Role of memory re-evocation: Evolution of the what-where-when memory during long-term consolidation

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Role of memory re-evocation: Evolution of the *what-where-when* memory during long-term consolidation

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Introduction

Models of long-term consolidation suggest that memories, richly contextualized and fit for revival in their original form, become more generic over time, losing the particular occurrence of the event. However, this transition from an episodic nature to a semantic nature (i.e., semantization) spares certain memories which can be relived decades later as vividly as on the first day. The multi-trace model (Nadel & Moscovitch, 1997) assumes that the re-evocation of a memory preserves it from semantization, contrary to the standard model (Alvarez & Squire, 1994) which postulates that the re-evocation leads to the semantization of memories.

AIM **The purpose of this study is to highlight the existence of a semantization process and to demonstrate that memories re-evocation preserves memories from semantization, in agreement with the Multi-Trace Model.**

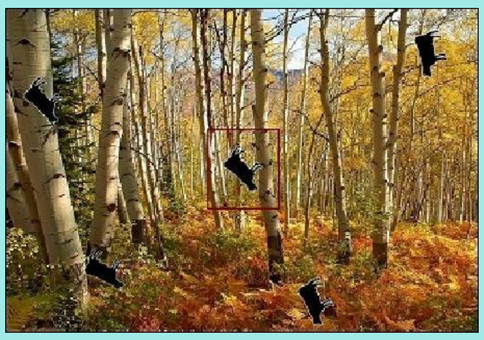
Method

- 24 participants (age range 18-26, mean age = 21.4, SD = 1.2, 5 males)
- Re-evocation is manipulated during cued recall in an inter-subject design

1/ Learning phase:

Events = Solving tasks associated with memorization of a *what-where-when* context.

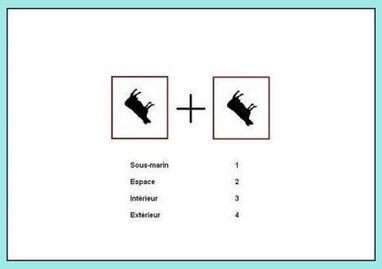
« Find the object with the same orientation»



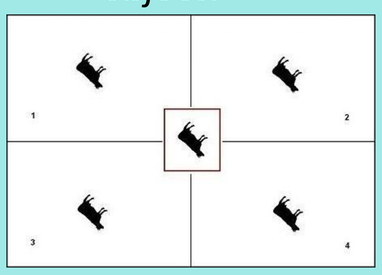
2/ Cued recall tasks:

- 3 sessions of recall each one day apart, with re-evocation in Session 2.
- The factual information of the task was presented. Subjects answered on the *what*, the *where* or the *when* associated with the task.
-A Remember-Know judgment is assessed for all responses
(i.e., Remember = autonoetic consciousness; Know = noetic consciousness)

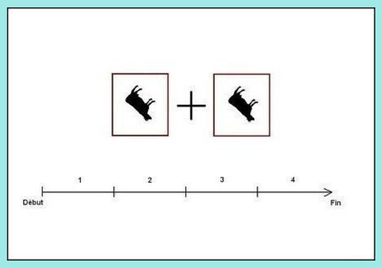
***« What** was the background like? »*



***« Where** was the object? »*



***« When** did I solve this task ? »*



→ We measured the correct response rate for the recalls and the Remember response rate.

For each event, only one What, Where, and When measure (one by session)
Session 3: binding measure added

Results *ANOVA mixed design*

Effect of Delay (T1 vs. T3 within-subject): *We observe a lapse of memory…*

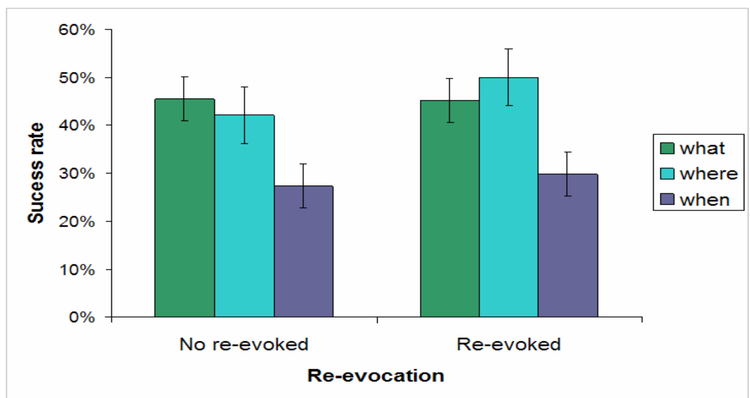
The context of memories is less well recalled after two days [$F(1,23) = 13.66$, $p < .05$]. The Remember response rate is also lower [$F(1,23) = 7.10$, $p < .05$].

Effect of re-evocation (inter-subject): *However, if re-evocation has no effect on accuracy, it does have an effect on Remember response*

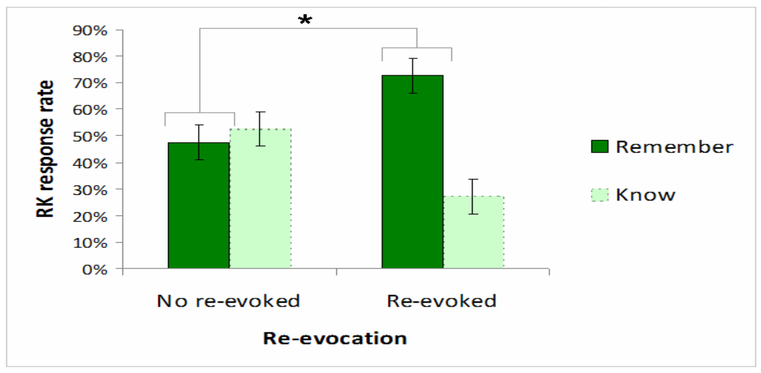
The Remember response rate is higher for the memories re-evoked [$F(1,22) = 6.52$, $p < .05$]. There was no main effect of re-evocation on mean proportion of *what-where-when* correct recalls [$F < 1$], nor interaction between re-evocation and category of recall [$F < 1$].

Few items gave rise to a complete binding performance (6,3%), Re-evocation had no effect on binding performance ($F < 1$).

Re-evocation effect on Remember responses



Re-evocation effect on *what-where-when* performance



Conclusion

The results show the existence of a lapse of memories in time, with a decrease of *what-where-when* context recuperation and a global transition from an autonoetic consciousness level to a noetic consciousness level.

Re-evocation from a contextual element enables to produce a greater proportion of Remember responses on another elements in subsequent testing. These results support the multi-trace model which suggests that re-evocation preserves overall the episodic nature of memories *via* the hippocampus. Unfortunately, we did not show any significant re-evocation effect on the *where* element.

Bibliography

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Nadel L., Mosovitch M., 1997. Memory consolidation, retrograde amnesia and the hippocampal complex. *Neurobiology, 7*, 217–227.
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