstrated by Carter and Cassaday (1998), using a similar methodology as Godden and Baddeley, but with anti-histamines instead to change the internal cues at the time of encoding and recall. The researchers found 40% higher rates of accurate recall in the matching conditions, compared to the non-matching conditions.

+ **Eysenck has suggested that retrieval failure may be one of the main reasons that we forget information from the LTM.** This, alongside the strictly-controlled conditions of a lab experiment (reducing the biasing effects of extraneous and confounding variables), increases the validity of retrieval failure as an explanation for forgetting, due to more confidence being placed in these conclusions on the basis of such experimental designs.

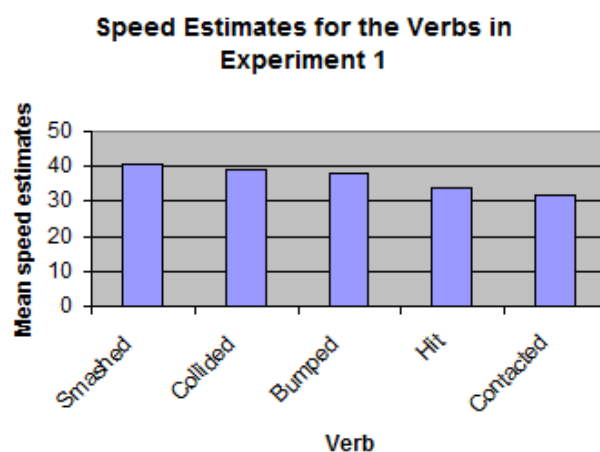
— **The findings from studies of retrieval failure may lack and ecological validity.** This is because Baddeley argued that it is difficult to find conditions in real-life which are as polar as water and land, for example, and thus questioned the existence of context effects in normal life. This suggests that retrieval failure may be best suited to explaining cases of forgetting where the cues associated with encoding and retrieval are uncommonly distinct, thus not providing an accurate depiction of forgetting in day to day life.

— **Godden and Baddeley repeated their underwater, deep-sea diver experiment (1975) but tested for the recognition of learnt words,** as opposed to recall, and found no significant difference in accuracy of recognition between the matched and non-matched conditions. This suggests that retrieval failure may only explain forgetting for some types of memory, tested in specific ways and under certain conditions, hence not being a universal explanation. This further suggests that the findings from studies of retrieval failure suffer from poor generalisability.

— **The encoding specificity principle suffers from cyclical reasoning** due to its over-reliance on assumptions. For example, it may not always be the case that differences between cues at the time of encoding and recall causes retrieval failure, but the cyclical nature of the ESP suggests that it is so.

Part 7 – Factors Affecting the Accuracy of Eyewitness Testimony: Misleading Information:

- Eyewitness testimony refers to the information recalled about a crime by an eyewitness. The accuracy of such an account can be reduced through the influence of misleading (incorrect) information in the form of leading questions and post-event discussions.
- The effects of leading questions on the accuracy of EWT was investigated by Loftus and Palmer (1974) where participants watched a film clip of a car crash and then gave speed estimates of the cars based on the leading question of “About how fast were the cars going when they x into each other?”, with each group being exposed to a different critical verb. Those exposed to the verb “smashed” gave a speed estimate 8.7 mph greater than those who’d heard “contacted”. Therefore, this shows that leading questions, because of the way they are phrased, suggest that there is a correct answer.
- The effects of leading questions can be explained using the idea of response bias (i.e. these questions only influence the participants to give a certain answer), whereas Loftus and Palmer’s study supports the substitution explanation (i.e. leading questions change the eyewitness’ memory of the crime), as those who’d heard the word “smashed” were more likely to report having seen broken glass 2 weeks after the crime (despite there being no broken glass) compared to those who’d heard the word “contacted”.
- Post-event discussions describe the discussions that take place between co-witnesses after the crime has taken place, and is subject to the influence of media and TV reports on the crime, as well as participants’ pre-conceived expectations of



how they would imagine the crime. Gabbert et al (2003), using a matched-pairs design, showed participants a film clip of the same crime scene, but with different details for each member. After engaging in post-event discussions with the other member of each pair and individually completing a test of recall, the researchers found 71% inaccuracy rates of information gained through such discussions, compared to a 0% control group rate who had worked alone throughout.

- Post-event discussions also demonstrate the idea of ‘memory conformity’, where we are more likely to pick up upon incorrect ideas or details because we believe that we are wrong and the other person is right.

— A key methodological criticism for studies of EWT is that they often use the same, young target to identify. This, as argued by Anastasi and Rhodes, may be affected by own age bias, which describes the tendency to recall others from your own age group with a high degree of accuracy, with a lower accuracy rate for those from other age groups. This means that participants aged 55-78 years may be inaccurately represented as having a lower accuracy of EWT, due to the frequent use of young targets.

— Demand characteristics may also reduce the reliability of the findings, as argued by Zaragosa and McCloskey, who suggest that participants often want to be as helpful and attentive as possible. This means that, through the mechanism of social desirability bias and the ‘Please-U’ effect, when in doubt over their answer to a question, they are likely to give an answer which seems most beneficial or expected of the researcher, thus biasing the results and reducing the likelihood that the same results will be demonstrated again.

— The artificial tasks and stimuli used by both Loftus and Palmer, alongside Gabbert, reduces the ecological validity of the findings and the mundane realism of the methodology. For example, the film clips of the car crashes do not expose participants to the anxiety of experiencing a real-life car crash. This anxiety may either have a negative (Johnson and Scott) or positive (Yuille and Cutshall) effect on the accuracy of EWT, thus biasing the findings.

