

The Effect of Answering Questions that Differ in Specificity on Mental Effort and Text Retention

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The Effect of Answering Questions that Differ in Specificity on Mental Effort and Text Retention

Tested information is retained longer than studied information. This, so called, testing effect is thoroughly studied in memory research. Recently, a renewed interest in the testing effect in an educational context can be observed. This study is placed within this line of research and investigates two aspects of the testing effect, namely, effortful retrieval and retrieval induced facilitation. Participants were randomly assigned to one of three experimental conditions that differed in the learning strategy used. Participants either restudied a text that they had received, answered specific questions after studying the text, or answered less specific questions after studying the text. It is assumed that more effort is needed to answer the less specific questions than to answer the specific questions. Therefore, we hypothesize that the less specific questions will produce a stronger testing effect than the specific questions. In addition, we investigate if the benefits of taking an initial test spill over to answering questions that were not initially tested. The results of this study confirm that answering less specific questions requires more effort, however, this does not pay off in a better retention of facts after a week. Nevertheless, a testing was found for the specific questions. No spill over effects were found.

The testing effect shows that effortful retrieval enhances the retention of information. Here, participants either restudied, answered specific or unspecific questions after studying a text. As expected, a testing effect was found for the specific questions but unexpectedly, not for the unspecific questions, although, answering these questions required more effort.

Tested information is retained longer than studied information. This, so called, testing effect is thoroughly studied in memory research (Roediger & Karpicke, 2006). Recently, a renewed interest in the testing effect in an educational context can be observed. This study is placed within this line of research and investigates two aspects of the testing effect, namely, effortful retrieval and retrieval induced facilitation. The effortful retrieval hypothesis holds that the testing effect occurs because it costs less effort to restudy a wordlist or word-pair list than to retrieve it from memory and that the extra effort that is invested to retrieve a fact results in a stronger and more elaborated memory trace of that fact which makes it easier to retrieve the fact at a later moment (Bjork, 1994). Retrieval induced facilitation means that the benefits of testing on retention spill over to related facts that were not initially tested (Chan, McDermott & Roediger, 2006).

To investigate the effortful retrieval hypothesis, this study examines the effects of specific (e.g., 'What did the dogs in Pavlov's experiments do when they heard a bell ringing?') and less specific questions (e.g., 'Describe how Pavlov proved that dogs can distinguish between different stimuli') on expository text retention. It is assumed that more effort is needed to answer the less specific questions than to answer the specific questions. Therefore, we hypothesize that the less specific questions will produce a stronger testing effect than the specific questions. In addition, we investigate if the benefits of taking an initial test spill over to answering questions that were not initially tested.

Method

Participants

Ninety-three Dutch high school juniors and seniors (57 males, 36 females; mean age = 16.32, SD = .90) from general secondary education participated in this experiment during regular school hours.

Materials

Instructional text. An expository text on the 'Pavlov reaction' (861 words) was used as learning content. The text was divided in ten paragraphs printed on separate pages.

Initial specific test. Ten specific, short-answer questions were formulated to determine recall of specific facts from the text. These questions required a one-or-two-words response and their answers were literally available in the text. Each correct answer received 1 point.

Initial less specific test. Ten less specific, short-answer questions to measure how well the participants could recall combinations of facts from the text were formulated. The questions allowed for a few-sentences response and their answers could be found literally in the text. Each correct fact received 1 point.

Final test. The final test consisted of the initial specific test with four new, specific questions and the initial less specific test with four new, less specific questions. The final test was scored in the same manner as the initial tests.

Effort measure. Paas' (1992) subjective 9 point rating scale was used to measure retrieval effort. It ranged from very, very, very low effort (1) to very, very, very high effort (9). Participants were asked 'How much effort did it cost you to understand the paragraph?' or 'How much effort did it cost you to answer the question?'

Design and Procedure

Participants were randomly assigned to one of three experimental conditions that differed in the learning strategy used. Participants either restudied a text that they had received ($n = 29$), answered specific questions ($n = 35$) after studying the text, or answered less specific questions

(n = 29) after studying the text.

The participants had 1 minute to study each paragraph and fill in the effort scale, then 5 minutes to perform a distracter task. Next depending on the experimental condition they were in, they restudied the text, answered the specific or less specific questions. They had 1 minute to restudy each paragraph or answer each question and fill in the effort scale, then 5 minutes to perform a distracter task. After a week, they took the final test. They were given 1 minute to answer each less specific test-question and 30 seconds to answer each specific test-question.

Results and Discussion

ANOVA revealed a significant effect of learning strategy on mean effort invested during the 'learning strategy phase', $F(2, 90) = 35.41$; $MSE = 52.52$; $p < .001$; $\eta^2p = .44$, indicating that the self-reported effort was differentially affected by each learning strategy. Bonferroni post-hoc tests revealed that: participants restudying the text reported experiencing significantly less effort restudying the text than participants answering specific or less specific questions, and participants answering the less specific questions reported experiencing significantly more effort than participants answering the specific questions (all $ps < .001$).

A MANOVA revealed a significant effect of learning strategy on the initially tested specific questions, $F(2,90) = 7.57$; $MSE = 18.98$; $p < .01$; $\eta^2p = .14$, and no significant effects on all other test questions, all $F(2,90) < 1$ and all $ps > .05$. A Bonferroni post-hoc test revealed that participants who had answered the specific questions before performed better on these questions after a week than participants who had restudied the text or who answered the less specific questions (both $ps < .01$). No significant difference between the latter two groups was found.

Discussion

Although a testing effect was found for the specific questions, no testing effect was found using the less specific questions and no spill over effects were found in this study. Reasons for these unexpected results will be discussed during our presentation at EARLI.

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