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The Effects of Restriction of Recognition on False Memory

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Abstract

Chunking is the ability to group and store information in a way that facilitates easy recall. This study examines how chunking is linked to abstractions in the way that human cognition works in order to make conclusions about the ability and ways to store information in long-term memory. In this study, researchers told participants to memorize a list of words. These words were thematic. Participants were then instructed to identify words that were previously presented on another list that at the end of the trial. There were three conditions in this experiment: 1. the participant was only allowed to pick 4 words on the final list, 2. the participant was allowed to pick 7 words on the final list, 3. the participant was allowed to pick 15 words on the final list. The final list consisted of 7 words from the original list, 8 regular distracter words that were not from the original list, and one special distracter that was consistent with the theme of the original list but did not appear. The researchers believed that the more words a person had to identify, the lower their proportion of word recognition; however, this was not supported. Results indicated that the third condition, 15 words, had the highest proportion of word recognition. The researchers also thought that the first condition, 4 words, would be the highest proportion of special distracters. This hypothesis was supported. Future research would benefit from a bigger, more diverse population and a new way to run the program, as well as looking into different variations of the test to further study how people chunk to help them with their long term memory.

The Effects of Restriction of Recognition on False Memory

Prior experience, environmental factors and personal factors all influence what one recalls in memory. It is important to be aware of all factors and their influence on memory when asking one to recall certain experiences, lists, names, etc. (Solso, MacLin, & MacLin, 2008). Loftus is the most well known researcher in the field of false memory and has conducted studies that relate to false recovered memories. She has found that false memories are created by a number of things such as "leading questions, hypnosis, guided imagery, and encouragement by the therapist" (Solso, MacLin, & MacLin, 2008). Obviously a multitude of factors contribute to what one remembers. It has been found that when participants are explicitly told what to remember, the chance of false memory recall and recognition is reduced (Neuschatz, Benoit, & Payne, 2003). It is also known from Craik and Lockhart's research that there may be a level of processing that happens when storing information. We tend to remember things better if they are stored in a meaningful way (Solso, MacLin, & MacLin, 2008).

False memory has been studied by the Deese-Roediger-McDermott paradigm in which participants are given a list of words that fit a particular theme to remember, and then a list of words from which they were to recall words from the original list. The list consists of words that participants were previously shown: a special distracter that fits the theme of the previously shown words but was not actually shown, and other distracters that do not fit the theme (Deese, 1959; Roediger & McDermott, 1995). Roediger and McDermott (1995) found that participants are just as likely to choose the special distracter as they do the original words on the list. Their findings are important to note because it suggests that participants are not storing these presented words in isolation, they are grouping them as wholes. These words seem to be abstracted when stored in memory and are all connected to each other. So, when the brain is activated to

remember words that it had previously encoded, it activates other words that fit the theme of those previously learned words, in a way being tricked to remember the wrong word (Solso, MacLin, & MacLin, 2008).

Arndt and Gould (2006) outline theories that suggest different reasons for this production of false memory. The first theory suggests that there is something that increases false memory which they call the error-inflating process. The second theory suggests that decreases false memory called the error editing process. They completed experiments like the original DRM paradigm, but manipulated the variables of how many associations were studied, how many times that item was presented, how much time participants were able to study the words, and how strongly those associations between the words were. Overall, they found that the more words participants were presented did cause higher false memory and the stronger the strength between the associations the higher false memory was. However, the more participants studied each of the word associations, both error-editing processes and error-inflating processes increased. Therefore this study suggests that there is a mechanism in the cognitive system that causes one to make either more mistakes in memory or fewer mistakes in memory.

While many studies have focused on the recall of false memories from the long term memory, there has been little research on how false memory is affected by the short-term memory. In their study on false memory and short-term memory, Coane, McBride, Raulerson III, and Jordan (2007) found that while many people believed false memories were recalled from the long-term memory, false memories also were recalled from the short-term memory. The also found that the set size of the original words affected and predicted the accuracies of participants correctly recalling original list words. Due to the nature of their findings, one might assume that

the more restricted the word choice post original list presentation, the more accurately one would recall the original list words.

In another study on false memory, Sugrue and Hayne (2006) compared false memory recall in adults and children. It was found that children falsely recalled more words than adults, regardless length of time constraints. Due to these findings, one might begin to question the validity of repressed memories that children recall of sexual abuse. While these results should not overturn previous findings, it should spur additional research in the area of memory recall in order to more accurately understand false memory and the factors such as environment, age, and length of time lapsed, etc. affect it.

