**Student Information Pack**

Unit 1

Memory



**The Multi-Store Model of memory:** Sensory register, short-term memory and long-term memory. Features of each store: coding, capacity and duration

**Types of Long-Term memory:** Episodic, semantic, procedural

**The Working Memory Model:** Central executive, phonological loop, visuo-spatial sketchpad and episodic buffer. Features of the model: coding and capacity

**Explanations for Forgetting:** Proactive and retroactive interference and retrieval failure due to absence of cues

**Factors Affecting the Accuracy of** Misleading information, including leading

**Eyewitness Testimony (EWT):** questions and post-event discussion; anxiety

**Improving the Accuracy of EWT:** The use of the cognitive interview







**Unit 1: Memory**

**Topic 1: The Multi-Store Model of Memory**

The model below is a representation of Atkinson and Shiffrin’s model of memory. Its features include:

1. Information flows through a number of storage systems
2. There are three main storage systems
3. Each stage differs in terms of:
4. Coding – the form in which the information is stored
5. Capacity – how much information can be stored
6. Duration – how long information can be stored for
7. Information can remain in short-term memory by maintenance rehearsal, and such repetition will create a long term memory
8. The more information is rehearsed, the better it is remembered
9. Information can be lost from each store, but in different ways



**Key Terms:**

**Capacity:** The measure of how much can be held in memory. For example, how many digits can be held in STM

**Coding:** As information enters the brain via the senses, it is transformed into a code so that it can be stored. The codes can be visual (pictures), acoustic (sounds) or semantic (the meaning of the information).

**Duration:** The measure of how long memory lasts before it is no longer available

**Sensory register**: The first store which holds the sensory information received through all the senses for a brief period of time. Examples include iconic (visual) and echoic (sound) memory.

**Short-term memory**: The memory for immediate events. These memories tend not to last for more than a minute or two, usually shorter, and disappear unless they are rehearsed. Capacity is limited to 7 plus or minus 2 individual items.

**Long-term memory**: The memory for past events that can last for the life-time of a person. Its capacity is most probably unlimited

**The Sensory Register (SR)**

Sensory register, also called sensory memory, refers to the first and most immediate form of memory you have. The sensory register is your ultra-short-term memory that takes in sensory information through your five senses (sight, hearing, smell, taste and touch) and holds it for no more than a few seconds. Our senses are engaged when we are exposed to a stimulus or something that causes a sensory response, such as a strong odour. It is the sensory register that enables you to remember sensory stimuli after your exposure to the stimuli has ended.

* **Coding in the sensory register**

There is very little coding in the sensory register. Information enters the memory system through our senses, and it is thought that everything we see, hear, touch, smell and taste enters sensory memory (sensory register) and remains in its raw form. There are different registers of each sense, for example.

Iconic register: memory for visual information

Echoic register: memory for auditory information

Haptic register: memory for touch

Supporting evidence: Crowder (1993) suggests that the different duration in SR between echoic and iconic registers suggests that information is coded according its sense modality.

* **Duration of the sensory register**

Between the sensory register and short-term memory there is a filter called ‘attention’. It is believed that information that is not attended to is lost very quickly

According to research, iconic memory has a very short frequency, maybe up to ½ a second (500 milliseconds). It is a little longer in echoic memory, with information remaining for about 3 seconds. Iconic memory is thought to cause the impression of an illuminated line when you wave a sparkler on bonfire night, you can even spell out someone’s name.

Supporting evidence: Treisman (1964) presented identical information to both ears through headphones but with a slight delay. At 2 seconds or less, participants could state that the messages were identical. After 2 seconds, this task became more difficult and errors were made. This suggests an echoic memory in SR of around 2 seconds.

* **Capacity of the sensory register**

The capacity of the SR is very large, with the information contained being in an unprocessed, highly detailed and ever-changing format.

Supporting evidence: Sperling (1960) flashed grids of letters in 3 x 4 format on screens for 1/20th of a second. Participants had to recall the letters from a specified row as indicated by a high pitch (top row) medium pitch (middle row) or low pitched (bottom row) tone. Recall of the specified row was high, suggesting that all the letters in the grid had been available in the participants’ sensory register.

**Short-Term Memory (STM)**

Short-term memory refers to the information that we are currently aware of or thinking about. The information found in short term memory comes from paying attention to sensory memories.

• Short-term memory is very brief. When short-term memories are not rehearsed or actively maintained, they last mere seconds (15-30 approximately).

• Short-term memory is limited, with the amount of information held at any one time in single digits

* **Coding in STM**

In short term memory (STM) it is widely accepted that the coding is mainly acoustic.  When a person is presented with a list of numbers and letters, they will try to hold them in STM by rehearsing them (verbally).  Rehearsal is a verbal process regardless of whether the list of items is presented acoustically (someone reads them out), or visually (on a sheet of paper). However, it is also recognised that visual coding does occur in STM, as does some semantic coding.

Supporting evidence: Baddeley (1966) found that lists of words that sounded the same were harder to immediately recall in order than words that sounded dissimilar. The greater confusion shows that words tend to be coded acoustically,

Examples of similar sounding words: *man ban can fan pan*

Examples of dissimilar sounding words: *pit few cow pen day*

* **Duration of STM**

How long information can stay in short-term memory ranges from a few seconds up to a minute, but for most of us, it is somewhere in between: textbooks often refer to between 15 - 30 seconds, (but this can be extended due to rehearsal).

