DP IB Psychology: HL

Models of Memory

Contents

The Working Memory Model

What is the Working Memory Model?

- The **Working Memory Model (WMM)** was devised by **Baddeley & Hitch (1974)** as a response to **Atkinson & Shiffrin's (1968) Multi-Store Model of Memory** in terms of providing a more **dynamic** and **flexible** model of memory
- The WMM focuses on **short-term memory (STM)** only, there is no provision made for the functions or types of **long-term memory** in the model, it only aims to explain the 'here and now' of memory i.e. what you need to work for you in the current moment
- The WMM sees STM as a complex information processor rather than as a static unitary store
- The WMM is composed of four units:
  - **the central executive (CM)**
  - **the phonological loop (PL)**
  - **the visuospatial sketchpad (VSS)** with the
  - **episodic buffer (EP)** which was added much later on in 2000

What is the Central Executive?

- The CE is the driving force of the WMM as it decides which tasks are to be assigned to which specific **slave systems** e.g. the VSS or the PL rather like the managing director of a company
- The CE is not so much a memory store but a **'command centre'** as it plays a key role in controlling the processes of working memory
- Although the CE is probably the most important element of the WMM it is very difficult to **test** (unlike the VSS and the PL)
- The CE decides which information to pay attention to and which information to ignore and it then directs the slave systems to act accordingly

What is the Phonological Loop?

- The PL attends to and organises **acoustic** information in the form of spoken or written information (e.g. written words are **encoded** via vocalising or 'speaking', them in the mind so that visual information becomes acoustic information)
- The PL can be divided into two parts:
  - the **phonological store** and
  - the **articulatory control system**
- The phonological store is the **'inner ear'** of the WMM as it processes and stores acoustic, speech-based information for a very short **duration** (a couple of seconds)
- The articulatory control system translates **written words** into **speech** so that they can then be kept in the phonological store in a kind of loop or 'holding pattern' so that we can gain access to it quickly, e.g. repeating a phone number over and over again until we can put it into our phone

What is the Visuospatial Sketchpad?

- The VSS attends to and organises **visual** and **spatial** information e.g. the colour of a flower, the arrangement of windows and doors in a house
- The VSS is used when you recognise a photo of your friend on social media for example or when you give directions to a stranger (e.g. How do I get to the train station?)
- The VSS can be divided into two parts:
  - the **visual cache** and
  - the **inner scribe**

- The visual cache is the **'inner eye'** of the WMM as it stores information about form and colour (e.g. a purple triangle)
- The inner scribe contains spatial and **movement-related information** (e.g. how to get from one side of a crowded room to the other)
- The inner scribe rehearses information which is then stored in the **visual cache**

What is the Episodic Buffer?

- The EB was added to the model in 2000 as a way of acknowledging that the CE has to communicate with LTM in order to be able to function effectively
- Our working memory needs access to the information stored in LTM to be able to respond to the current situation – not being able to remember which side of the road to drive on, for example, could cause all sorts of problems!
- The EB acts as a sort of messenger that communicates between LTM and the slave systems of the WMM
- The EB arranges information into 'packets' and, when the time is right, it moves this information to other slave systems in a way which makes sense for the individual and which follows a set sequence i.e. events occur continuously rather than seeming out of joint (e.g. if you are having a conversation you see the other person speaking at the same time as their lips move)

Which research studies support the WMM?

- **Baddeley et al. (1973)** – **dual-task lab experiment** provides support for the PL and VSS
  The case of KF
- **(Shallice & Warrington, 1974)** – the **case study** of a brain-damaged patient provides evidence of the PL and the VSS as separate slave systems

Baddeley et al. (1973) is available as a separate Key Study – just navigate the Cognitive Processing section of this topic to find it along with the Key Study for the Multi-Store Model of Memory (Two Key Studies of Models of Memory)

Evaluation of the Working Memory Model

Strengths

- The WMM provides a much more detailed and dynamic model of STM than the multi-store model of memory does as it explains how different processes in memory e.g. response to acoustic and visual information occur at the same time
- The WMM can be tested under **controlled conditions** such as those used in a lab experiment

Weaknesses

- There is very little insight or evidence as to how the CE functions in terms of directing attention towards the slave systems
- Not properly explaining the role of LTM in memory means that the WMM is limited and ignores key factors in the ways that STM and LTM combine to produce working memory