In light of the research surrounding false memories recovered both from the long-term and the short-term memory, this study was designed to examine how restricting the numbers of words participants are able to choose impacts participant's recall and false recognition of words when completing a task that utilizes the short-term memory. The researchers hypothesized that the more restricted a participant's word choice, the greater the likelihood that the participant will correctly choose words presented in the original list. In addition, it was hypothesized that when participants are more restricted in the number of words they are allowed to choose, the special distracter would be chosen less often.

Method

Participants

There were 30 participants in this experiment. Participants were recruited through intro psychology classes for extra credit and/or were friends or acquaintances of the researchers. Of the 30 participants, 14 reported visual impairments that were corrected by contacts or glasses. Participants were Caucasian in order to avoid cultural differences, with 18 females and 12 males.

All of the participants were students at a small, private midwestern undergraduate college. Participants' ages ranged from 19 to 22 with a mean age of 20.9 years of age.

Equipment

This experiment was run on Gateway E4300 computers with a Pentium 4 Processor using LCD monitors, model number FDP1565, that were 306 mm in width with resolutions set at 1024 x 780. The program Java was utilized to run the experiment. Participants accessed the False Memory Laboratory experiment software through the Cognition Laboratory Experiments website for Hanover College at http://psych.hanover.edu/classes/Cognition/psy333.html. The lists of words used in the experiment and instructions were obtained and utilized from the Cog Lab False Memory experiment.

Stimuli

There was one independent variable (IV) manipulated in this experiment with three conditions which were choose 4 words, choose 7 words, or choose up to 15 words. The words were 14-sized font. The sequence of 16 words was displayed in the center of the screen for 1.5 seconds after a white fixation point (i.e., a [+] symbol) was presented at the beginning of the experiment.

Procedure

Participants were given an informed consent that they were to sign and then filled out a brief demographic questionnaire. After filling out the demographic questionnaire, participants were given directions that instructed them on how to complete the experiment.

In order to start the experiment, participants were to either click on the 'Next Trial' button at the top of the screen or hit the space bar on the computer keyboard. Once participants hit the 'Next Trial' button, a sequence of fifteen words appeared in the middle of the screen

following the presentation of a white fixation point. The words were presented for one and a half seconds each. After the full sequence of words had been presented, a gray box appeared in the top middle-half of the screen. This box contained a list of words, some of which had been presented in the sequence and some that were distracters (not shown in the sequence). The list of words in the box contained seven original words, one special distracter word that fit the theme of the original words, and eight distracter words that were unrelated to the original words. Participants were also told that not all of the words from the sequence would be shown in the box. They were instructed that they could click on words in any order that they wished. Participants were to choose 4, 7, or as many words that they recognized from the previously presented sequence of words, depending on the condition in which they had randomly been placed. After clicking on the words that they chose, participants were to click the 'Next Trial' button to begin the next trial. Each participant completed 6 trials.

Following the completion of the condition, participants' condition, proportions of word recognition, proportions of distracter recognition, and proportions of special distracter recognition were computed and displayed. Participants were instructed to leave the screen as it was and were debriefed. Researchers then recorded each participant's data and demographics in an Excel spreadsheet.

Results

A One-way ANOVA was used to test for proportion of word recognition, proportion of distracter recognition and proportion of special distracter recognition among three amounts of words participants were allowed to choose. Proportion of word recognition differed significantly across the three amount conditions, F (2,29) = 21.37, $p < .001$. Bonferroni Post-hoc comparison for the proportion of word recognition was not significant (alpha at .05) between condition seven

(*M* = .7340) and condition fifteen (*M* = .8367), *t* (17) = 1.33, *p* = .202. Condition four showed a mean of *M* = .4527. See *Figure 1*. Proportion of special distracter recognition also differed significantly across the three amounts, *F* (2,27) = 10.5, *p*< .001. Bonferroni post-hoc comparisons for the proportion of special distracter recognition was not significant (alpha level of .025) between condition seven (*M* = .5170) and condition fifteen (*M* = .6167), *t* (17) = .82, *p* = .422, Comparisons for the proportion of special distracter recognition was significant (alpha level at .025) between condition four (*M* = .1773) and condition seven (*M* = .5170), *t* (19)= 4.49, *p* < .001. See *Figure 2*. Proportion of distracter recognition was not significant across the different condition amounts, *F* (2, 29) = 1.996, *p* = .155.