Supporting evidence: Peterson and Peterson 1959 presented three consonants, known as trigrams (ex. VGH, JSK), to participants for varying short-periods of time (3, 6, 9, 12, 15 and 18 seconds). The researchers also asked participants to count backwards in threes from a random three digit number to supress rehearsal. It was found that correct recall diminished quickly the longer the delay. After just 3 seconds, 80% of trigrams were recalled; after 6 seconds, 50%; after 18 seconds, fewer than 10% of the trigrams were recalled. This demonstrates that without rehearsal, information is rapidly lost from STM.

* **Capacity of STM**

How much information can be held in STM is limited. Notwithstanding that there are differences in capacity depending on the type of information, it is universally agreed that people can hold about seven things in STM.

Supporting evidence: Jacobs (1887) presented participants with random sequences of letters or digits and recorded their memory span (he decided that for his research, a person’s memory span was the longest sequence of items recalled 50% of the time). He found that on average, 9.3 digits were correctly recalled in order, and 7.3 letters were recalled in correct order. In further research, Miller found that not only could people recall about 7 individual items, but could also recall 7 chunk of information. Miller suggested that the capacity for STM is 7 ± 2 chunks (in other words, nearly all people can recall between 5 and 9 small chunks of information). However, more recent research that managed to eliminate the possibility of letters being passed to LTM, and has found that on average, only 3.87 items could be correctly recalled (Cowan et al, 2005; Mathy and Feldman, 2012) suggesting that in Jacobs’ and Miller’s research, some of the information had been rehearsed and passed to LTM, thus over exaggerating the capacity of STM.

**Long-Term Memory (LTM)**

LTM refers to the potentially permanent memory store which has a vast capacity and where memories can last for many years. People can store information about childhood, information about the world, and memory of how to do things. It is often said that you never forget to ride a bike once learned.

* **Coding in LTM**

It is widely acknowledged that information is coded semantically in LTM, especially for verbal information. This means that information is stored in LTM when it has meaning or in other words, some relevance or importance to us. However, there is some evidence for both visual and acoustic encoding in LTM.

Supporting evidence: Baddeley (1966) presented participants with a list of words that were either semantically similar or semantically dissimilar to each other. He found that 20 minutes after presentation, participants were better able to recall the semantically dissimilar words in order compared with the semantically similar words. This confusion with words that have similar meaning led Baddeley to conclude that we store information semantically in LTM.

Examples of similar semantic words: *great, large, big, huge*

Examples of dissimilar semantic words: *good, hot, salt, small*

* **Duration in LTM**

This is dependent of the person’s life span, as memories can last up to a life-time. Information that is processed at a deep level is likely to be remembered for longer, and memories based on skills rather than facts tend to be remembered better.

Supporting evidence: Bahrick et al. (1975) found that after 48 years of leaving school, participants could put names to faces from their yearbook with 70% accuracy. This was in contrast to only 30% accuracy when asked to free-recall the names of their ex classmates. This shows that some memories can remain persistent for a very long time, and will be recalled if the right cues exist.

* **Capacity in LTM**

The capacity in LTM is generally accepted to be unlimited. Therefore, no matter how much information is stored long-term, the store never becomes full.

Supporting evidence: Standing et al, (1970) gave participants a single presentation of a sequence of 2560 photographs for 5 or 10 seconds per picture. Even after 36 hours, participants could identify the correct photo when paired with a new scene approximately 90% of the time. This shows that a vast amount of material can be stored in LTM, at least in picture form, and gives support for the argument that LTM is probably an unlimited store.

**Evaluation of the Multi-Store Model of Memory**

**Supporting Evidence:**

**(P)** There have been numerous research studies showing scientific evidence for the multistore model.

**(E)** For example, Glanzer and Cunitz found that If participants were prevented from rehearsing a list of one syllable words for a short period by counting backwards in threes (the Brown-Peterson technique), they could remember the first words in the presentation, but not those presented in the middle or the end. If participants were allowed to recall immediately, they remembered both the words at the beginning and the end of the lists. This is known as the primacy-recency effect. This supports the MSM in that the words at the beginning of the list are rehearsed and therefore placed in LTM, but the words in the middle of the lists are quickly displaced by rehearsing the first words, however, the words at the end of the list are remembered because they are still fresh in STM. In contrast, If rehearsal is prevented at the end of the list, then the end words are neither in STM because of decay, or in LTM because displacement of counting backwards in threes.

**(S)** These findings support the distinction of STM and LTM and the role of rehearsal in passing information from STM to LTM.

**(P)** In biological evidence into brain localisation using MRI scans, different areas of the brain appear to be active when tasks requiring either STM or LTM are required.

**(E)** Beardsley (1997) found that that the pre-frontal cortex is active when individuals are involved with tasks involving short-term memory. Squire et al, (1992) found that the hippocampus is active when long-term memory is engaged.

**(S)** The different brain localisation when using either the STM or LTM shows that the parts of memory are in different parts of the brain, thus supporting the concept of distinct memory stores as proposed by Atkinson and Shiffrin.

**Other (Challenging) Research:**

**(P)** Other researchers demonstrated that memory is a product of processing information, and not maintenance rehearsal.

**(E)** Participants were asked questions about stimulus words at different processing ‘levels’. The words with questions that required a ‘shallow level’ of processing, for example, “is the word printed in capital letters” were less likely to be recalled that words with questions that required a ‘deep level’ of processing, for example, “Is the word a type of fruit.”

**(S)** This demonstrates that how the information is processed is important to memory, and contradicts the original claim that for memories to be transferred into LTM, maintenance rehearsal (verbal repeating) is required. Thus giving doubt to some of the assumptions of the multi-store model.

