

STM abilities in LTM tasks¹

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The study investigated the relationship between STM and LTM using the same type of stimuli and the same format of presentation for both measures. It was shown that Ss who perform well on a reliable span task get similar items into LTM faster than Ss with smaller short term capacities.

Previous research investigating the relationship between individual differences in LTM and STM concluded that span capacity and long term storage are basically independent cognitive abilities. (e.g., Jensen, 1964; French, 1963; Kelly, 1954). One possible explanation for the lack of correlation between these two systems lies in the vast differences between the types of tests used to measure each type of memory. Without exception, the materials used as stimuli differed, the format of presentation differed, and the possibilities for individual differences in strategy differed from one test to the other.

The present research is an attempt to minimize these cited differences and make the only variable short term storage vs long term storage. Thus, the type of stimuli used in this study was identical for both tests, and an attempt was made to eliminate individual differences in strategies by forcing rote memorization of all stimuli (eliminating association, chunking, etc.) and by requiring that the items in both tasks be recalled in the order presented.

As a measure of STM, a digit span test with a short intervening task was used. This measure has been found to have a high reliability and to correlate highly with other tests of STM (Whimbey & Leiblum, 1967). In his comprehensive article relating STM to a general theory of memory, Melton (1963) suggested that one possible definition of LTM is multiple presentation of stimuli. In accord with this definition, three supra-span series were presented a number of times as a measure of LTM.

Method

The Ss were 41 students taking an introductory psychology course and serving in the experiment as a course requirement. They were run in groups of about 14, and all Ss were given each test in the same order.

Both tasks involved recalling series of single digit numbers and were presented by a tape recorder at the rate of two digits per sec. This rapid rate of presentation prevented chunking, rehearsal or the use of other memory techniques between presentation of each digit. For both tasks, the Ss were given a sheet with the following word-letter pairs: bear-Q, bird-L, crab-V, fish-H, frog-R, flea-J. The presentation of each series of digits was followed by one of these

six words. The Ss were instructed to first write the letter corresponding to the last word presented and then to attempt to recall and write the series of digits.

The first task, a measure of short term recall, consisted of 30 trials. In each block of five trials, one 5-, 6-, 7-, 8-, and 9-digit series was presented in random order. In scoring, a series was considered correct if it was reproduced in the order presented and preceded by the appropriate letter. The S's score was determined by allotting 5 points for each 5-digit series correct, 6 points for each 6-digit series correct, etc.

As a measure of LTM, the second task consisted of three series of 8-digits which for most Ss was supra-span. The block of three series of digits was repeated 10 times, each time varying the end word and in random order within the block, but limited by the consideration that the last series of any one block could not be the first series of the next. For this task, Ss were given special answer booklets with three answer spaces on each response page and a blank page between each response page. The digits were presented in the same manner as the previous experiment except that after each group of three series, the Ss were instructed to turn to a new answer sheet. In scoring this task, Ss who got at least one series correct on the first two blocks were eliminated since this indicated that an 8-digit series was probably within their span capacity. For the remaining Ss, if a S got the same series correct on three out of four trials among the last eight presentations of that item, the series was considered to be in LTM.

Results and Discussion

This experiment was an attempt to eliminate the usual vast differences between types of materials used and mnemonic strategies in order to test for a possible relationship between long and short term memory. The main variables involved appear to be short term span and learning after multiple presentations.

Of the 41 Ss tested, three were eliminated because their span was greater than the items used for the LTM task; they got one or more of the 8-digit series correct on the first or second trials of the LTM task. Of the remaining 38 Ss whose STM capacity was too small to get an 8-digit series correct on the first two block presentations, six reached the criterion for long term storage—three out of four trials correct for a specific item. Not one of these six Ss had a digit span score which fell in the bottom 45% of the distribution of short term scores for the

group; they all had relatively high digit span scores. Using a binomial statistic, the relationship between STM and LTM is significant at the .03 level.

In view of this fact, it was concluded that Ss with larger short term spans were able to get things into LTM faster than those with smaller STMs when required to do so by rote repetition; those who benefited most from practice were the ones who did best on the straight digit span task.

The fact that only six out of 38 Ss were able to achieve the criterion for LTM storage is consistent with other research (Hebb, 1961; Peterson, & Peterson, 1959; Bower, 1962) which found that a very small amount of recall occurs if another activity intervenes before rehearsal of an item can occur.

A motivational factor is one possible explanation for the relationship obtained in the present study. However, data were also obtained from the same Ss on two free recall tasks, one involving 30 words and the other consisting of 10 two-digit numbers; both of these tasks were found to have no correlation with both digit span and the repeated digits task. If motivation had any appreciable influence, one would expect it to carry over into the correlations of these tasks also.

In observing the data presented here and additional, as yet unpublished, data, it is felt that there is a definite relationship between STM and LTM. Early evidence, such as this study, tends to imply that span is a factor of LTM; that is, if all other variables

are held constant, Ss with larger spans will have better LTMs.

There is a strong relation between the two systems. From the data presented here, we can certainly conclude that for items to get into LTM, they probably must, and definitely can, do so via STM.

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