Working memory

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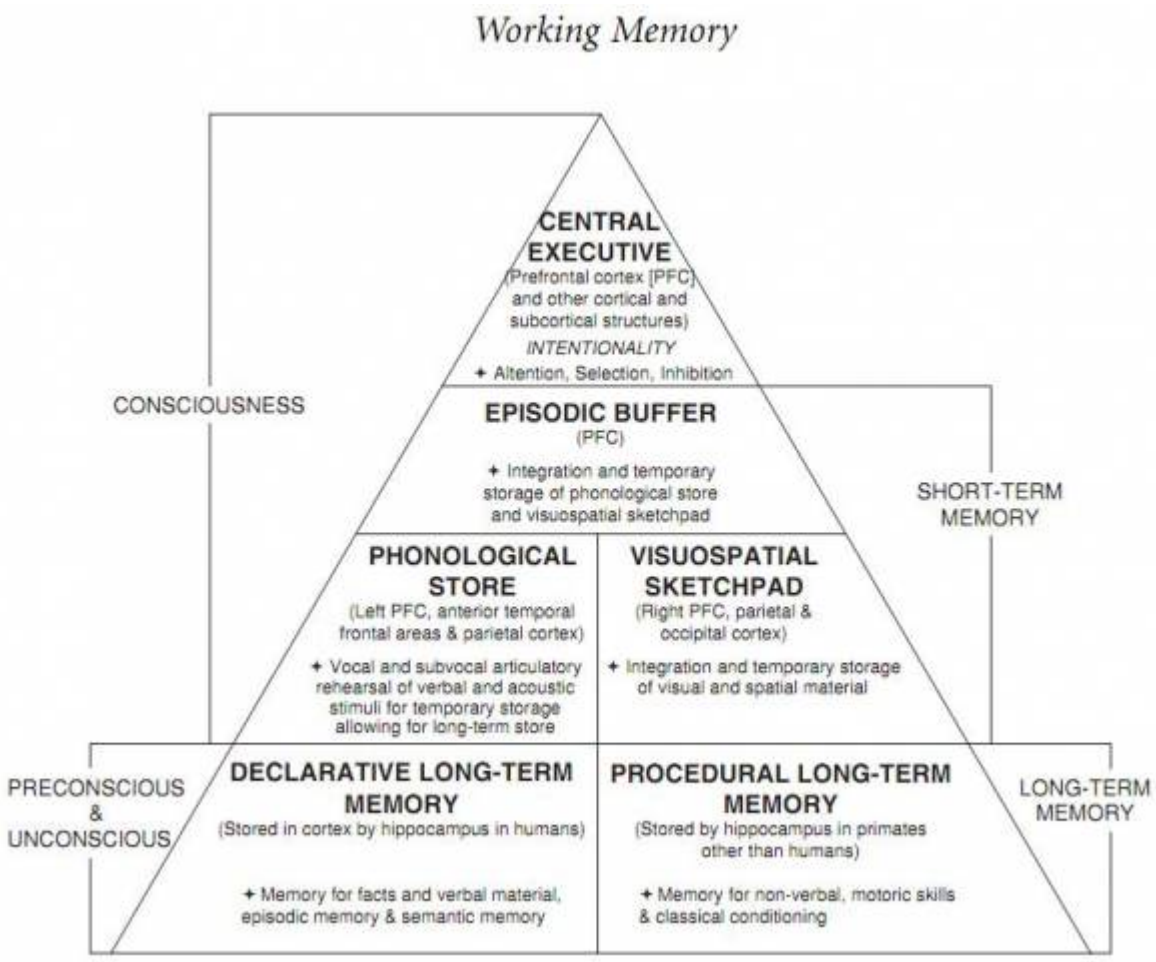
Alan Baddeley and **Graham Hitch** proposed a famous working memory model in **1974**. In their experiments they examined subjects' retention of series of numbers which were memorized before they had to judge simple logical statements. The results have shown that although both tasks required working memory capacity, the ability of remembering the number sequence wasn't strongly affected by judging logical statements. This led to an assumption that working memory is composed out of more than one component.

Baddeley and Hitch suggested working memory is composed of three parts: the **central executive**, a system that controls the **phonological loop** (a subsystem for remembering phonological information such as language by constant refreshing through repetition in the loop), and the **visuospatial sketch pad** (a subsystem for storing visual information).

This model was later revised and improved by Baddeley[1)2)] but also contributed by other authors[3)], which resulted in additional component of **episodic buffer**[4)] and more detailed functions and analysis of other components, as described in table below.



Central executive	It is still undecided weather it is a single system or more systems working together. Central executive's functions include **attention** and focusing, **active inhibition** of stimuli, planing and decision-making, sequencing, **updating**, **maintenance** and **integration of information from the two subsystems**. These functions also include communication with long-term memory and connections to language understanding and production centers.
Episodic buffer	Episodic buffer has the role of **integrating the information** from phonological loop and visuospatial sketchpad, but also from long-term memory. It serves as the **storage component of central executive**, or otherwise information integration wouldn't be possible.
Phonological loop	According to Baddeley, phonological loop consists of **two components**: a sound **storage** which lasts just a few seconds and an **articulatory processor** which maintains sound information in the storage by **vocal or subvocal repetition**. Verbal information seems to be automatically processed by phonological loop and it also plays an important, maybe even key role in language learning and speech production. It can also help in memorizing information from the visuospatial sketchpad. (For example, repeating “A red car is on the lawn.”)
Visuospatial sketchpad	This construct according to Baddeley enables temporary storing, maintaining and manipulating of visuospatial information. It is important in **spatial orientation** and solving **visuospatial problems**. Studies have indicated that visuospatial sketchpad might actually be containing two different systems: one for spatial information and processes and the other for visual information and processes.

Nelson Cowan proposed a different model of working memory in 1997[5]. Unlike Baddeley's model, which is concerned with modularity and components of the working memory, Cowan offered a view oriented mostly on underlying processes which define the working memory.

According to Cowan, the central part of the working memory are the activated elements inside the long-term memory, which are needed to preform a cognitive task. Without rehearsing, these elements remain active for about 20 seconds. Working memory holds all of these activated elements, but only about 4 of them can be in focus, what is decided by switching attention using central executive. Like in Atkinson and Shiffrin model, ingoing information is first stored in the sensory memory. Sensory information then activates certain elements inside the long-term memory. In his model, Cowan does not address the issue of processing information of different modality like Baddeley.

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Read more

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2)

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3)

See: Coolidge, Frederick L., and Thomas Wynn. The Rise of Homo sapiens: The Evolution of Modern Thinking. Wiley-Blackwell, 2009.
4)

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