**Fails to Explain:**

**(P)** The MSM suggests that both STM and LTM are unitary stores, but later evidence pointed to a need to rework the simple unitary concepts

**(E)** Shallice and Warrington (1970) found that in one patient with amnesia, he found recall of digits very difficult when they were read to him, but much better when he read them to himself (the case study of KF). In another case study, after a virus caused damage to the hippocampus, Clive wearing had very little long term memory for events that had happened in his life, but could still remember skills such as playing piano, reading music and writing in a diary

**(S)** Evidence such as this lead theorists to rework the MSM, showing that it is too simplistic to think of both STM and LTM as single stores. Instead, each should be considered as consisting of a number of different stores which specialise in processing and storing different types of information. (see the working memory model as a replacement for STM and the tripartite approach to describing LTM)

**(P)** The Multi-store model argues that the transfer of information between STM and LTM is via rehearsal

**(E)** There is plenty of evidence from everyday life that information passes from STM to LTM without the need of maintenance rehearsal

**(S)** Rehearsal may explain how information is passed from STM to LTM in memory studies in laboratories with lists of words, but does not indicate how LTMs are formed during our day to day existence. The ‘levels of processing’ theory offers a more thorough explanation of this.

**Applications:**

**(P)** The Multi-store model of memory can be used to give a greater understanding of how memory works, this can be helpful to people who rely heavily on their memories, such as students.

**(E)** The model informs students that to pass information into a permanent store, they need to repeat the rehearsal of the information required. Just reading it once would not be considered effective rehearsal, according to the model

**(S)** The model confirms the importance of effective revision if students want to do well in exams, and is therefore a useful model

**Topic 2: Types of Long-Term memory -** Episodic, semantic and procedural

One of the major limitations of the MSM is that its description of LTM as a single unitary store is now seen as outdated. Many research studies have shown that there are at least three different types of long-term store

**Episodic Memory**: First suggested by Tulving (1972), it is the type of long-term memory that gives individuals an autobiographical record of things that have happened to them (our memories of our experiences). In other words, it is the storage of episodes that happen throughout our lives. Examples of episodic memories are your school leaving party, your last holiday, what you did last night, your first kiss etc. Think of episodic memories in terms of 3Ws, containing information about *what* happened, *where* it happened, and *when* it happened. Individuals tend to see themselves as actors in these events, and the emotional charge and the entire context surrounding an event is usually part of the memory, not just the bare facts of the event itself. Furthermore, having episodic memory allows us to make predictions about what will happen to us in the future.

That is not to suggest that episodic memories contain exact reproductions of what happened. It is suggested that episodic memories are constructed, rather than reproductive, and is prone to errors and illusions. The section on eye-witness testimony will explore this further, but our episodic memories are subject to stereotyping, subjective interpretation, missing out information or adding in missing parts.

**Semantic Memory**: This is a structured record of facts, meanings, concepts and knowledge about the external world that we have acquired. It refers to general factual knowledge, shared with others and independent of personal experience and of the time and place in which it was acquired. Semantic memories may once have had a personal context, but now stand alone as simple knowledge. It therefore includes such things as types of food, capital cities, social customs, historical dates, functions of objects, vocabulary, understanding of mathematics, etc. There is an enormous amount of information available in semantic memory, and is continually being added to.

**Procedural Memory:** This differs from the other two types of long-term memory, as it tends to be unconscious, whereas the other two are conscious. Procedural memory (“knowing how”) is the unconscious memory of skills and how to do things, particularly the use of objects or movements of the body, such as tying a shoelace, playing a guitar or riding a bike. These memories are typically acquired through repetition and practice, and are composed of automatic sensorimotor behaviours that are so deeply embedded that we are no longer aware of them. Once learned, these "body memories" allow us to carry out ordinary motor actions more or less automatically. A good example of this is learning how to drive a car. Initially it is very difficult, but with repeated practice it becomes ‘second nature’.

**Evaluation of the different types of Long-term memory**

**Supporting evidence**

**(P)** There is evidence to suggest that when a person uses episodic memory, they use a different region in the brain compared with when they use semantic memory

**(E)** Tulving (1989) injected himself, his wife and 4 others with particles of radioactive gold that he could use to track brain blood flow in a scanner. He scanned each person’s brain whilst they thought about historical facts or childhood experiences. He found in three of the six participants (including himself), that when they were thinking about historical facts blood flow increased at the back of his brain, whereas when he thought about childhood experiences blood flow increased at the front of his brain.

**(S)** The activation of the different areas of the brain when recalling facts or episodes suggests a biological basis to the different types of memory in LTM

**(P)** Many studies using people with amnesia have demonstrated that there are different long-term memory stores.

**(E)** In the case of Clive Wearing, as illness caused the near total destruction of his hippocampus. This left him with an inability to store new episodic or semantic information for any more than a few seconds. However, he was perfectly able to read, write, speak and play piano. Corkin (1968) studied a brain-damage patient known as HM. HM had severe anterograde amnesia as a result of an operation to treat epileptic seizures. Like Clive Wearing, he appeared unable to store new long-term memories. HM was taught a new motor skill (tracing lines on a moving disk). Initially his performance was very poor, but he gradually improved. Several days later, HM was tested again. He was able to perform the task as well as he previously could, although he had no recollection of having done the task before. Other researchers investigated learning in people with Huntingdon’s Disease, a progressive, degenerative

disease of the brain. They found that HD patients had no problems learning new facts and knowledge, but had severe problems learning new motor skills.

