PRIORITY AND DISTINCTIVENESS: ENHANCING FREE RECALL USING CATEGORICAL NETWORK

by

Kara Ann Wilson

A Thesis Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Arts in Psychology

Middle Tennessee State University
August 2019

Thesis Committee:

Dr. Stephen Schmidt, Chair

Dr. Constance Schmidt

Dr. James Houston

I dedicate this research to each person who stood firmly behind me along the way.

I could not have done this without your unwavering support. I love you.

ACKNOWLEDGMENTS

First and foremost, I would like to express my sincere gratitude to Dr. Stephen Schmidt. Taking your cognition course years ago changed my life and helped me find my direction. Furthermore, your guidance and passion inspired me to face my fear of research and even fall in love with it. Dr. Constance Schmidt and Dr. James Houston, thank you for being on my committee and for your patience and constant support. I have learned so much from you all and for that I am forever grateful.

Next, I would like to thank my family for their unconditional love and support. Thank you for believing in me and pushing me when I felt as though I could not keep going. I love you all so very much. To my twin, Krista - you are the glue that has kept me together. I do not know who I would be without you. Thank you.

Lastly, I would like to acknowledge my closest friend. Our intellectually engaging conversations will always stay close to my heart. May your pursuit of life-long learning inspire you as much as it has inspired me.

ABSTRACT

Schmidt, Schmidt, & Wilson (in prep.) demonstrated that participants can use word color to prioritize recall only when they are told which of two word colors has higher value before (rather than after) list presentation. The purpose of the current study was to determine the effects of word priority and distinctiveness on memory when word priority is determined by membership in semantic categories rather than by word color. Participants recalled homogeneous lists of words from the same category, 50/50 lists (with half of the words from one category given low priority point values and half of the words from another category given high priority point values), and isolation lists (with one high or low priority target word embedded in serial position 2 in a list of background words with contrasting priority). For each list, participants were given point values (low vs high priority) to two different categories following each word list presentation. High-priority target and background words were better remembered than low-priority words. Distinctive targets were better remembered than non-distinctive targets, but only when the targets were high-priority. The results of this study demonstrate that participants can prioritize recall of words according to semantic category after the words have been presented. Furthermore, the results indicate that priority is a stronger factor in enhancing memory than distinctiveness, but that distinctiveness can strengthen recall for stimuli that also have high priority.

TABLE OF CONTENTS

LIST OF FIGURES

Page

LIST OF TABLES

Page

CHAPTER I: INTRODCTION

Seven years ago, I was driving down the road in my small town; my typical Thursday route. The stores, post office, and fast food restaurants were all mundane to me and no longer demanded my attention. This one Thursday afternoon, however, my attention was captured. I saw a man standing in the parking lot of a strip of stores wearing a banana costume. As I scanned my visual field, nothing around him gave context as to why he was wearing this. I was so intrigued, I turned around and went back to ask him why he was wearing the costume. His only answer was “Banana puddin’!” I still remember this vividly to this day.

Many studies in psychology have examined what makes some stimuli (like banana costumes) or experiences stand out and stick in our memory and why. Von Restorff (1933) reported that an item that differs from a list of otherwise alike items is often better remembered than the similar words. The item is better remembered whether it is conceptually, physically, or temporally dissimilar. This effect has been found in numerous studies (see Schmidt & Schmidt, 2017 for a review). This same concept can be viewed in other events or stimuli that are particularly memorable to individuals, including: flashbulb memories (traumatic, emotional events), bizarre imagery (which will be further discussed), and nudity (See Schmidt, 1991 for a review).

While there are many explanations for increased memory in psychology literature, two of the major ones are discussed below and include distinctiveness and priority. Green

(1956) argued that being surprised by a distinctive item is responsible for extra processing, and therefore better memory, for the item. Fisk and Wickens (1979) found that placing significance, or priority, on certain categorical items yielded increased recall for those items. This paper will expand on these ideas while contributing to the research pool while utilizing the categorical semantic network.

