

9.65 February 25, 2004 MEMORY II: Conceptual Short Term Memory (CSTM) HANDOUT

A central problem with both the Standard Memory Model and Baddeley's theory of working memory is the neglect of long-term memory activation during processing.

Very short-term conceptual memory: Processing on the fly

What we retain in long-term memory depends on what gets linked up during encoding. Coding in terms of MEANING (what you already know) provides many RETRIEVAL ROUTES. Therefore, rapid activation of relevant information is essential, during encoding.

Proposal: There is another form of short-term memory in which lots of material from long-term memory is very briefly activated, enabling us to understand what's happening and to make links with our existing knowledge that result in longer-term memory.

CSTM Hypothesis: Claims

-Meaningful stimuli such as words and scenes rapidly but briefly activate rich conceptual representations of stimuli such as words and scenes.

-These fleeting representations do not show up with many of the standard methods for studying and testing short-term memory such as the memory span

-Nonetheless, these fleeting representations are fundamental to cognitive processing and to the form that long-term memory takes, because they enable the almost instantaneous discovery of meaningful structure in the material--such as the meaning of a sentence or the gist of a picture.

What kinds of evidence are there for this hypothesis?

Evidence for **rapid activation of conceptual/semantic information**

-SEMANTIC PRIMING in Lexical Decision, etc.

-EYE-TRACKER STUDIES OF READING

-TARGET SEARCH IN SCENES

Evidence for **rapid forgetting of most unstructured material:**

Method: **Rapid Serial Visual Presentation (RSVP)**. To dissociate STM and CSTM, need very rapid presentation.

PICTURE SEQUENCES: Search versus Memory

-We can comprehend information coming in very rapidly, but we forget most of it. For example: when you look at a series of photographs presented at a rate of 3 to 9 a second, you can remember--recognize--very few afterward.

But if told to look for a particular kind of scene, such as "a picnic" or "a baseball game" you can easily enough pick it out, suggesting that we can understand each picture momentarily.

WORD LISTS

Something similar happens with rapid sequences of words EVEN WHEN THE NUMBER OF WORDS IS WITHIN THE MEMORY SPAN. You can remember less than 3 words, on average, when short lists are presented at a rate of 12/s.

RSVP SENTENCES

BUT: if the string of words forms a meaningful sentence, then it is easy to remember even a 14-word (or longer) sentence, at 12 words a second.

The difference is that when the material can be organized into a coherent structure, we can both process and remember it even at a high rate: when otherwise we would remember no more than 2.6 unrelated words.

This and other evidence suggests that a lot more information is transiently available than we can reflect on (by the time we reflect, some of it is lost)--like iconic memory, it seems to be there for only a few hundred ms.

While the information is active, structures that literally "make sense" can be built and have a chance to survive long enough to be reflected on and to be remembered for at least a short time.

How ARE sentences remembered? And why is immediate memory for a sentence usually verbatim?

Demo (Potter & Lombardi, 1990)

Why is recall of sentences usually verbatim, or very close to it?

-Not the Phonological Loop: concurrent articulation has no effect

-Regeneration from meaning (with lexical priming)

-Evidence: lexical intrusions

Processing on the fly: selecting a word in a sentence

Method: Show someone a sentence using RSVP, and at some point present two words simultaneously: but only one fits into the sentence context. Even when reading at 8 words a second, the correct one of the two can be selected. Note that the relevant context sometimes followed the doublewords.

Before:

basket

Maggie wrote the letter with a ***** she had with her.

pencil

Maggie carried the kitten in a basket/pencil to her house.

After:

Maggie used a basket/pencil to write the letter.

Maggie used a basket/pencil to carry the kitten.

Results:

Often, the other (irrelevant) word can't be remembered, right after recalling the sentence. Evidently it was momentarily available and then got lost: conceptual very short-term memory.

Conclusions: Doubleword experiments

-Readers readily select the relevant word, even when the biasing context appears after the doublewords: indicating that both words are processed and remain available briefly.

-The irrelevant word is apt to be forgotten.

-These results are consistent with the claim (e.g., Swinney, 1979) that multiple meanings of **ambiguous words** are briefly activated (with or without awareness), one meaning that fits the context is selected, and other meanings are forgotten.

E.g., He walked up the steep grade...

He got a good grade....

-Some form of short-term memory that includes **conceptual information** about the word candidates is needed to account for selection, especially given that selection can be based on information coming as much as a second later than the word (see the "double word" results). We call this form of memory CSTM (conceptual short-term memory).

Another example of the rapid use of sentence context when reading in RSVP was given in the lecture on object recognition, when discussing word perception in context: "The boy rode the *house* around the pasture," etc.

CONCLUSIONS

There is a cognitively important stage of processing that occurs well before "short-term memory" (of the Baddeley articulatory loop type) and that has associated with it a fleeting form of memory: conceptual short-term memory (CSTM).

Conventional STM, in contrast, is a largely separate system, a buffer that can maintain phonological representations (see Baddeley, 1986).

CSTM is the basis for LTM. Material that becomes conceptually well-structured as it is processed in CSTM is likely to persist at least briefly in LTM, permitting (for example) regeneration of an RSVP sentence in immediate recall.