

THE MULTISTORE MODEL OF MEMORY

Question: Describe and evaluate the Multi-store Model of memory.

The multi-store model of memory was the idea of Atkinson and Shiffrin, 1968/71.

Atkinson and Shiffrin suggested that memory was comprised of three separate stores – the Sensory Memory store, the Short-term Memory (STM) store, and the Long-term Memory (LTM) store. They presented a diagram to show this.

According to this model, memory is characterised as a flow of information through a system. The system is divided into a set of stages, and information passes through each stage in a fixed sequence. There are capacity and duration limitations at each stage and transfer between stages may require recoding.

When a stimulus impinges our senses (such as reading these words, which are of course, received by the eyes) it goes through the Sensory Store, passing onto the STM store, and then possibly onto the LTM store. This is the order. Much of this information will be lost en route.

To recall the information, such as what you have just read, it is needed to pass back from the LTM, to the STM (in reverse order).

The Sensory Memory holds information for a very short time. It takes rapidly passing impressions of light, sound, smell etc. and preserves them just long enough for them to be recognised. It is the attention system. Any information, which we pay attention to, is selected, and is then processed further into the STM. All other information is disregarded at this moment.

The STM contains only the small amount of information that is actually in active use at any one time. Verbal information is encoded at this stage in terms of its sounds. Atkinson and Shiffrin believed that memory traces in STM are fragile and can be lost within about 30 seconds unless rehearsed/ repeated. Information here can also be lost through displacement, due to the duration.

Material that is rehearsed is passed onto the LTM store where it can remain for a lifetime, although loss is possible from this store through decay or interference.

In order to recall information, it must be 'retrieved' from the LTM to the STM. This information needs to be re-lived in the STM before it is released through action/ speech.

Forgetting in LTM can occur due to retrieval failure.

There are many positive and negative criticisms of the multi-store model of memory.

There is a lot of evidence *for* the multi-store model.

The Primary-Recency Effect, was conducted by Atkinson, 1970. In this experiment, participants were presented with lists to remember. Results show best recall was the first and last items – the first items rehearsed into the LTM and the last items recalled from the STM. The ones in the middle were less likely to be recalled. This shows evidence for existence of several stores, including a STM and a LTM.

Similarly, the Brown and Peterson technique suggests that if rehearsal of items is prevented (using a distracter task), then information does not enter the LTM.

Other evidence in support of the distinction between STM and LTM, and that they exist, comes from the case studies of people with brain damage, which gives rise to memory impairment. Milner, 1966, reported on a young man, referred to as HM, who was left with severe memory impairment after brain surgery. He was able to talk normally and to recall accurately events of people from his life before surgery, and his immediate digit span was within normal limits. He was, however, unable to retain any new information and could not lay down new memories in LTM. When told of the death of his favourite uncle, he reacted with considerable distress. Later, he frequently asked about his uncle and, on each occasion, reacted again with the level of grief appropriate to hearing the news for the first time.

KF, a motorcycle accident victim investigated by Shallice and Warrington, 1970, suffered from the reverse of this memory impairment. He had no difficulty in transferring new items into LTM but had a grossly impaired digit span. He has good long-term recall but can only hold two items at any one time in his short-term memory. This again shows the existence of the two types of memory, STM and LTM. However, this case of KF is also a negative point, as when you compare it to the diagram, the diagram states that LTM must go back to STM first before released. KF's case shows this wrong.

Cases like these lend support to the Atkinson and Shiffrin model, in that they seem to point a clear existence of these separate stores.

However, there are problems with the model of Atkinson and Shiffrin.

De Groot, 1966, showed how expert chess players had phenomenal STM for chess positions as long as they fitted in with known rules. When pieces were randomly arranged their recall was no better than non chess players. This shows that STM and LTM may not be so separate and distinct.

The model is also too simple and inflexible and fails to take account of factors such as the strategies people employ to remember things. It also places emphasis on the amount of information that can be processed rather than its nature. Some things are simply easier to remember others, perhaps because they are more interesting, more distinctive, funnier etc. The multi-store cannot account for this.

It is also criticised for focussing on the structure of the memory system at the expense of adequately explaining the process involved. For example, visual stimuli registered in sensory memory are thought to be changed to an acoustic code for access to STM. In order to translate the pattern of the letter 'M' into the sound 'em', the individual needs to access knowledge about letter shapes and sounds which is stored in the LTM. This means the information from the LTM must flow backwards through the system to the recoding stage prior to STM. This suggests that the flow of information through the

system is interactive rather than strictly sequential as Atkinson and Shiffrin suggested. Their suggestion that rehearsal is the only means of transfer from STM to LTM has also been criticised.

Similarly, another model – the Working Memory Model of Baddeley and Hitch, 1974, casts doubt on Atkinson and Shiffrin's model.

Rather than the STM being a simple inflexible store, as Atkinson and Shiffrin's theory showed, Baddeley and Hitch suggested that the STM was made up of several subsystems, each having a specialised function. They suggested that these subsystems were involved in complex thought processes, including analysis and judgements about information input.

Baddeley and Hitch's working memory model was made up of three separate sections, the Central Executive, the Phonological Loop, and the Visuo-spatial Scratch Pad.