Distinctiveness

Schmidt (1991) conceived distinctiveness as the antipode of similarity. Distinctiveness occurs when features of an item and/or event are incongruent with previously stored representations in memory for other items and events. Two kinds of distinctiveness have been proposed: secondary and primary distinctiveness. Secondary distinctiveness occurs when the item is novel to the individual's life experiences, or long-term memory. The bizarre imagery effect provides an example of secondary distinctiveness. In bizarre imagery tasks, participants are given noun pairs and are asked to create interactive images for the pairs. For example, when given the words "cigar" and "piano" the non-bizarre group created a typical image of a cigar lying on a piano, while those in the bizarre group formed images of the piano actually smoking the cigar. Bizarre imagery sentences such as "The dog road the bicycle down the street" are also remembered better than non-bizarre sentences such as "The dog chased the bicycle down the street" (Schmidt, 1991, p. 531). Findings from these studies indicated that bizarreness can enhance recall when presented within the context of common material. Bizarre imagery enhances free recall but does not enhance recognition (See Schmidt, 1991 for review). This method of secondary distinctiveness (bizarre imagery) manipulates memory by utilizing novel ideas for participants.

In contrast to secondary distinctiveness, primary distinctiveness is defined by incongruence between an item and other stimuli in working memory. This can occur in various contexts of stimuli, including conceptual categories. For example, if an individual is reading a list containing words such as “dog, cat, horse, cow,” the individual will most likely recognize that the category being presented is “animals.” An example of primary distinctiveness would be using that same list presented with a word from a separate category (e.g. adding a vegetable; broccoli). The word that is incongruent with the rest of the list would stick out as the comparison is being made to other stimuli that have been recently presented. When researchers have explored primary distinctiveness using physical dimensions such as letter size, distinctive items are better recalled than non- distinctive items. Physically distinct items also tend to be recalled together in clusters. (Schmidt, 1991).

Hunt (2006) outlined four major points concerning distinctiveness; the first point is that distinctiveness is not a property that belongs to material to be memorized, rather it is a psychological property of the comprehension and perception process of the material. To illustrate this concept, Hunt uses an example of the isolation effect. If you take an isolated item from an experimental list and place it in a control list without the isolation, the item is no longer distinctive. Therefore, the distinctiveness property cannot be placed on the item alone, but rather the way it was perceived in the isolation list. The second major point described is that distinctiveness does not rely solely on salience, or on substantially crossing the threshold of noticeability. Von Restorff's (1933) research supports this point, as she isolated items towards the beginning of experimental lists rather than the middle or end of lists. She utilized this early isolation method in order to avoid salience effects, and several studies have replicated this method (Hunt, 1995; Kelly & Nairne, 2001; Pillsbury & Rausch, 1943). Hunt's (2006) third point of distinctiveness is that *difference* does not equal *distinctiveness*. When comparing memory for related and unrelated word pairs, Epstein, Phillips, and Johnson (1975) found that across conditions, related word pairs yielded higher memory than unrelated word pairs. These results suggest a dichotomy between distinctiveness and difference and show that difference alone is not always beneficial to memory. Hunt's (2006) final major point of distinctiveness is that it is relative. The distinctiveness property is affected by many factors including the conditions for experiment, the test methods utilized, and expectations or intent of the individual. Schmidt (1991) summarized that distinctive processes lead to further encoding, and therefore better memory, than non-distinctive processes. The mnemonic advantages of distinctiveness can be found in both recognition and recall memory tasks.

Priority

Tulving (1969) investigated priority by running an experiment in which participants were asked to remember all words in experimental lists, but to start recall with famous names that were embedded in the lists. His results suggest that placing high priority on certain words increases the likelihood for recall, while also decreasing the likelihood of recall for one to two preceding items on the list. Bellezza and Hofstetter

(1974) manipulated priority by asking participants to recall all words, giving underlined words priority in recall. As with Tulving, placing priority on words increased the likelihood of their recall. While these studies touch on priority's effect on memory, they focus primarily on its retrograde amnesic effects rather than determining whether the priority or isolation of the emphasized item is responsible for its enhanced recall.