Part 8 – Factors Affecting the Accuracy of Eyewitness Testimony: Anxiety:

- Anxiety is a physiological response to external pressures, characterised by an increased heart rate, vasoconstriction of blood vessels, increased sweat production etc. Anxiety can have either a positive or negative effect on the accuracy of EWT.
- Johnson and Scott (1976) demonstrated that anxiety has a negative effect on the accuracy of EWT. The high-anxiety condition overheard a heated argument in the neighbouring room, with the sound of smashing glass and a man walking through the waiting room with a bloody paper-knife, as opposed to a greasy pen in the low-anxiety condition. When asked to identify the man, participants in the high-anxiety condition experienced 16% lower rates of accurate recall, compared to the low-anxiety condition. This may be explained by the tunnel theory of memory and the weapon focus effect, where our attention is drawn towards the weapon as a source of anxiety.
- The positive effect of anxiety on the accuracy of EWT was demonstrated by Yuille and Cutshall (1986), who followed up 13 eyewitnesses, 5 months after a real-life shooting at a shop in Canada. The researchers found that eyewitness accuracy was still high after this period, with an 11% higher accuracy of recall for those eyewitnesses who ranked their anxiety as ‘high’ (compared to ‘low’) at the time of the shooting and using a 7-point anxiety scale. There were, however, small discrepancies over estimates of height, weight and clothing. This supports the idea that heightened anxiety draws our attention to external cues through the ‘fight or flight’ response, where such attention may have given us an evolutionary advantage by increasing our chances of escaping and survival.

— The Yerkes-Dodson Law suggests that there is an ‘inverted-U’ relationship between increasing arousal and increasing performance (in this case the accuracy of EWT), with moderate arousal yielding the highest levels of performance. However, this can be considered as an overly-simplified explanation of anxiety because it does not take into account the multiple factors which make up arousal i.e. cognitive, behavioural, emotional etc.

— The weapon focus effect may be testing for the effects of surprise rather than anxiety. For example, Pickel found that the highest levels of accuracy of EWT were experienced in the condition with high



unusualness i.e. a raw chicken in a hairdressing salon. This suggests that the weapon focus effect can only be used to explain certain influences of anxiety on the accuracy of EWT.

— There are significant ethical issues associated with exposing participants to distressing images of a car crash (Johnson and Scott) and forcing them to recall traumatic crimes which have occurred in the past (Yuille and Cutshall). This breaches the BPS guideline of the right of the participant to be protected from psychological harm, thus meaning that a cost-benefit analysis would be needed to compare the associated ethical costs with the benefits of increased knowledge of the effects of anxiety on the accuracy of EWT.

— Real-life studies, particularly with the use of field studies, are particularly susceptible to the biasing effects of extraneous variables which have not been controlled. For example, Yuille and Cutshall could not have controlled the influence of post-event discussions, which has been suggested to reduce the accuracy of EWT, as demonstrated by Gabbert et al. This, alongside media influences in the form of TV report, and the effects of individual schemas, means that field studies of EWT may be flawed in that they lack reliability.

Part 9 – Improving the Accuracy of Eyewitness Testimony: Cognitive Interviews:

- The cognitive interview is a method of interviewing eyewitnesses, which is thought to be particularly effective in increasing the rates of accurate recall, by considering the theories discussed previously. The stages are as follows:
 - 1. Report everything = Even seemingly insignificant details may be important or trigger the recall of larger events, by acting as a 'cue' (think back to retrieval failure!).
 - 2. Reinstate the context = Recalling the weather, location and mood of the day prevents context-dependent forgetting by reminding the eyewitness of their external cues at the time.
 - 3. Change the perspective = Recalling events from the perspective of the victim or persecutor prevents the eyewitness' account from being affected by their own schemas or pre-conceived perceptions of how the crime, in their opinion, happened.
 - 4. Reverse the order = Recalling events in a different order, other than chronological, reduces the ability of the eyewitness to lie (as it is simply difficult) and also reduces the impact of schemas on their perception of events.
- The enhanced cognitive interview was developed by Fisher et al (1987) and focuses on the social dynamics of the interactions between the eyewitness and the interviewer e.g. knowing when to make eyecontact and when to diminish it (increases the likelihood that the eyewitness will be calm and comfortable) as well as increasing rapport with the eyewitness (increases the likelihood that they will answer truthfully about personal or sensitive topics).

— The cognitive interview may have little practical value, due to being too time-consuming and requiring specialist skills. For example, Kebbel and Wagstaff argued that only a few hours of training, as is possible for many police forces, is insufficient to adequately train interviewers, especially for the enhanced social understanding required for the enhanced cognitive interview. Therefore, this lack of time for training may explain why some forces may be unimpressed with the CI.

— The CI does not only increase the recall of correct information by 81%, but also increases the recall of incorrect information by 61%, as suggested by Kohnken et al (1999). This appears counterintuitive when considering that the chief aim of the CI was to improve the accuracy of recall of correct information and so increase the reliability of eyewitness testimonies as a whole.

+ The entire CI need not be used to reap the benefits, as Milne and Bull (2002) suggested, where context reinstatement and report everything produced the greatest accuracy of recall of correct information as compared to any other combinations of steps. This means that even if police forces do not have enough time to train the entire force for all of the 4 steps involved in the CI, even gradual changes from the standard police interview can increase the accuracy and reliability of eyewitness testimony.