The central executive is the most important component in the model and is responsible for conscious thought, planning and decision making. It is the active site of thinking and is virtually the same as attention since it holds and manipulated everything to which we are paying attention at any one time. It is flexible in that it can process information from any modality and has very limited capacity, since you know that it is not possible to carry out very many conscious activities at once. For example, if your friend comes and asks you a question while you are deciding on an outfit, you will stop thinking about it while you listen and respond.

The phonological loop is known as the 'inner voice', which holds words and rehearses any words that are currently being considered. It stores a limited number of sounds for brief periods. It is now thought to be made up of two components, as suggested by Gathercole and Baddeley, 1993. One component is the *phonological store*, which allows acoustically coded items to be stored for brief periods, and the other is the articulatory control system, which allows subvocal repetition of the items stored in the phonological store.

The visuo-spatial scratch pad stores visual and spatial information and can be thought of as an inner eye. Like the phonological loop, it has limited capacity. In other words, it is possible, for example, to rehearse a set of digits in the phonological loop while simultaneously making decisions about the spatial layout of a set of letters in the visuo-spatial scratch pad. There is evidence that these separate stores exist, such as dual task capacity

In conclusion, the working memory model appears to have a number of advantages over the simplistic formulation of the Atkinson and Shiffrin concept of STM. There is little empirical evidence to support the working memory model but the recognition of the complexity of the STM makes it sound theoretical sense. However, some brain-damaged patients appear to suffer impairment to some functions of STM and not others therefore suggesting existence of several specialised systems within STM. This was suggested by Shallice and Warrington, 1974

The main weakness, however, is that the component we know least about, the central executive, is the most important. It has a limited capacity, but no one has been able to quantify it experimentally. Richardson, 1984 argues that there are problems in specifying the precise functioning of the central executive.

The Levels of Processing Model, proposed by Craik and Lockhart, 1972, concentrates on the LTM and the semantic processing occurring there.

It presents another alternative to the Multi-store model, which suggests information is transferred to LTM via rehearsal (repetition).

This model suggests that the depth or level at which we process information determines its place in LTM and also how well we recall that information. Therefore, the greater we think about information for whatever reason, the more likely it will be remembered for longer.

Craik and Lockhart accepted Atkinson and Shiffrin's separate stores but suggested that encoding and processing of information in LTM was more complex. They suggested that information could be processed or encoded at Shallow, Deeper, and Deepest levels. The deeper the processing the stronger and more durable the memory.

The first stages of processing are shallow and involve recognising the stimulus in terms of its physical appearance, for example, the shape of the letters and words written in.

The deepest level of processing involves coding the input in terms of its meaning.

The variance here, between this model and Atkinson and Shiffrin's multi-store model, is that Craik and Lockhart disagreed with their theory in the area of how information enters the memory. According to Atkinson and Shiffrin, information was put into memory/LTM through repetition. Craik and Lockhart proposed that it is the depth and processing, which is done that result in remembering information.

There is evidence for Craik and Lockhart's theory that the deeper the processing the stronger and more durable the memory.

Hyde and Jenkins, 1973, presented auditorily (by the use of hearing) lists of 24 words and asked different groups of participants to perform one of the following so-called oriented tasks:

Rating the words for pleasantness/

Estimating the frequency with which each word is used in the English language/

Detecting the occurrence of the letters 'e' and 'g' in any of the words/

Deciding the part of speech appropriate to each word (e.g. noun, adjective)/

Decided whether the words fitted into a particular sentence frame.

Half the participants were told in advance that they would be expecting to recall the words (intentional learning group) and the other half were not (incidental learning group). After testing all the participants for recall of the original word list, Hyde and Jenkins found that there were minimal differences in the number of items correctly recalled between the intentional learning group and the incidental learning group. In addition, it was found that recall was significantly better for words which had been analysed semantically (i.e. rated for pleasantness or frequency) than words which had been rated superficially (i.e. detecting 'e' and 'g'). This is in line with the theory because semantic analysis is assumed to be a deeper level of processing than structural analysis.

However, there are also negative points about the processing model.

The model is descriptive rather than explanatory – it simply says that deeper processing leads to better recall but does not explain why this should be.

The sectionalised model of Long Term Memory (LTM) was the theory of Tulving, 1985. This model is divided into two sections.

The first section is 'Procedural Memory'. This is the kind of knowledge acquired only through doing. For example, these involve such abilities as how to ride a bike, or knit a sweater. This type of LTM is the type in which you do something once, and will never forget it; it becomes proceduralised.

The second section is 'Declarative Memory'. Declarative Memory is sub-divided into 'Semantic Memory' and 'Episodic Memory'.

Semantic memory contains information about our knowledge of the world. For example, facts, rules, concepts and language.

Episodic memory contains the memories of specific events, personal recollection. For example, your first day at school, or what you did yesterday.

Flashbulb memory is also included in declarative memory. Flashbulb memories involve the vivid recall of what individuals were doing when a major event occurred. This event may be a public or a private occurrence.

For example, what you were doing when you heard that Princess Diana had died.

These memories may be seen as 'special' and are thought, by researchers, to involve special brain mechanisms.

In conclusion, I believe that the Multi-store model of memory is basic and limited in explaining such a complex phenomena as memory.