Two Key Studies on Models of Memory: Glanzer & Cunitz (1966) & Baddeley et al. (1973)

Key Study: The MSM – Glanzer & Cunitz (1966)

Aim: To investigate **serial position effect** as evidence for there being two separate stores of memory (**STM** and LTM**)** which supports the **Multi-Store Model of Memory**

Participants: 46 males who were all enlisted in the US army

Procedure: Each participant was individually shown 15 lists each containing 15 words. There were three **conditions** of the **independent variable**:

- **Immediate recall** after being shown the list
- Recall after a 10-second **interference task** (the **Brown-Peterson** technique of counting backwards aloud from a given number in threes)
- Recall after a 30-second interference task (the **Brown-Peterson** technique of counting backwards aloud from a given number in threes)

Results:

- Participants in the immediate recall condition showed the expected **'U' curve** of the serial position effect - i.e. more items recalled from the beginning and the end of the list, showing **both primacy and recency effect**
- Participants in the 10-second delay condition showed a similar primacy effect to the immediate recall group but much less of a recency effect
- In the 30-second delay condition the primacy effect was high but the recency effect had disappeared with fewest items recalled from the end of the list compared to the other two conditions.

Conclusion: By preventing **rehearsal** with a 30-second interference task, items from the end of the list had not been rehearsed in STM so they could not be transferred to LTM and so the recency effect is prevented. In other words, there appear to be two separate storage facilities for STM and LTM.

Evaluation of Glanzer & Cunitz (1966)

Strengths

- This is a **well-controlled lab experiment** with **standardised procedure** which makes it **replicable** thus high in **reliability**
- The **dependent variable** was measured **quantitatively** which means that the results are easy to compare and to analyse **statistically**

Limitations

- The procedure lacks **ecological validity** due to the artificial nature of the task
- The use of an **independent measures** design could give rise to **participant variables** i.e. one condition of the IV could have consisted of people whose memory was naturally better than in the other groups

Key terms:

- **Serial position effect**
- **Primacy effect**
- **Recency effect**

Key Study: The WMM – Baddeley et al. (1973)

Aim: To investigate the existence of the **VSS** and the **PL** as separate components in the **Working Memory Model** by using a **dual-task activity** (dual-task study)

Participants: There is no information available as to who was included in the sample

Procedure: A dual-task **lab experiment** in which participants were given a tracking task (following a spot of light with a pointer around a circular path) while imagining block capitals in their head such as H, T, F and E

- *Condition A: Participants were asked to start at the bottom left-hand corner of the path and to begin tracking the shape with their light-pointer. They were asked to respond verbally to each angle with a 'yes' if it included the bottom or top line of the letter and a 'no' if it did not. So, if the participant was thinking of a letter 'F' then they would respond that yes, it had a top and a middle line but no bottom line. They did this while tracking the spot of light*
- *Condition B: The participants started tracking the pattern with the light-pointer and they were then told to imagine one of the letters, 'F' for example. While they were tracking the pattern they were asked, 'Does this letter have a top line/middle line/bottom line in it'? But they were asked to just imagine the letter in their head. So, they were having to follow a pattern while at the same time imagine a letter in their head*

Results: Participants in condition B experienced great difficulty in tracking the spot of light and at the same time accurately identifying in their head whether the letter had a top/middle/bottom line. Tracking and letter imagery tasks were competing for the limited resources of the Visuo-Spatial Sketchpad, whereas the tracking and verbal tasks in condition 1 (responding verbally whilst visualising the letter) used separate components: the VSS and Phonological Loop
Conclusion: There may be separate slave systems – the VSS and the PL - which operate in working memory. Overloading one of the slave systems with two tasks means that it cannot function properly

Evaluation of Baddeley et al. (1973)

Strengths

- The procedure is **replicable** which means that the study could be repeated to check for **reliability**

- The study focuses on the dynamic nature of working memory as it demonstrates how memory is used in the moment in order to complete a complex task

Weaknesses

- As the participants had to visualise each letter in their heads there is the possibility that they became distracted and thought of other things which would mean that the study lacks **validity**
- As no information was provided as to who made up the sample it is difficult to generalise the findings

Key terms:

- **Dual-task**
- **Visuospatial Sketchpad**
- **Phonological loop**