THE EFFECTS OF STORY CREATION ON RECALL PERFORMANCE

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Abstract

Prior experiments (e.g., Nairne, Pandeirada, Thompson, 2008) have demonstrated that considering information with respect to one's survival improves recall performance relative to other well-known deep processing tasks. In the present experiment, we sought to determine whether creating stories might lead to similarly high levels of recall performance. To determine this, participants were assigned to either a survival, pleasantness, or story creation condition and were asked to consider 20 common nouns with respect to one of those three sets of instructions. After performing one of these tasks, participants were asked to complete a brief distractor task followed by a free recall test. The results indicated that participants' free recall performance was best in the story creation condition, intermediate in the survival processing condition, and worst in the pleasantness processing condition. Overall, these results suggest that creating stories may represent a particularly effective approach for remembering information.

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The Effects of Story Creation on Recall Performance

It is known that participants' recall performance can be significantly enhanced through the use of deep semantic processing (e.g., Weinstein, Bugg, Roediger, 2008). Recently, researchers have proposed an encoding manipulation called "the survival processing effect," based on the idea that the human memory system is specifically designed or 'tuned' to remember information that is processed in relation to its' survival value (Nairne, Pandeirada, Thompson, 2008). This survival processing manipulation has been demonstrated to lead to better recall and recognition performance than other well-known deep processing tasks (e.g., Weinstein, Bugg, Roediger, 2008). Survival processing is believed to elicit better memory performance because our memory systems have evolved, like other biological systems, to reflect the challenges faced in the ancestral past. Although this area of research is relatively new, a great deal has been learned about the effects of survival processing on memory in recent years.

Nairne, Pandeirada, and Thompson (2008) were the first to demonstrate the effects of survival processing on recall performance using a functionalist approach. In their study, Nairne et al. (2008) conducted two experiments to determine whether our memory systems are 'tuned' to process information considered with respect to ones' survival. Experiment 1 compared a survival scenario with other encoding procedures that were known to produce high retention rates. These conditions included pleasantness, generation, imagery, self-reference, in addition to an intentional memory condition. Participants were asked to rate common nouns briefly presented on the screen in accordance with one of those sets of instructions. After rating the words, the participants completed a brief distractor task, and were then asked to recall the words. Despite the fact that these processing instructions represent some of the best deep processing tasks identified to date, the authors found that participants in the survival-processing group

recalled more words than participants in all of the other conditions.

In a second experiment, Nairne et al. (2008) sought to demonstrate that the enhanced recall performance demonstrated in Experiment 1 was due to considering material in relation to its' survival value, rather than as a result of the unique 'thematic' structure of the survival processing instructions. In that experiment, survival processing was contrasted with a 'vacation' processing condition, in which participants were asked to rate common nouns in terms of how helpful they might be in terms of adding enjoyment to an extended vacation. Despite the fact that both of these sets of instructions (survival and vacation) included a theme, memory performance was better in the survival condition than in the vacation condition. The authors suggest that these results indicate the unique mnemonic value of survival processing on recall performance.

Weinstein, Bugg, and Roediger (2008) expanded on Nairne et al.'s 2008 survival study in order to determine if the survival processing advantage described by Nairne and colleagues could be accounted for by basic memory processes. In other words, they sought to eliminate explanations other than the functionalist position described above. In Experiment 1, the participants rated the relevance of common nouns to a survival scenario, a moving scenario, and for pleasantness. After rating the list of words, the participants completed a distractor task before completing a free recall task. The authors reported results similar to those observed by Nairne and colleagues, with participants in the survival condition recalling more words than participants in either the moving or pleasantness conditions.

A second experiment was conducted to identify the processes which contribute to the survival memory advantage (Weinstein, Bugg, Roediger, 2008). The following three scenarios were presented to the participants: surviving in the grasslands, surviving in a modern city, and

moving into a new house. In addition, the scenarios were written in a way that asked the participants to imagine themselves in each situation, or to imagine a friend in each scenario. The purpose of this manipulation was to determine whether the effect relied on self-referential processing. The results indicated that the grasslands survival scenario led to better recall than the other conditions. In addition, the survival processing advantage was observed for both the first-person and the third-person sets of instructions. The authors concluded that these results support Nairne et al. (2008)'s evolutionary account rather than other competing explanations.

