Metacognitive Control and the Spacing Effect

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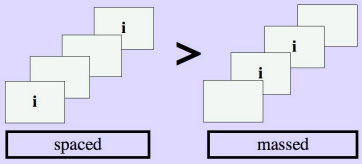
ABSTRACT.
The purpose of this study was to see if forcing adult and child learners to use a spacing strategy (even when they chose to mass study) would benefit their performance. After making JOLs, participants chose to *mass* or *space* study of word pairs. A third of their selections were *dishonored*. That is, they got massed when they chose spaced; spaced when they chose massed. Results showed that the *spacing effect* obtained for both adults and children when choices were honored. However, dishonoring choices in order to force a spacing strategy improved performance for only the children, but not for adults. The data suggest that spacing is an effective strategy for learning. However, particularly for more expertise learners, metacognitive control of spacing is crucial for enhancing learning and should be honored.

The Spacing Effect

In the literature, it has been found that as the spacing, or lag, between repeated study trials is increased, long-term memory performance of the studied items also increases (Glenberg, 1979; Melton, 1970; Underwood, 1970). This is known as the **spacing effect**.



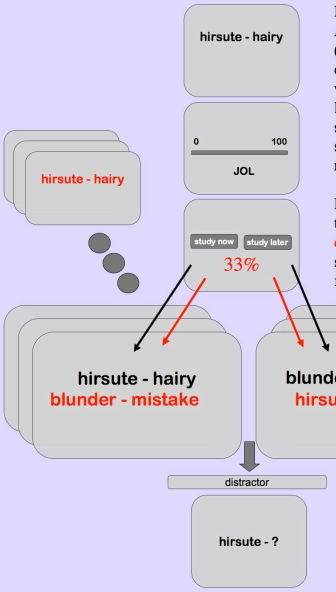
The phenomenon is so effective in the literature that it has even been mandated a law:

Neisser's law

(Taken from Bjork, 1988, p.399)

You can get a good deal from rehearsal,
If it just has the proper dispersal.
You would just be an ass
To do it en masse
Your remembering would turn out much worsal.

Methods and Hypothesis



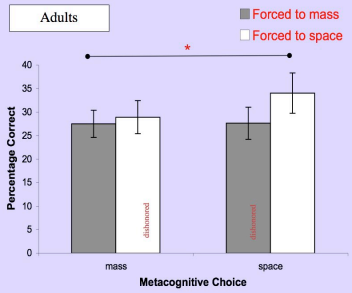
Methods: The general procedure came from Son, 2004. Adults (Experiment 1) and children in grades 3-5 (Experiment 2) and studied synonym pairs for 1 second each, and then made JOLs. They then chose whether they wanted to mass (study now) or space (study later) their learning on that particular item. If they chose to mass, the same pair would be presented again immediately for 3 seconds. If they chose to space, then the pair would not be re-presented until after having studied the entire list.

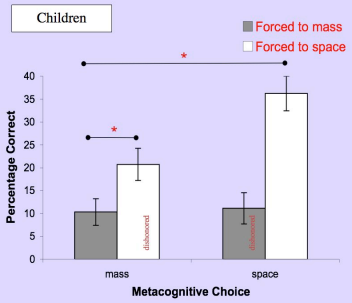
However, their choices were honored only a third of the time. On the remaining third of the trials, their choices were dishonored (in red). That is, the computer forced subjects to space when they chose to mass, and vice versa. A test followed a distractor task.

Which is better:
A spacing strategy or one's metacognitive choice?

Question: Is spacing always the best strategy? That is, even if metacognitively, the learner chooses to mass, is it beneficial to ignore their decisions and to force them to use a spacing strategy?

Results





DISCUSSION.

The results show that for the study pairs that were *honored*, the usual *spacing effect* occurred. That is, people remembered the spaced items better than the massed items. For the *dishonored* items, however, the spacing effect did not hold. Performance was no better for the (forced) spaced items than those items that were massed. These data indicate that a spacing strategy is not a universal benefactor. In particular, one's own *metacognitive choice* -- even one that consists of using the thought-to-be-harmful *massing* strategy -- may be more critical for optimizing final performance. Does that mean that we leave all decision making to the learner? Not necessarily. The children's data showed that, in fact, forcing a spacing strategy (while dishonoring their decisions) helped significantly in boosting final performance. In general, these findings suggest that only when people's metacognitive decisions are likely to be very flawed, as in the case with young children, is it advantageous to "advocate" a strategy already known to be helpful.

References

Bjork, R. A. (1988). Retrieval practice and the maintenance of knowledge. In M. M. Gruneberg, P. E. Morris, & R. N. Sykes (Eds.), Practical aspects of memory II (pp. 396-401). London: Wiley.

Glenberg, A. M. (1979). Component-levels theory of the effects of spacing of repetitions on recall and recognition. Memory & Cognition, 7, 95-112.

Melton, A. W. (1970). The situation with respect to the spacing of repetitions and memory. *Journal of Verbal Learning and Verbal Behavior, 9*, 596-606.

Son, L. K. (2004). Spacing one's study: evidence for a metacognitive control strategy. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 30*, 601-604.

Underwood, B. J. (1970). A breakdown of the total-time law in free-recall learning. Journal of Verbal Learning and Verbal Behavior, 9, 573-580.

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