Fisk and Wickens (1979) found that recall of conceptually isolated items was higher for participants receiving priority instructions than participants who did not receive such instructions. An important component to this study is missing: the Fisk and Wickens research does not include a control list, i.e. a list containing words all from the same category. Because this control list is missing, isolation is only able to be measured with priority and not without. Importantly, Castel, Benjamin, Craik, and Watkins (2002) introduced a new method of measuring the effect of priority in the absence of item distinctiveness. In this study, a list of randomized words was arbitrarily assigned points based on a one to twelve point scale. Participants saw the words for 1 sec. each and then were immediately given the point value for that word, followed by a 20 sec. recall. The results indicated that priority given to certain items can increase memory for those items without relying on distinctive properties of the item. This finding indicates contribution in memory from priority itself. The process used for lists is similar to the present study. In this study, participants will view words in list structures for 1 sec. each and the words will be given a randomized point value to assign high and low priority; however, participants will know the point values before they see the words and the points will be given to categories rather than individual words. Based off of the Castel et al. (2002)

findings, it is expected that the point system will aid in recall for words from the high priority (higher point value) categories. Conversely, we also need to examine whether an isolation effect occurs when isolated words do not receive high priority at encoding.

Categorical Effects on Memory and Recall

A study by Bousfield and Sedgewick (1944) focused on semantic memory retrieval and categorical recall. Subjects in this study were presented with 60 words equally distributed among 4 categories; the word presentations were random, mixing the categories. Results found that closely related items were often recalled quickly together in “bursts” (Crowder, 1976, p. 324). This research may have helped paved the way for the discovery of clustering by W. A. Bousfield (1953). The basic idea of clustering is that items from the same semantic category are related and are more likely to be recalled together than two items from different semantic categories. Bousfield (1953) suggests that words in presentation can carry their own unique strengths for being memorized, but that “relatedness increments” give the words extra strength and that this occurs primarily during output (Crowder, 1976, p. 325).

Bousfield’s research sparked a debate in research on clustering over the following question: Does categorical clustering occur in a hierarchical fashion, or does it rely more heavily on word-to word associates? Bousfield and Cohen (1953) expanded on hierarchical memory representations based off of the Hebbian structure (Hebb, 1949). These structures indicate which words are superordinate (category) and subordinate (words associated with the category). The idea is that recalling a subordinate word initiates the connection to the category. Once the connection to the category is made, a connection to other subordinate words that fall under the same category are evoked, increasing the potential for memory recall (Crowder, 1976, p. 326). This process can be triggered by giving a category cue during a test phase of an experiment, such as “recall the animals.” In contrast to the hierarchical memory representation theory, J. J. Jenkins and Russell (1952) supported the word-to-word associative theory. In this study, participants were given a list of 24 pairs of words (48 words in total) with strong relation such as OCEAN-WATER and TOBACCO-SMOKE, however, the words were randomized, making sure that the associated words were never shown together. When performing a free recall task, words were frequently recalled in their associative pairs. These results suggest an important role of word-to-word associates in clustering.

Category distinctiveness relies on conceptual information, rather than physical differences (Schmidt, 1991). Schmidt (1985) found that conceptually distinctive items tended to be the organizing factor in retrieval, which led to increased retrieval for these words both in general and in a group. This finding goes hand-in-hand with primary distinctiveness research in which the distinctive word sticks out and leads to an orienting-attention response (Schmidt, 1991).

Current Research Purpose

The purpose of the current research was to examine the effect that distinctiveness and priority have on memory while using categorical (semantic) stimuli. This research is Experiment 3 in an ongoing study (Schmidt, Schmidt, & Wilson, in prep.). The purpose of the first two experiments was to view the effect that priority and distinctiveness have on memory recall, utilizing target words in different list structures. List structures included homogeneous lists (all black or all red words), 50/50 lists, and isolation lists (one black word in a list of all red words, and the reverse). Experiments 1 and 2 focused on using a physical component (color) to manipulate distinctiveness within the lists. Target words were arbitrarily determined and were used in the second serial position in each experimental list. In some lists (isolation lists), target words were isolated, and in other lists (homogeneous and 50/50 lists) they were not. Hypotheses for Experiment 1 and 2 included that target words would be well remembered when isolated and given high priority. In order to avoid the effect of some words being more easily remembered than others, the target words were counterbalanced across word list structures.