**(S)** These findings give a strong indication that damage to specific areas of the brain leave the patients with deficits in one or more types of long term memory, whilst leaving other long-term memory stores intact, this offers support for the biological basis of separate long-term stores

**Other (challenging) research**

**(P)** Other researchers disagree with Tulving’s three distinctions of long term memory

**(E)** Cohen and Squire suggest that semantic and episodic memory should be understood as the same type of memory, called ‘declarative memory’, and research by Kan et al (2009) found that there was interdependence between episodic and semantic memory

**(S)** Whether there are two or three types (or more) of LTM may be important when attempting to help people recover their cognitive functions after illnesses such as stokes.

**Applications**

**(P)** Being able to identify different aspects of LTM has led to psychologists targeting specific kinds of memory to make people’s lives better

**(E)** Belleville et al (2006) demonstrated that episodic memories could be improved with training in older patients with mild cognitive impairment

**(S)** This shows that the tripartite division of long-term memory has had tangible benefits for people with cognitive impairment, making it a useful theory.

**Topic 3: The Working Memory Model (WMM)**

After the development of the multi-store model, research questioned the existence of a single STM store. Because we actively process information in STM, it is far too complex to suggest that STM is just a temporary store for transferring information into LTM. Baddeley and Hitch (1974) devised the ‘working memory model’ in an attempt to demonstrate what is happening to information when we are consciously thinking about it. Cohen described the WMM as the explanation of conscious thought happening ‘now’.

The working memory model is made up from four components. At the head of the model is the central executive, which attends and monitors incoming information, and allocates slave systems to tasks. The slave systems are the phonological loop, the visuo-spatial Sketchpad and the episodic buffer. Their roles are described below.

**The Working Memory Model – Baddeley and Hitch (1974)**



**NB:** Although LTM is shown here, it is not actually part of the working memory model.

**The Central Executive**

The function of the central executive is to direct attention to particular tasks, determining how the brain’s resources are allocated to tasks. By resources, Baddeley and Hitch refer to the three slave systems below. Information goes to the CE via the senses or long term memory, and this information is then sent to the other systems for processing and temporary storage. The CE has very little capacity so it cannot attend to too many things at once, and it has no capacity for storing data.

**The Phonological Loop (The inner ear and the inner voice)**

Stores limited number of speech-based sounds for brief periods and has two components:

* ***The phonological store (the inner ear)***

Allows acoustically coded items to be stored for brief periods (someone talking, a melody etc.)

* ***The articulatory control process (the inner voice)***

Allows sub vocal repetitions of items in phonological store. This is similar to maintenance rehearsal.

**The Visuo-Spatial Sketchpad (the inner eye)**

The VSS processes and stores mental images in terms of what they look like and their place in the visual field. It is independent from the phonological loop, and has a limited capacity. It is used when people are planning a spatial task, like moving from one room to the next, reaching for their cup of coffee etc.

**The Episodic Buffer**

Added in 2000, the episodic buffer is a general store that allows both sound and visual information to be bound together. It integrates information from the other systems and also offers a sense of time sequencing. It records events (episodes) that are happening and sends information to LTM. Like all the systems in working memory, it has a limited capacity.

**Evaluation of the working memory model**

**Supporting Evidence:**

**(P)** There are numerous studies which support the existence of each store

**(E)** The Central Executive is supported by D’Esposito et al (1995) who found using fMRI (functional magnetic resonance imaging) scans in the prefrontal cortex was activated when verbal and spatial tasks were performed simultaneously but not when performed separately, suggesting the brain area is associated with CE functioning. Trojani and Grossi (1995) reported on a case study of a brain damaged patient who had impaired functioning of the phonological loop but had a perfectly functioning visuo-spatial sketchpad, suggesting two separate stores. Gathercole and Baddeley (1993) found that participants had difficulty simultaneously tracking a moving point of light and describing the angles of a hollow letter F, because both tasks required VSSP functioning, whereas other participants had very little difficulty with tracking the light and completing a verbal task, indicating that the VSSP and the PL are separate slave systems. Prabhakaran (2000) found biological evidence using fMRI scans that the episodic buffer is located in the right-frontal lobe.

**(S)** This evidence confirms the existence of the separate systems involved with the Working Memory Model

**Other (challenging) research:**

**(P)** There is evidence to suggest that the notion of a single central executive is incorrect

**(E)** Eslinger and Demasio (1985) reported on the case study of EVR who had a cerebral tumour removed. He performed well on tests of reasoning, which suggests that his central executive is intact; however he had poor decision-making skills, which suggests that his central executive was not wholly intact.

**(S)** This suggests that the original concept of the central executive is unsatisfactory. Something that Baddeley acknowledges when he stated in 2003 “The central executive is the most important but the least understood component of working memory.”

**Explains better:**

**(P)** The multi-store model of memory only describes the structure of memory, but the WMM attempts to explain how memory functions

**(E)** This has led to a greater understanding of cognitive dysfunction, for example, knowledge of the phonological loop and its role in the development of reading in children has led to a better understanding of dyslexia

**(S)** The development of the working memory model has led to tangible benefits for dyslexic students, which the multi-store model did not

**Applications:**

**(P)** The WMM suggests practical applications; one example is with children with attention deficit hyperactivity disorder (ADHD)

**(E)** ADHD is thought to be linked with impairments with working memory, so Alloway (2006) suggested a number of methods to help children focus on tasks: 1) Use brief and simple instructions so they don’t forget what they are doing; 2) Break instructions down into individual steps; 3) Frequently repeat instructions; 4) Ask the child to periodically repeat instructions

**(S)** The development of the working memory model has clear practical applications that help children, showing the value of the model

**TOPIC 4 Explanations for Forgetting:** Proactive and retroactive interference and

retrieval failure due to absence of cues

Forgetting can be defined as a failure to retrieve memories (retrieval failure). Explanations vary between how other information interferes with memories, and how the absence of cues can lead to information not being retrieved.

