# Theories and models of memory

Baddeley and Hitchdeveloped another model of short-term memory which is called working memory. The distinction between short-term memory and working memory is that short-term memory is frequently used interchangeably with working memory however the two of them should be used separately. Short-term memory refers to just the temporary storage of information within the memory whereas working memory refers to the processes that are used to temporarily organise, manipulate and store information. Their model also put forward instead of the short-term memory being a single store, it is in fact an active processor containing many different types of stores- the central executive, phonological loop, visuo-spatial sketchpad and episodic buffer.

**Central executive:**

The central executive is the main and most important component of the model which can be best described and known for attention. It is responsible for controlling and monitoring the operation of the slave systems known as the phonological loop and visuo-spatial sketch pad that have limited capacity, and relates them to the long-term memory. Within the central executive, it decides what information needs to be attended to and which parts of the working memory to send this information to in order to be dealt with. Also, it is its function to decide what working memory pays attention to whenever someone is completing an activity and another activity comes into conflict with it. The central executive basically directs attention and puts the activity most important as priority meaning it selectively attends the important stimuli and ignores the least important.

Despite how important the central executive is in the working memory model, we know less about it compared to the two subsystems it controls. It is Baddeley who suggests that the central executive functions more like a system that controls attentional processes, rather than a memory store. This is unlike the visuo-spatial sketch pad and the phonological loop which are both specialised storage systems.

**Phonological loop:**

The phonological loop holds speech-based information for 1-2 seconds and is composed of an articulatory control process and a phonological store. The articulatory control process acts as an inner voice which practices information from the phonological store by repeating it again and again. An example of this is remembering a phone number we have just heard. As long as we keep repeating it in our heads, we can retain the information in working memory. The phonological store on the other hand is the inner ear. Spoken words enter the store directly meanwhile written words must firstly be changed into a spoken code before they can enter the phonological store.

The working memory model has strengths and is supported byShallice and Warrington (1974). Theyfound support for the working memory model through their case study of KF. KF was a brain damaged individual who had an impaired short-term memory. He struggled to immediately recall words which were represented verbally, but was fine with visual information. This suggested that he had an intact visuo-spatial sketchpad but an impaired articulatory loop, therefore showing evidence for the working memory model’s view of short-term memory. This finding couldn’t be explained using

the multi-store model of memory, which therefore put forward that the short-term memory was just one system.

**Visuo-spatial sketchpad:**

The visuo-spatial sketchpad is known as the inner eye and refers to what things look like. It also processes the temporary storage of spatial and visual information. It can manipulate visual and spatial information held in the long-term memory, and images in two and three dimensions, for example people can recall someone's face they know from long-term memory in only two dimensions and can also imagine walking around their kitchen in three dimensions.

Evidence suggesting that the working memory uses two completely different systems for dealing with verbal and visual information is that it is much harder to perform two verbal tasks at the same time because they interfere with each other and results in performance being reduced. The same applies to carrying out two visual tasks at the same time. However, a verbal processing and visual processing task can be completed at the same time because the information does not interfere. Furthermore, this supports the view that the sketch pad and phonological loop are two separate systems within the working memory.

Gathercole and Baddeley (1993)also support the working memory model and they completed a lab study where people participating were divided into two groups. All of them had to complete a task which involved them following a moving spot of light. This would use the visuo-spatial sketchpad. At the same time as this was going on, one group also had to describe the angles on a

letter, which was another task involving the visuo-spatial sketchpad. The other group meanwhile was given a second task that would involve and use the phonological loop and they were given a verbal task whilst following the light. The results were that Gathercole and Baddeley found the performance was way better in the participants completing tasks which used separate systems.

**Episodic buffer:**

The episodic buffer was added into the working memory model by Baddeley in 2000 after the model failed to explain the results of various experiments. It briefly stores information from the other subsystems, integrating it together, along with information from the long-term memory, resulting in complete scenes or ‘ episodes’. It basically acts like a backup store which communicates with both the components of the working memory and the long-term memory.

The episodic buffer is not limited to one sense only, unlike the other two slave systems. Its functions seems to weave visual memories, ‘ bind’ memories together and phonological memories into single episodes, which then become stored in the episodic long-term memory. The central executive chooses information from the phonological and the visuo-spatial sketchpad that go into the episodic buffer to then form an episode of memory. Along with this, the episodic buffer also appears to ‘ download’ episodes from the long-term memory, referring them to be analysed and possibly recalled to conscious memory.