Experiment 1's design relied on encoding with distinction and priority; that is, participants were told to give priority (one points vs ten points) to either red or black words before viewing the words. Distinctiveness in this study was defined by the color of the word viewed – that is, a red word in an isolation list of black words was measured as distinctive vs black words as non-distinctive and vice versa. This method was used as a result of past studies that found that memory for a red word isolated in a list of black words is greater than memory for the same red word in a list of homogeneous red words. This effect also occurs for an isolated black word compared to the same black words in a homogeneous black list (Schmidt, 1991). Both experiment 1 and 2 predicted higher memory for words that were both high priority and distinctive (e.g. a high priority black word in a list of low priority red words). Experiment 1 resulted in high priority target words, isolated by color, being recalled with higher success than high priority targets in homogeneous and 50/50 lists. However, low priority distinctive targets were more poorly recalled than low priority targets in the homogeneous list. This result suggests that priority at encoding, rather than distinctiveness, supports good memory for isolated items. Experiment 2's design was very similar to Experiment 1 with one major change: the design aimed to view the retrieval end, rather than encoding, of priority and distinctiveness. In this design, participants were given priority for red or black words *after* viewing the lists, but this did not result in support for distinction or priority enhancing recall. Like Experiment 1, however, recall was greater for target words than background words.

Both of these preliminary studies indicate that high priority is crucial during encoding the list of words. The results also suggest that participants are unable to use physical cues like color to aid retrieval (Schmidt et al., in prep). The two preliminary experiments give rise to an important question: is it possible to enhance recall in the retrieval stage (rather than at encoding) if we use semantic rather than physical information to define distinctiveness and priority? Based off of Hebbian structure (1949) and the findings of Bousfield and Cohen (1953) on hierarchical structures, categorical recall should naturally occur, as the words used are stored in a connected semantic network together. To test this, we utilized categories, rather than color, as there is a semantic network of information about categories that is already present in our day-to-day lives. For instance, most people have storage of categorical information about "animals." Asking participants to recall animals that were previously read, rather than asking participants to remember which words were red or black, may yield better results due to the participants being able to utilize their own semantic network of the category "animal" rather than relying on perceptual memory (Schmidt et al., in prep).

In this study (Experiment 3), target and background words were used in each list, just as used in Experiment 1 and 2. Target words appeared in the second serial position and were counterbalanced across list structures. Isolation (one word from a category was viewed while the remainder of the list was from a separate category), 50/50 (half of the words viewed were from one category, while the other half were from a separate category), and isolation (all words viewed were from the same category) lists were used. For example, in an isolation list the word "strawberry" may have appeared in a list of words that were all earth formations. Word priority was counterbalanced and randomly assigned to participants.

Based off of previous studies and Experiment 1, our hypotheses were as follows: target words will be better recalled than background words; if words are given high priority, then they will have a higher recall than low priority words in both isolation and 50/50 lists; target words with high priority (ten points vs one point) and distinctiveness (isolated in a list of other category words) will be better recalled than low priority, non-distinctive (homogeneous and 50/50 list) target words; and low priority distinctive words will result in poorer recall in 50/50 lists than in homogeneous lists. These priority and distinctiveness effects were not expected to be found within homogeneous lists, as the high priority/distinctive target appeared in a list of words from the same category.

CHAPTER II: METHODS

Participants

Undergraduate students were recruited using the Psychology Research pool. Based on the effect sizes in Experiments 1 and 2, 85 participants were recruited.