1. **Interference theory**: Interference theory suggests that forgetting is due to information in LTM becoming confused with or disrupted by other information during coding, leading to inaccurate recall. There are two types of interference: proactive and retroactive

**Proactive Interference:**

This involves memory impairment for something we have learned by other learning that had occurred previously. In other words, old information interferes with the new information. Imagine that you had already learned Spanish, and later learned French, then some of the Spanish would interfere with you trying to speak French.

Jacoby et al (2001) argued that proactive interference occurs because of competition between the strength of the old learning and the weakness of the new learning. If you try to use a new password for an online transaction, the strength of an old password will interfere, and you lose the ability to recall the new one. Perhaps a more damaging example is calling your new partner by your old partner’s name!

**Retroactive interference:**

This involves the disruption to recall of previously learned material by the interference of newly learned material (newer information interferes with older information). For example, the learning of a new car registration number plate disrupts the recall of the old one.

**Evaluation of interference theories of forgetting**

**Supporting evidence:**

**(P)** There are numerous studies which support the role of interference in forgetting

**(E)** In an early demonstration of proactive interference, Underwood (1957) showed that participants who were repeatedly asked to learn series of word lists made far more errors as the number of lists increased compared with when they first began the study

**(S)** As the participants made more errors as the more lists they had to remember, this shows that the old information was interfering with the newly learned information, which is what proactive interference would predict.

**(P)** There are numerous studies which support the role of interference in forgetting

**(E)** Schmidt et al, 2000 collected a sample of 211 former students of a Dutch elementary school and sent them a map of the surrounding area of the school. The map had the street names removed and replaced with numbers from 1 – 48. Participants were asked to name as many as they could. The researchers found that there was a positive association with how many times the participants had moved outside the area, and the number of names forgotten. The researchers concluded that learning new street names made recalling the old street names more difficult. This shows that interference plays a role in forgetting and not time passed.

**(S)** This demonstrates that retroactive interference plays a role in forgetting because the new information interferes with the old information

**Other research:** time vs interference

**(P)** There are numerous studies which support the role of interference in forgetting

**(E)** In research by Baddeley and Hitch (1977), it was found that rugby players forgot the names of the teams they played over the season, not because of the length of time that had passed, but how many games they had played. Players who had played more games forgot more teams than those who had played fewer games, even though the same length of time had passed

**(S)** This shows that information about the teams played was competing for recall

**Fails to explain**

**(P)** These explanations tend to focus on what happens when we forget information that is similar

**(E)** It fails to explain how forgetting information, skills or other information happens in the majority of real life settings, where we are not juggling with similar material but still manage to forget a lot of what we experience

**(S)** the explanations may be able to tell us how interference affects our memories in artificial situations, but they do not explain most cases of forgetting in real-life.

**Applications:**

**(P)** Theories of forgetting have a number of important applications

**(E)** These explanations can inform educators about the best way for students to learn information. It may be prudent when revising for exams, that students do not revise similar topics next to each other, as this is likely to interfere with recall of the information. McGeoch and McDonald (1931) showed that people would make far more errors if they had to recall an original list after learning a new list of synonyms than if they had only the original list to learn.

**(S)** This make the explanations valuable to society as they help with educational methods, revision techniques and therefore aid learning

1. **retrieval failure due to absence of cues**

The reason that people forget information is because there are insufficient cues. When information is placed in memory, their associated cues are stored at the same time. If these cues are not available at the time of recall, then there is an appearance that the information has been forgotten. This theory suggests that the information is still available for recall, but it cannot be accessed until the correct cues are in place.

Tulving (1983) referred to what he called the Encoding Specificity Principle (ESP). This states that a cue is going to help us remember information, it has to be present during encoding (when we learn the information) and at retrieval (recall). If the cues at encoding and retrieval are different then some forgetting will occur. For example, if you revise at college, you are more likely to retrieve the information than you are if you revise at home, as the college will act as a cue for retrieval because the surroundings were there during encoding.

**Context dependent forgetting:** This refers to external cues that are different when encoding information and when retrieving it. This is illustrated in to example above (college vs home revision)

**State-dependent forgetting**: This refers to internal cues (states of awareness) that are different during encoding information and retrieving it. An example is encoding information while under the influence of alcohol, only to forget it the next day.