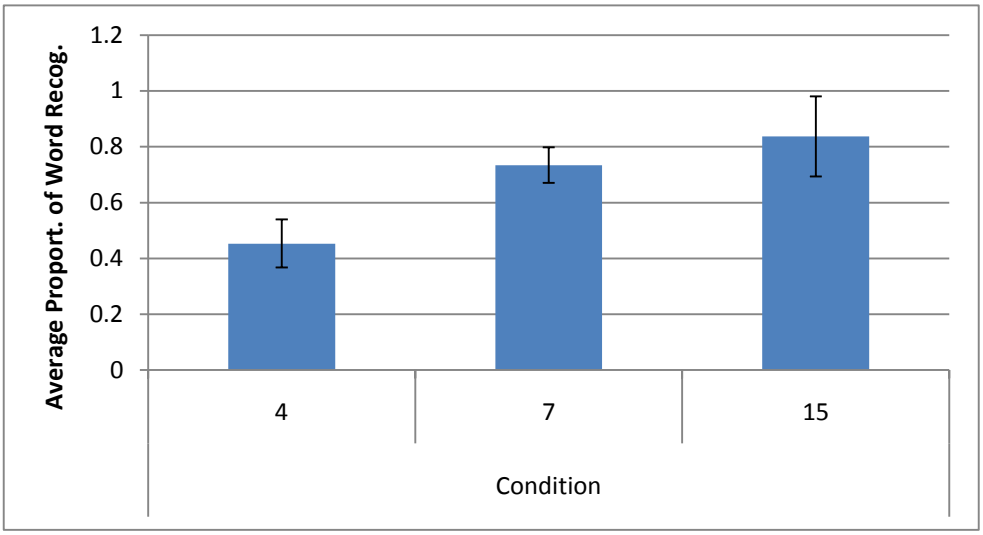

Figure 1. Means of word recognition in each condition.

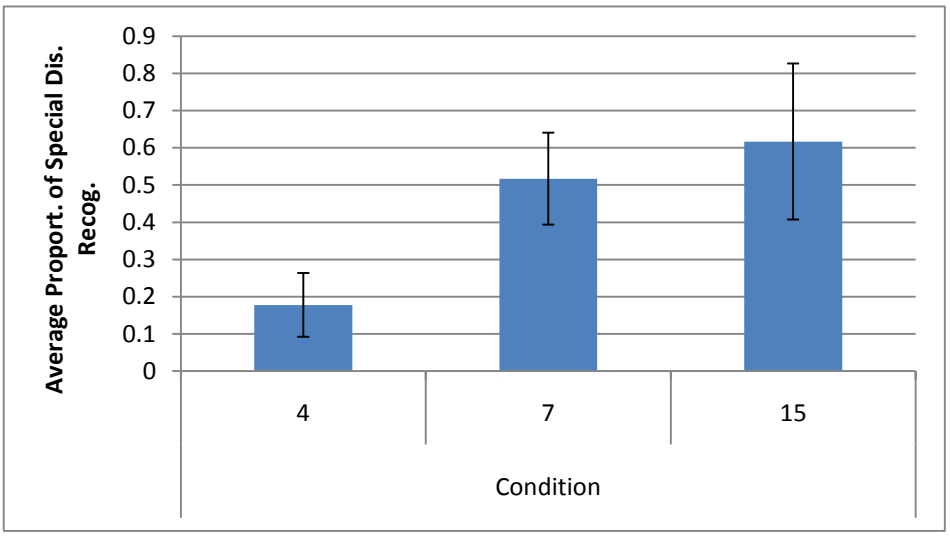

Figure 2. Means of proportion of special distracter recognition in each condition.

Discussion

Researchers' hypothesis that the more words a person had to identify, the lower their proportion of word recognition was not supported. Given that the proportion of word recognition differed significantly across the three amount conditions, the researchers concluded that there was something different about the ways that participants responded in each of the conditions. If participants are restricted in the amount of words they are able to choose, their ability to recognize words that they have chunked decreases. This could be because of the spreading activation theory which would argue that as one recognizes a word, other words that were chunked together and associated will come up in memory as well (Solso, MacLin, & MacLin, 2008). It seems that the more restricted one is in recognition, the worse the ability to extract single words from the overall chunk. There was no significant difference in word recognition when the participant was only allowed to choose 7 words and when the participant was allowed to choose 15 words. This suggests that after a certain point, (meaning a cutoff value in the number of words one is allowed to choose) the extraction from chunking is no longer affected. This supports Roediger and McDermott (1995) abstraction theory of long term

memory. One abstracts in order to form many long term memories. Therefore, it is hard to recognize specific details (up to four words) as opposed to more general themes (seven to fifteen words).

