

Other Senses, Integration and Cognition
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Memory

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Other Senses, Integration, and Cognition: Memory

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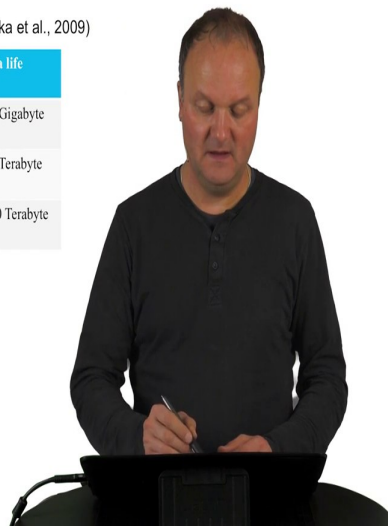
In order to store information and to make use of it during the interaction, humans have a memory.

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Memory. Information storage:

- **Memory requirements** for human perception (Malaka et al., 2009)

	per hour	per year	in a life
reading	50 Kilobyte	140 Megabyte	11 Gigabyte
hearing	50 Megabyte	270 Gigabyte	21 Terabyte
vision	1 Gigabyte	7 Terabyte	530 Terabyte



And this memory has a, has to store considerable amount of information.

Depending on what input channels we have, the amount of information varies between a couple of kilobytes to 1 Gigabyte for the visual perception per hour. And if you sum that up for the lifetime of the human you easily end up with Terabytes of data.

In order to store this data, the data is not organized in terms of raw data but in terms of objects. And this happens in a hierarchical manner in the human memory system.

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Memory. Types of memory:

- **Sensory memory**
 - Duration from milliseconds to several seconds
 - Specific for each sensory modality (iconographic, echoic, ...)
 - Transition to working memory is influenced by attention, etc.
- **Short term memory (working memory)**
 - Duration 20-45 s
 - Only stores small pieces of information
 - Recognition simpler than recall

(see also <http://www.simplypsychology.org/working%20me>)



Actually human memory consists of 3 layers.

On the first layer we have the sensory memory which stores information for a couple of milliseconds to several seconds. This sensory memory is modality specific that is we have an iconographic, or an echoic sensory memory.

If you want to store information for longer times then it needs to be transited to the next step which is working memory or the short term memory.

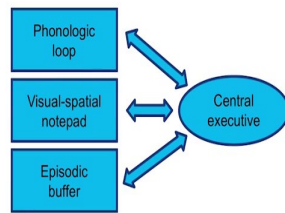
The short term memory can store information for up to 20 or 45 seconds and it organizes the information in terms of chunks or pieces of information. And the capacity of this working memory is thought to be around 7 plus minus 2 chunks of information that is stated in a popular article by Miller from 1956.

And in this

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Memory. Types of memory:

- Model of the working memory according to Baddeley and Hitch (1974), Baddeley (2000)



(see also <http://www.simplypsychology.org/working%20memory.html>)



working memory there are different models which try to explain this. And one popular model is the one from Baddeley and Hitch which states that the information in this working memory is also organized modality specifically.

So we have a phonologic loop which is able to carry linguistic information. It might be coming, for example from listening to speech or from reading a text. And there is the visual-spatial notepad and there is the episodic butter, buffer and all three are organized by Central executive unit.

Now it may come to an overflow of information if there is too much information in one of these blocks on the left hand side. For example if you listen to speech and at the same time read a text then both pieces of information would go into the phonologic loop. And then they are overlaid and you might not make sense out of that information any more.

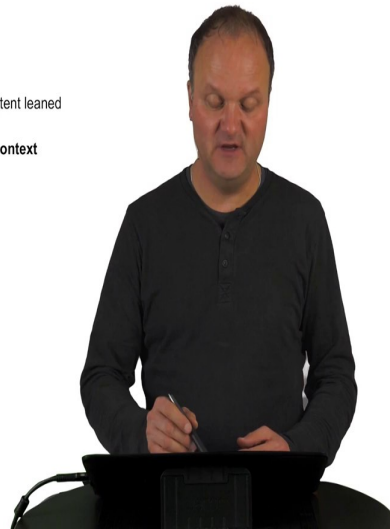
So it is better to combine different memory parts like for example as I am doing in this film, you listen to my speech which goes into your phonologic loop and you view the illustrations behind me which go to the visual-spatial notepad. So it is better to distribute the information over different pieces of this working memory.

And then if you want to store information

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Memory. Types of memory:

- **Long term memory**
 - Transfer via **repetition and learning**
 - **Slower, but larger storage capacity**
 - No capacity limit, forgetting via interferences with content learned earlier/later
 - **Storage** not as separate information items, but in a **context**



for longer times it needs to go into the long term memory. The transfer from the working memory to the work, to the long term memory works only by repetition and by learning. And this is the central part of the learning process that you need to repeat information in order to get it into your long term memory.

The access to the information is slower in working memory but it has a much larger storage capacity. In fact there is no theoretical capacity limit but still there is info, there is the possibility that information drops out of this long term memory by forgetting processes. And these forgetting processes work by interferences with content learned earlier or later in your lifetime history.

In this long term memory, information is not stored as separate information items but in a context. For example you might remember situations which were important to you and then by remembering situation you might remember people who have been present in this situation, you might remember the time, the place where it happened and so on.

You might remember more details starting from the context that is a popular organization of information in this long term memory is by a context or by a situation.

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