**Evaluation of Retrieval Failure theory**

**Supporting evidence: context dependent forgetting**

**(P)** There are numerous studies supporting the role retrieval failure in forgetting

**(E)** Godden and Baddeley (1975) studied deep water divers and the effects of context dependent memory. There were four conditions

|  |  |
| --- | --- |
| Learn on land – recall on land (same context) | Learn underwater – recall on land (different context) |
| Learn on land – recall underwater (different context) | Learn underwater – recall underwater (same context) |

Participants had to learn lists of 36 words (two or three syllables) and recall them in the different conditions, the finding of percentage recall are shown below

|  |  |
| --- | --- |
| Learn on land – recall on land (same context)Recall accuracy = 37% | Learn underwater – recall on land (different context)Recall accuracy = 23% |
| Learn on land – recall underwater (different context)Recall accuracy = 24% | Learn underwater – recall underwater (same context)Recall accuracy = 32% |

**(S)** The higher percentage recall in the matched environments support the prediction that if the cues at encoding are the same as the cues at retrieval, recall is more likely, and if they are different, recall is less likely. This supports the concept of context dependent forgetting

**Supporting evidence: State dependent forgetting**

**(P)** There are numerous studies supporting the role retrieval failure in forgetting

**(E)** Carter and Cassaday (1998) gave anti-histamine (anti-allergy) drugs or a placebo (vitamin pills) to participants (students from Nottingham University). Anti-histamines have a mild side-effect of causing drowsiness and therefore altering the state of awareness for the participants. Participants were asked to learn and recall information in four different conditions

|  |  |
| --- | --- |
| Learn on drug – recall on drug (same state) | Learn on placebo – recall on drug (different state) |
| Learn on drug – recall on placebo (different state) | Learn on placebo – recall on placebo (same state) |

The results showed a marked decrease in accuracy of recall in a memory test when the participants’ internal state did not match at the time of encoding and retrieval, and an increased performance when the internal states did match

**(S)** This supports the concept of state dependent forgetting, as when the internal cues were different during encoding and retrieval, recall of a list of items was worse, as predicted by the theory

**Wider evaluation:**

**(P)** Baddeley (1997) argued that these studies do not reflect real-life, and therefore the strength of the explanations should be questioned

**(E)** He claimed that the contexts or states have to be very different to have an effect and subtle changes of environment or internal states, that tend to be the norm, will not have a strong effect

**(S)** We must not make exaggerated claims about cue dependent forgetting based on evidence that alters both context and state in a dramatic way.

**Applications:**

**(P)** If the explanations are valid, there are very important applications

**(E)** In places where getting instructions correct is absolutely vital, such as soldiers in novel environments, it is important to recognise that instructions maybe more likely to be forgotten if issued back in the safety of the camp. This would be true for many different people, such as deep water divers repairing oilrigs, astronauts, medics etc. therefore care must be taken to recognise this, and much practice in different scenarios required

**(S)** The value of these explanations maybe that they are used to save the lives of people in threatening and novel situations

**TOPIC 5: Factors affecting the accuracy of** Misleading information, including leading

 **Eyewitness Testimony (EWT):** questions and post-event discussion;

anxiety

Eye witness testimony is defined as an account or evidence provided by people who witnessed an event, such as a crime, reported from their memory.

In appeals against conviction in the United States, DNA evidence has overturned over 200 cases and in 75% of these, eye-witness testimony was the main evidence against them. In a famous case, Cornelius Dupree had spent 30 years in prison for rape because the victim incorrectly identified him as the perpetrator. DNA evidence proved that he was innocent, and the conviction was quashed. Many variables can influence the accuracy of eye-witness testimony. These include being presented with misleading questions during police interviews, post-event discussion with other witnesses, and the anxiety that people feel if they witness or are a victim of the crime.

**Misleading information:**

Most cognitive psychologists agree that our memories for events are not precise copies of what happened, as you might see if you were filming it. Instead, we only accurately retain fragments of the information, and fill in the gaps. This reconstruction of events leads to inaccuracies in recall, which can be compounded if we receive information after the event which distorts our original memory. For eye-witnesses to an incident, a subtle change in the wording of a question can have dramatic effects on what they recall, as is demonstrated by the findings of the study below

* ***Loftus and Palmer 1974 – misleading questions***

Two experiments are reported in which subjects viewed films of automobile accidents and then answered questions about events occurring in the films. In experiment 1, 45 university students were divided into 5 conditions. The question “About how fast were the cars going when they smashed into each other?” elicited higher estimates of speed than questions which used the verbs ***collided, bumped, contacted,*** or ***hit*** in place of ***smashed.*** (see table 1 below)***.***

In experiment 2, 150 students were split into three conditions, one condition were asked the question with ‘smashed’, the other condition were asked the question with ‘hit’ and the other condition had no question (control). On a retest one week later, those subjects who received the verb ***smashed*** were more likely to say “yes” to the question, “Did you see any broken glass?”, even though broken glass was not present in the film (see table 2 below).

**Table 1:** results for Loftus and Palmer (1974) leading question experiment:

|  |  |
| --- | --- |
| **Word** | **Average speed estimates** |
| Smashed | 40.5 mph |
| Collided | 39.3 mph |
| Bumped | 38.1 mph |
| Hit | 34.0 mph |
| Contacted | 31.8 mph |

**Table 2:** results for Loftus and Palmer (1974) broken glass experiment

|  |  |  |  |
| --- | --- | --- | --- |
| **Response** | **Smashed** | **Hit** | **Control** |
| Yes | 16 | 7 | 6 |
| No | 34 | 43 | 44 |

In both these experiments, it can be seen the memory of the incident was changed due to the leading question in the first experiment. These results get are consistent with the view that the questions asked subsequent to an event can cause a reconstruction in one’s memory of that event.