The aforementioned studies provided empirical support for the contention that the human memory system may be 'tuned' to remember information rated for its' relevance to one's survival. Otgarr, Smeets, and Van Bergen (2010) conducted an experiment to determine whether the survival processing effect could be extended from words to pictures. They hypothesized that participants would remember more pictures in the survival condition and that the recall of details included in pictures would be better in the survival condition than in other competing conditions. In the study, participants were assigned to one of three conditions: survival, moving, and a pleasantness condition. After listening to the instructions, participants rated pictures on their relevance to one of those conditions, completed a brief distractor task, and were then asked to recall as many pictures as they could by recalling the verbal label associated with each picture. The results indicated that participants did recall more verbal labels in the survival condition than in the other conditions. In addition, the participants in the survival condition were more likely include memory distortions than were the participants in the pleasantness condition. Thus, processing information in terms of survival may lead to better retention at the cost of increased inaccuracies in recollection.

Based on the results of these, and other recent studies, it is evident that processing

information for its' relevance to a survival processing scenario represents one of, if not the best, deep encoding task identified to date. The purpose of the present study was to compare survival processing with another form of processing that has been found to improve memory performance, namely, asking participants to create a story using experimenter provided content. By constructing a verbal narrative, participants may be able to focus uniquely on both item-specific information and relational information, thereby enhancing memory for a given set of information. In fact, given the historical importance of communicating essential information using stories, as well as the ease and regularity with which stories are commonly shared, it is possible that the human memory system is 'tuned' to remember stories in a manner similar to survival related content.

Bower and Clark (1969) studied the effects of the chaining method (constructing a narrative story around a critical word to be remembered in order to learn a serial list) to demonstrate how creating stories can improve participants' memory performance. Participants were assigned to one of two conditions (narrative or control) and completed a learning task relevant to their condition for twelve different lists of nouns. The participants in the narrative condition listened to the following set of instructions:

> *A good way to learn a list of items is to make up a story relating the items to one another. Specifically, start with the first item and put it in a setting which will allow other items to be added to it. Then, add the other items to the story in the same order as the items appear. Make each story meaningful to yourself. Then, when you are asked to recall the items, you can simply go through your story and pull out the proper items in their correct order.* (Bower, Clark, 1969)

After creating a story, participants completed an immediate free recall task for that list and then this process was repeated for 11 additional lists. In the control condition, participants received the same twelve lists in the same order as participants in the narrative condition and were

provided same amount of time as those participants to study the lists. The instructions for participants in the control condition were to simply study the list of words. Finally, a final recall test was administered in which participants were asked to recall all 12 lists placing the words in the order in which they were originally presented in each list. The results indicated that whereas both groups had near perfect scores on the immediate recall tests for each list, there was a significant difference in performance on the final recall test. More specifically, participants in the narrative condition performed better than their control condition counterparts.

In another related study, Bellezza, Richards, and Geiselman (1976) randomly assigned participants to either a story condition or a 'remember' condition in order to observe the effects of semantic processing and organization on recall performance. The remember condition was designed to have participants simply study the list of words in preparation for a subsequent test (i.e., an intentional memory test). Those in the story condition were told to incorporate each word into a sentence and to create a continuous story using the sentences generated from the presentation of each word, whereas participants in the remember condition were not instructed to construct sentences after the presentation of each word. Following completion of the learning task, a free recall task was administered. The results indicated that participants assigned to the story condition recalled more words than the individuals assigned to the remember condition. In addition, there was evidence of a negative correlation between the order in which the items were presented and the order in which they were recalled. This observation suggests that any organization used to connect the story words was weakly sequential. Sequential organization can only be achieved when the order of recall correlates positively with the order of presentation.

Belleza et al. (1976) conducted a second experiment in an attempt to analyze the effect of a delay between studying and recalling the words. They observed that the introduction of an

interpolated task led to a positive correlation between the order in which words were presented and the order in which words were recalled in both conditions. The interpolated task required participants to write down any twelve words beginning with the letter 'a' that were not included on the list. Furthermore, unlike in Experiment 1, a positive correlation between the order in which the words were presented and the order in which they were recalled was observed. Finally, in a third experiment, the short delay utilized in Experiment 2 was extended to a 24-hour delay. The results obtained in Experiment 3 were similar to those observed in the second experiment with participants again tending to recall words in the order in which they were originally presented. Thus, it appears that inserting a delay between study and test tends to eliminate immediate recall of words stored in short-term memory and strengthen sequential organization. Furthermore, and perhaps more germane to the current study, participants recalled more words in the story conditions than in the 'remember' conditions across all three experiments.