There was also no significance found in proportion of special distracter word recognition between the condition where the participant identified 7 words and in the condition where the participant identified 15 words. Given that the special distracter words were thematic with the words in the list, the researchers thought that having to recall more of the words in the list, the condition with 15 words, would show cause for more errors in memory and thus the participants would rely on other cognitive heuristics such as looking for patterns, or in this case a theme. However, this was not the case in this study. Researchers found that there was no significant difference between the conditions where the participants had to indentify 7 and 15 words. However, there was a significant difference between the condition where participants were able to choose four words, and the other two conditions. In general, results did support researchers' hypothesis that less special distracters would be chosen when participants were allowed to choose less words from the list. This finding also supports the abstraction and chunking theories of long term memory.

There was no significant difference between conditions for distracter recognition. This suggests that in all cases participants are recognizing words that were not on the original list. Therefore, they were able to distinguish between the themed words and the non-themed words. So, it may be that abstractions help us to recognize differences.

In future studies it would be helpful to get more participants. Given that our participants were all from a small, Midwestern college and were all Caucasian, this study can obviously not be applied to the general population. Hopefully in the future, there will be studies conducted

with more participants and with inclusion of a variety of races. It is also important for the development of computer programs to continue. The researchers experienced many problems with getting the program to work and feel that this might have had a negative effect on the results. It would also be interesting to see if the results changed if the time that the words appeared was either shorter or longer. It would also be interesting to see if the results were changed if there was some sort of prolonged delay after the words were presented in order to get rid of any recency effect that might have happened. The researchers felt that they should have looked to see which words the participants chose, especially in the condition identifying 4 words, in order to check to see if they were always recalling the most recent words. This is perhaps something else that can be done in further research. Variations on this study would be able to test the limits of memory. For example, finding that cutoff point discussed above would be helpful in understanding the limits of abstraction in long-term memory.

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Appendices

A. Informed Consent

This research is being conducted by Annamarie Elmer, Holly Heindselman, and Rachel Robertson in the Department of Psychology at Hanover College. The experiment in which you are asked to participate is designed to examine memory abilities. You will be given a series of fifteen words and asked to recognize them in a panel afterwards. Finally, you will be asked a few demographic questions, and then you will be debriefed.

The entire experiment will not take longer than 10 minutes. There are no known risks involved in being in this study, beyond those of everyday life. The information you provide during the experiment is completely anonymous; at no time will your name be associated with the responses you give. If you have any questions about what you are doing in the study, feel free to stop participation at any time. A comments section will be provided afterwards. You may print that page off as evidence of study participation if you would like extra credit in your psychology class (0.25% credit for professors who allow this).

If you have any questions after the study, please contact Annamaire Elmer at elmera@hanover.edu, Holly Heindselman at heindselmanh@hanover.edu, Rachel Robertson at robertsonr@hanover.edu, or John Krantz at krantzj@hanover.du.

Acknowledgement of Informed Consent

I have read the study description and I acknowledge that I am participating by my own free will. I understand that I may refuse to participate or stop participating at any time during the study. Please print out a copy of this for your records if you like.

_____ _____

Signature Date

B. Demographics

1. Age _____

2. Gender Male Female

3. Visual impairments Yes No

   If yes, what is your impairment? _____

C. Instructions

Start a trial by clicking once on the 'Next trial' button. On the left of the window a sequence of words will appear, with each word presented for one and a half seconds. After the full sequence has been presented, the buttons on the right will show labels for words, including some of those just shown. The other buttons will contain distracter words.

You must distinguish the old words from the new (distracters) words. Your task is to click on the buttons for the words that were just shown. You may click on the buttons in any order you like. Not all the words in the sequence will be listed on the buttons. You will only be allowed to choose 4, 7 or as many words as you like. After you click either 4, 7, or up to 15 words that you remember from the sequence, click the 'Next trial' to start the next trial.

D. Debriefing

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The study in which you just participated was designed to measure the effect of memory and recognition abilities. The original list consisted of 15 themed words. The panel consisted of seven original words, one word that fit the theme but were not present on the original list, and eight words that were unrelated to the theme of the original list. This is a variation of a previous study examining false memory. This earlier experiment found that participants are as likely to recall the words that are consistent with the theme but not present in the original list as they are to recall words that were presented in the original list. We hypothesized that the more we restricted choice in the panel, the more likely the participant would be to choose words from the original list.

If you have any questions or comments about this research, please contact Annamarie Elmer at elmera@hanover.edu, Holly Heindselman at heindselmanh@hanover.edu, or Rachel Robertson at robertsonr@hanover.edu.