**Evaluation:**

**Validity:** There is an issue with the validity of showing films of car crashes compared with witnessing real-life crashes. The witness to real-life crashes are likely to experience a greater emotional response compared with watching one of film, which may affect the memory of the witness. Other critics suggest that the participants may have worked out the aims of the study, and on hearing the word ‘smashed’, gave the higher answer that they thought the researcher was hoping to get. If either criticisms are correct, then the findings of these experiments tell us little about real-life eye witness testimony

**Reliability:** Many laboratory studies have found similar findings when participants are faced with leading questions, however one experiment found that leading questions did not change the accuracy of the EWT. Loftus (1979) showed participants slides that showed the theft of a large purse from a handbag. 98% of the participants remembered the correct colour of the purse. They were then asked to read an account of the incident that was allegedly written by a professor of psychology. In this account, the professor stated that the purse was brown, a false statement as the original colour was red. Only 2 participants changed their answer to brown on a subsequent test, with most keeping to their original identification of a red purse. This shows that for information that is blatantly incorrect, leading questions have little effect.

**Applications:** If these findings are reliable, then such information can be used to train people not to use leading questions when questioning witnesses. Based on studies such as these, psychologists with legal representatives developed the cognitive interview, designed to increase the accuracy of eye-witness testimony

* ***Gabbert et al (2003 & 2007) Post-event discussion***

Co-witnesses are likely to discuss the event with eye-witnesses and this could be a source of further distortion. 58% of eye-witnesses had reported discussing the incident post-event with other witnesses (Skagerburg and Wright, 2008)

Errors in eyewitness accounts can occur when a witness comes into contact with post-event ‘misinformation’. A common way to encounter misinformation is through face-to-face interaction, in particular via conversation with other individuals who also witnessed the crime. The current research compares this kind of misinformation with the non-social post event narrative method typically employed in laboratory studies.

**Gabbert et al (2003)** investigated memory conformity effects between pairs of participants who viewed a simulated crime event on video. Participants were led to believe that they were seeing the same video of a crime scene. Although the two video clips contained exactly the same sequence of events, they were filmed from different angles to simulate different witness perspectives. Critically, this manipulation allowed

different features of the event to be observed for each participant. After viewing, participants were asked to recall the event either alone or in pairs. An individual recall test was then administered to examine the effects of co-witness discussion on subsequent memory reports. A significant proportion (71%) of witnesses who had discussed the event reported at least one (out of two) erroneous detail acquired during the discussion with their co-witness, this was 0% in a control group. 60% of these participants believed the suspect to be guilty, even though they hadn’t actually seen the crime taken place because of the different angle. This shows that people can have their memories distorted by other people in post-event discussion

**Gabbert et al, (2007):** Young (17-33 years) and older (58-80 years) adults viewed a simulated

crime-event on video and were later exposed to four items of misinformation about it. The misinformation items were either introduced as part of a discussion about the event with a confederate or were embedded within a written-narrative about the event that participants were asked to read. A questionnaire containing twenty items about the event was given to participants before and after the experimental manipulation.

Participants were less accurate than controls on questionnaire items after encountering misinformation. More importantly, misinformation encountered socially was significantly more misleading than misinformation from a non-social source. This was true for both young and older adults.

**Conclusion.** Misinformation encountered socially produced more errors than misinformation from a non -social source. This finding has implications both for applied (forensic) and theoretical understanding of eyewitness memory.

**Evaluation:**

**Validity:** the controlled nature of the research questions the mundane realism of the findings. Is it feasible that participants would act in a similar way if the research was based on real life events? It might be that there was a conformity effect because they knew it was a study, so the outcome of their answers had no social impact (no-one was going to prison). This might make them more likely to conform, as there are no consequences for doing so.

**Reliability:** there are many studies who have found similar findings to Gabbert et al. (ex. Wright, Self &

Justice, 2000) which means that Gabbert et al’s findings are consistent with other research, with this we can suggest with confidence that EWT can be distorted by post-event discussion

**Applications:** From this research, it could be important to inform police officers that they should interview witnesses as soon as possible, and ask them not to discuss the case with any other co-witness. However, in the aftermath of an incident, it would be natural for co-witnesses to discuss what they have just seen, so this needs to be taken into account when questioning them on events later.

* **Anxiety**

Eye-witnesses are often very anxious and stressed when witnessing a crime, especially if they are victims themselves. This is because of the danger they perceive to be in, although there may be some important individual difference to how people react to this anxiety. It is thought that the anxiety can be a source of distortion for EWT.

***Loftus and the weapons focus***

Loftus (1979) suggested that when a weapon was used in a crime, the subsequent anxiety in the eye-witness meant they would focus on the weapon rather than other details, such as clothing or the face of the attacker. This is supported by two experiments

Loftus (1979) created two conditions were the participants either heard a hostile and aggressive argument by two people in a different room, followed by one of them emerging holding a letter opener covered in blood, or they heard a harmless conversation between two people followed by one of them holding a pen with grease on his hands. Participants were asked to identify the culprit from photographs, with only 33% correctly identifying the culprit in the letter opener condition, and 49% correctly identifying the culprit in the pen condition. Loftus argued that the anxiety caused by seeing the letter opener caused the weapons focus which lead to them not paying attention to other information.

Loftus et al (1987) asked participants to watch one of two sequences: a person pointing a gun at a cashier and receiving some cash, and a person passing a cheque to the cashier and receiving some cash. Loftus found that participants correctly identified details about the incident in the ‘cheque’ condition more than they did the ‘gun’ condition, again demonstrating the weapons focus effect

Yuille and Cutshall (1986) conducted research into a real-life crime. 13 people, who had witnessed a shop keeper shooting a thief dead in Canada, were interviewed 5 months after the event. These interviews were compared with the original police interviews immediately after the event. Participants were asked to rate how much anxiety they felt during the incident. Those who had reported high anxiety levels reported the highest level of accuracy when recalling the incident five months later (88% accuracy), compared with those who had reported a relatively low level of anxiety (75% accuracy). This is in contrast to Loftus’s laboratory findings.