The aforementioned studies demonstrate that, at the very least, asking participants to create stories can improve their memory for presented information relative to control conditions. The purpose of the present experiment was to compare recall performance following story processing with both survival processing and a pleasantness control scenario. In the present study, participants were provided with a list of 20 common nouns. They were instructed to either use the words to create a story, list how the items might help them survive in a grasslands environment, or list pleasant and unpleasant attributes of the items. We hypothesized that, if the human memory system is in fact 'tuned' to remember story related content, in a manner similar to how we may be predisposed to remember survival related content, that participants would recall more words in both the story and survival conditions rather than in the pleasantness control condition.

Methods

Participants

Ninety-one undergraduate students attending the University of Mississippi participated in fulfillment of partial course credit. Data from one participant was excluded from the analyses because of a failure to follow instructions.

Materials and Design

A between-subjects design was employed in which participants were randomly assigned to one of three instructional conditions (story, survival, and pleasantness). All experimental stimuli were presented and all responses were recorded using pencil and paper. Participants studied a list of common nouns comprised of 20 unrelated words selected from a category norm study (Van Overschelde, Rawson & Dunlosky, 2004).

Procedure

Participants arrived at the laboratory and worked through the study in small groups ranging from 1 – 4 participants at a time. After consenting to participate in the study, each participant received a sheet of paper with a set of instructions at the top of the page, followed by a list of 20 common nouns. Underneath the list of words, the remainder of the page was blank to provide a space for participant responses. As noted above, participants were randomly assigned to one of three experimental conditions, and depending on the condition to which they were assigned, received one of the three following sets of instructions:

Pleasantness

In this task, we would like you to list pleasant or unpleasant attributes of each of the words listed below. Please write the word in the space provided, followed by several pleasant or unpleasant attributes of the word.

Survival

We would like you to imagine that you are stranded in the grasslands of a foreign land, without any basic survival materials Over the next few months, you'll need to find steady supplies of food and water and protect yourself from predators. In this task, we would like you to note the ways that each of the words in the list might help you to survive in this situation. Please write the word in the space provided, followed by ways that the word might aid survival.

Story

Many people find stories to be interesting and entertaining. Please write a short story in the space provided below and be sure to include each of the following words in your story.

After listening to the experimenter read one of these three sets of instructions, participants were provided with 10 minutes to complete the task. Following this, participants were asked to flip the participant response form over. On the other side of the response form, the top half of the page contained a number of double digit multiplication problems (for example, 54 * 23). Participants were asked to work on this multiplication distractor task for 2 minutes. After this two-minute interval had elapsed, participants were asked to use the bottom half of the response sheet to recall as many of the words from the previously viewed list as possible. Participants were provided with 5 minutes to complete the recall task, and if they finished early, were asked to use the remaining time to try to think of more words from the list. After the recall task, participants were debriefed and thanked for their participation.

Results

The primary dependent variable in the present experiment was the proportion of words that participants correctly recalled. All but one participant provided pleasantness or survival responses for all 20 words or used all 20 words in the short story that they wrote. The one participant that did not use all of the words used 19 out of the 20 words in a short story and was included in the subsequent analyses. In addition, intrusions were rare (less than 1% of words

recalled in all three conditions). The proportion of words recalled correctly as a function of experimental condition (story, survival, pleasantness) are displayed in Figure 1. A One-Way Analysis of Variance (ANOVA) revealed that the manner in which participants processed the words influenced their subsequent recall performance, F (2,87) = 28.09, $p < .0001$. Planned comparisons indicated that participants recalled more words in the story condition ($M = .87$) than in the survival condition ($M = .74$), t (58) = 3.80, $p < .0001$. In addition, participants recalled more words in the story condition than in the pleasantness condition ($M = .61$), t (57) = 7.39, $p < .0001$. Finally, participants' recall performance was better in the survival condition than in the pleasantness condition, t (59) = 3.85, $p < .0001$. Thus, overall, having participants write a short story led to the best overall recall performance, listing survival related attributes led to intermediate performance, and listing the pleasant or unpleasant aspects of words led to the lowest level of recall performance.

Discussion

The purpose of this study was to compare story processing with two other well known deep processing conditions. We predicted that creating a story using a list of common nouns might lead to better recall performance than a pleasantness control task, and could lead to performance equal to or better than a set of survival processing instructions. During the experiment, participants read one of three sets of instructions and completed a brief math distractor task before completing a free recall task covering the processed information. The results indicated that the participants' performance was best in the story condition, intermediate in the survival condition, and lowest in the pleasantness condition. These results replicated those obtained in prior studies (e.g., Nairne et al., 2008) suggesting that processing information with respect to one's survival improves recall performance relative to well-known deep processing

tasks like pleasantness processing. Furthermore, they extend these results to suggest that creating stories may lead to even better recall performance than survival processing. The proximate mechanism driving these effects may be the way both survival and story processing tasks require participants to focus on both the item-specific aspects and the relational aspects of the presented words. The ultimate mechanism may be that our memory systems evolved to focus on such content.

