Detailed Notes on Short-Term Memory

Introduction to Short-Term Memory

Short-term memory (STM) is a temporary memory system that stores small amounts of information for brief periods. Unlike sensory memory, which holds information for milliseconds, short-term memory can hold information for several seconds. STM plays a vital role in daily activities, such as remembering a phone number for a few seconds before dialing it. Importantly, STM has a limited capacity, meaning that only a small number of items can be stored at any given time.

Differences Between Short-Term Memory and Sensory Memory

At the beginning of the video, the instructor explains the key differences between sensory memory and short-term memory:

- Sensory Memory: It briefly holds a large amount of information for a very short duration, typically around 100 to 250 milliseconds. For example, when you quickly glance at an object, the image stays in your visual system for a fraction of a second.
- Short-Term Memory: STM, on the other hand, stores fewer items but holds them for longer durations, around 20 to 30 seconds.

Key Concept: Information stays in short-term memory through a process called rehearsal (mentally repeating the information). If rehearsal stops, the information quickly fades.

Capacity of Short-Term Memory

The speaker dives into how much information STM can hold. This capacity was originally studied by George Miller in 1956, who found that STM could hold around 7 ± 2 items. This means STM typically stores 5 to 9 pieces of information (e.g., numbers, letters, or words).

However, recent research suggests that STM's capacity may be smaller—closer to 4 ± 2 items.

Chunking: One method to increase STM's capacity is through chunking. This refers to grouping related information into larger, meaningful units, or 'chunks.' For example:
- Instead of remembering 10 digits (e.g., 1, 2, 3, 4, 5, 6, 7, 8, 9, 0), you can chunk them into smaller groups like 123-456-7890, making it easier to recall.

Modality Coding: Another important point is that STM uses modality coding, meaning the way information is encoded depends on its type:

- Visual information (like a picture) is encoded differently from auditory information (like a spoken word).

Acoustic Coding and Rehearsal in Short-Term Memory

STM relies heavily on acoustic (sound-based) coding. The speaker introduces the idea that STM often stores information based on how it sounds. This is backed by an experiment in 1964 by Koenraad, who showed that people were more likely to confuse letters that sounded similar, like B and P.

Subvocal Rehearsal: Subvocal rehearsal refers to repeating sounds in your mind to keep them active in STM. For example, when you hear a phone number and repeat it in your head to remember it, you're using subvocal rehearsal.

Forgetting in STM: The video also explains how forgetting happens in STM:
- Decay Theory: This theory proposes that memory fades over time if it is not actively rehearsed.
- Interference Theory: New information entering STM can interfere with and push out older information, leading to forgetting.

Brown-Peterson Task

The Brown-Peterson task is an experiment designed to study forgetting in STM. In this task, participants are asked to memorize a string of letters or digits (e.g., TRY AGAPE), but they are also given a distracting task, such as counting backward by threes.

Results: The experiment showed that recall accuracy dropped significantly after 18 seconds. This demonstrates that STM can only hold information for a limited duration, especially when distractions are present.

Decay and Interference Theories

Further exploration of the Brown-Peterson task showed two primary reasons for forgetting in STM:

- Decay: The idea that memory fades over time. In the experiment, participants' recall accuracy decreased after 3 seconds and continued to decline until it stabilized at around 18 seconds.
- Interference: Similar items in memory can interfere with each other, making it harder to recall the original information.

Proactive Interference in STM

The video discusses proactive interference, which occurs when old information makes it harder to remember new information. For example, if you've memorized one list of words and then try to learn a second similar list, the words from the first list might interfere with your ability to recall the second list accurately.

Findings: Researchers found that when similar items were presented, participants had more trouble recalling new information. This suggests that interference plays a major role in forgetting within STM.

Role of Interference and Decay

In this section, the video discusses how both interference and decay contribute to forgetting in STM.

- Interference: Particularly for items like words that are frequently presented, interference is a significant factor in STM forgetting.
- Proactive Release: A technique called proactive release can reduce interference. For example, if you switch from remembering letters to numbers, it becomes easier to recall the numbers because the letters no longer interfere.

Retrieval from Short-Term Memory

The video then shifts to how information is retrieved from STM. Saul Steinberg's experiments showed two main types of retrieval:

- Parallel Search: The brain compares a probe (e.g., a test letter) to all the items in STM simultaneously.
- Serial Search: The brain compares the probe to each item in STM one by one.

Serial Exhaustive Search: Even when a match is found, the brain continues to search through all items in STM. This is called serial exhaustive search and is the primary method for retrieval from STM.

Serial and Parallel Processing in STM

Researchers in the 1970s found that STM could function in two ways:

- Serial Processing: When items are presented randomly, the brain compares them one at a time in a sequential manner.
- Parallel Processing: When items are presented in an organized sequence, the brain compares all of them at once, making retrieval faster.

Characteristics of Short-Term Memory

In this section, the speaker summarizes the key characteristics of STM:

- Capacity: STM holds around 7 ± 2 items, though recent studies suggest it may hold closer to 4 ± 2.
- Encoding: Information in STM is usually encoded acoustically (based on sound).
- Duration: Information lasts for about 18 to 20 seconds without rehearsal.
- Forgetting: Forgetting in STM can occur due to both decay and interference.
- Retrieval: Retrieval from STM is typically done through serial exhaustive search.

Introduction to Working Memory

The video introduces working memory, an extension of STM. Working memory doesn't just store information; it also manipulates it, which is essential for performing complex tasks like solving problems or following multi-step instructions. Working memory is closely linked to attention, and rehearsal is key to extending the duration that information can be held.

Conclusion

Short-term memory is crucial for temporarily storing and manipulating small amounts of information. Its capacity is limited, and it is prone to forgetting through decay and interference. Retrieval from STM is usually done through a serial exhaustive search process, where each item is compared one by one. The introduction of working memory expands our understanding of how STM is involved in more complex cognitive tasks.