**Evaluation**

**Internal Validity:** critics have suggested that Loftus is testing surprise, and not anxiety. In another study, researchers (Johnson and Scott) showed an incident in a hair-dressing salon, but in one condition, the confederate appeared with a raw chicken. This produced just as many inaccurate details as when the incident involved a handgun, suggesting surprise rather than anxiety could account for the weapons effect.

**Reliability:** The difference between the real-life example and the lab experiments show that there is a lack of consistency in the research. But there is also a lack of consistency between real-life studies. Valentine and Mesout (2009) divided attendees (who volunteered to take part in a study) to London Dungeon into two groups, either as a high anxiety group or a low anxiety group, based on answers to questionnaires and heart monitor readings. They then visited the labyrinth of horror, designed to frighten people, where they met an actor. Participants were then asked to identify the actor in a line up. Those in the high anxiety condition only had a17% accuracy, whereas those in the low anxiety condition had a 75% success rate. This does not support Yuille and Cutshall’s findings

**Applications**: It is important to recognise the role of anxiety in EWT and proceed with extreme caution when convicting someone on EWT alone. It might be that other evidence, such as DNA sampling or CCTV footage could be used to collaborate the witness’s testimony before we can conclude that a conviction is safe.

**TOPIC 6: Improving the Accuracy of EWT:** The use of the cognitive interview

Before the advent of the Cognitive interview, police interviews would often be conducted in such a way that it elicited false information, with witnesses unable to give accurate accounts of what happened. That changed when Geisleman et al argued that police interviews must take into account the characteristics of human memory. These characteristics include:

Memories are complex, and are made up from different types of memory

Retrieval cues are important, and their absence can lead to inaccuracy

Misleading information can distort recall

The four techniques used in cognitive interview are presented here.

|  |  |
| --- | --- |
| **Geisleman et al (1985) four instructions for CI** | **How does this differ from standard police interviews?** |
| **Recreate the context of the original incident** | Ask the witness to try and picture the circumstances surrounding the crime. Next ask the witness to think about, or visualise the scene. Ask what the scene looked like, who was present or nearby, where the furniture was, what the weather was like, how the witness was feeling at the time or how they reacted to the event | *Police do not ask witness to recreate the context, instead just to free recall the events and then answer questions* |
| **To report every detail** | Tell the witness that some people withhold information because the feel it is irrelevant, but they should try and tell the whole story, leaving nothing out. Here the interviewer must be extremely patient and allow the recall as the witness sees it | *The police interview uses the repetition technique, where they repeat the questions needed for the eyewitness testimony, often interrupting the witness* |
| **To recall the event in reverse order** | Tell the witness that although it may not feel normal, to try and tell the story in the reverse order, starting at the end of the event or at a significant part of the event. This should help stop witnesses recreating the event in relation to expectations or stereotypes about what normally happens in crimes such as was witnessed | *The police would ask for free recall, which would usually end up with a chronological account of events.* |
| **To change perspectives** | Instruct the witness to recall the event from a different physical perspective, from a location other than where he or she was during the event. What might they have seen from across the street? What did any of the other witnesses see? What would they have heard? Again this is used to disrupt the personal expectations of what usually happens in a crime (as seen in films etc.) |  *The standard interview is more likely to focus only on the witness’s point of view, asking questions about what they saw directly.* |

Fisher et al (1987) added elements to CI. Called the enhanced cognitive interview (ECI) social dynamics were taken into account, such as when to (or not to) establish eye-contact, ways to reduce anxiety, minimising distractions, asking the witness to speak slowly and to ask open ended questions.

**Evaluation of the use of CI**

**(P)** There are numerous studies which support the effectiveness of CI

**(E)** Kohnken et al (1999) carried out a **meta-analysis** of 53 studies investigating ECI, and found, on average, a 34% increase in the amount of correct information generated compared with standard police interviews, although caution is required, as most of these studies were carried out with volunteer participants in a laboratory and not in a ‘real life’ setting.

To assess whether or not the Cognitive Interview is more effective than standard police interviews during interviews with eye-witnesses (in a laboratory setting) Geisleman et al (1985) showed police training videos to 89 students. About 48 hours later, the students were interviewed individually by American Law enforcement officers (detectives, CIA investigators and private investigators). The interviewers had either been trained in standard police interviewing techniques or in the new Cognitive Interview Schedule. Each interview was taped and analysed for accuracy of recall. The results of the study can be seen in the table below

|  |  |  |
| --- | --- | --- |
|  | **Cognitive Interview** | **Standard interview** |
| **Correct items reported** | 41.5 | 29.4 |
| **Incorrect items reported** | 7.3 | 6.1 |
| **Made up (confabulated) items** | 0.7 | 0.4 |

**(S)** The results from both this research studies clearly show that accuracy of EWT is improved by the use of cognitive interview, and as a result, it should be suggested that the procedures are used for all EWT in the future.

**Which techniques is more valuable – economic impact?**

**(P)** The Cognitive Interview tends to take longer and use more resources than the traditional interview, and some critics suggest that some of the procedures are more valuable than others. It also requires more training.

**(E)** Milne and Bull (2002) found that a combination of report everything and context reinstatement produce the most effective reports which confirmed some of the police officers views that some aspects are better than others

**(S)** In times when police funding is being cut, it may be more viable to only use aspects of the CI so that time and resources are not being used without good reason to do so

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