There are some limitations with the present study that may limit our ability to interpret the present results. First, although all of the participants were provided with 10 minutes to complete each processing task, it is possible that participants in some conditions may have spent more time on the task than others. For example, it is conceivable that participants in the pleasantness and/or survival conditions may have completed the task prior to those working in the story condition. Thus, processing time, rather than the processing tasks themselves cannot be definitively ruled out as a contributor to the observed results. Going forward, it will be important to eliminate this potential confound. This could be achieved by, for example, having participants view each word for a fixed period of time and write a line to their story while the word is presented.

Second, the distractor task proved challenging to a few participants. More specifically, a few participants stated that they did not remember how to solve the multiplication problems and, as a result, left them blank. Simple addition and subtraction tasks, or other distractors like having participants play a game of Tetris, may offer better options going forward. Despite this, the few participants who did not complete the tasks were equally distributed across conditions, thus this issue likely did not contribute to our observed results.

In previous studies of this type (e.g., Belleza et al., 1976), items from the word lists were presented one at a time. In the present study, to facilitate story creation, we opted to present the words all at once. Additionally, many similar studies (e.g., Nairne et al., 2008) used 30 item words lists while we employed 20 words so that participants could create a cohesive story within the limited amount of time they were provided. These differences could make comparisons between our results and previous studies more difficult. Finally, most studies of this type have participants rate the items one at a time as they appear on the screen, rather than write anything new themselves. It seems as if asking participants to list pleasant attributes and survival related aspects of the words improves memory relative to merely rating them.

The present results replicate those of others suggesting that survival processing leads to improved memory performance relative to a pleasantness task and extends those results to include a different word list and different manner of processing (listing attributes of items as opposed to rating them). In addition, the present results suggest that our memory systems may be predisposed to processing and remembering stories and that storytelling may be an especially good way of encoding and retrieving information.

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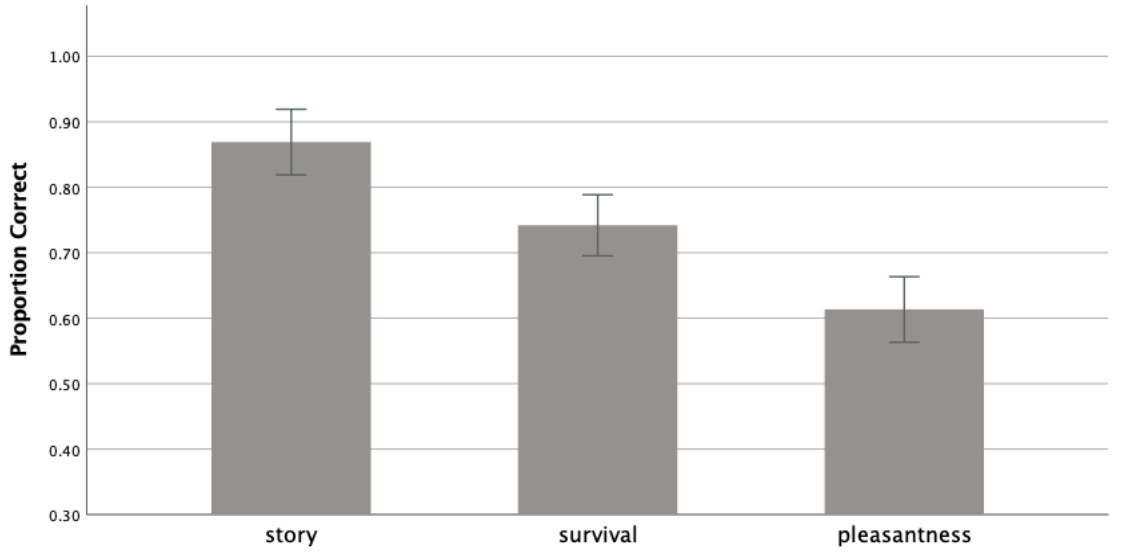
Figure 1

Proportion of Words Remembered Correctly as a Function of Instructional Condition



Note: Bars represent 95% Confidence Intervals

APPENDIX

Word List:

diamond
aunt
silver
magazine
cat
wool
blue
fork
couch
leg
grape
sword
beer
nail
garlic
doctor
river
rain
shirt
door