Materials

110 words were obtained from the Van Overschelde, Rawson, and Dunlosky (2004) category norms. Word length was controlled by omitting words containing less than 4 letters and more than 11 letters. The following categories were used for experimental lists: Occupations, countries, music, fish, clothing, sports, animals, fruit, earth formations, and tools. The top response for each of the categories (2004) was not used in order to control the guessing rate in participants' responses. The lists were then created using the second highest through the eleventh highest responses. Six experimental lists were created containing ten words each. See Appendix C for lists of categories and words. Gendered words (e.g. mailman) and two-worded responses were not included. A sample list containing ten random words from categories not used in the experimental lists was used as a practice list. Experimental lists were constructed in the following types: homogeneous, with all words from the same category; 50/50, with half of the words from one category and the other half from a different category; and isolation, with one word from a category in the second serial position in the list and the other nine words from a separate category. The isolation lists were given either high or low priority for the isolated (target) word vs background words from another category. The target words used

in experimental lists were the fifth highest popular response given in Van Overschelde, Rawson, and Dunlosky (2004) category norms.

Design

Words were counterbalanced with high or low priority across list structures. Participants only saw words from each category once. All 10 categories were viewed by each participant, with 5 different possibilities of list presentation. For example, one participant viewed an isolation list with the categories “countries” and “occupations” used, while the next participant viewed an isolation list with the categories “music” and fish.” Additionally, all categories such as “clothing” were high priority for half of the participants in a 50/50 list and low priority for the other half of the participants. Target words were arbitrarily determined and were used in the second serial position in each experimental list. The target words were counterbalanced across all list structures. While all participants viewed all of the same categories, they viewed them in different list structures. The experimental design was a 3 (list structure: homogeneous, isolation, 50/50) x 2 (priority: high, low) x 5 (counterbalancing), mixed design. Counterbalancing was manipulated between subjects, while priority and list structure were manipulated within subjects.

Procedure

Participants were tested in a laboratory room controlled for distractions in a psychology department building of a university in Tennessee. Each group contained no more than six participants at a time. E-prime 2.0 software was used to administer the sessions on Dell desktop computers with CRT monitors. An experimenter read the instructions aloud, while participants read along on their screens. Participants first completed the practice list, followed by six experimental lists. Ten words were presented per experimental list. Each word appeared in black font on a white background and was presented for 2 sec, followed by a blank screen for 1 sec. Immediately following the presentation of each experimental list, participants were told what point values were assigned to the categories viewed. For a 50/50 list with half countries and half occupations, some participants were told that countries are given a point value of 10, while occupations are given a point value of 1. For isolation lists, either high or low priority was given for the isolated (target) category word vs background words from another category. For homogeneous lists, all words shown came from a single category and were given high or low priority, while giving the opposite to a category that did not appear on the list. Counterbalancing ensured that other participants received the opposite point values in all list structures. Points were assigned to determine high vs low priority for the categories. Lastly, a 30 sec free recall was given after each list in which participants used the computer keyboard to record their responses. Responses were only scored for the experimental lists.

CHAPTER III: RESULTS

Participant responses were recorded by the e-prime 2.0 software. Two researchers scored word recall for each participant; inter-rater reliability was 99%. All discrepancies were rescored. Average recall as a function of priority, list structure, and item is shown in Table 1.

The proportions of words recalled from all experimental lists were analyzed using a 3 (list structure: homogeneous, isolation, 50/50) x 2 (priority: high, low) x 2 (item: target, background), repeated measures analysis of variance (ANOVA). An alpha level of .05 was used for all analyses. The effect of list structure was not significant, F (2,83) = .48, MSE = .044, $p > .05$, $\eta_p^2 = .006$. A main effect for priority was found, F (1,84) = 7.42, MSE = .80, $p = .008$, $\eta_p^2 = .081$. Across all conditions and list structures, high priority words were better recalled (M = .68) than low priority words (M = .63). There was a main effect for item, F (1,84) = 22.00, MSE = 2.56, $p < .001$, $\eta_p^2 = .208$. Target items were better recalled (M = .70) than background items (M = .60). This is likely due to the primacy effect. The primacy effect refers to the higher recall probability of list items that appeared towards the beginning of the list presentation relative to items appearing in the middle of the list (e.g., Rundus, 1971). Because target words were in serial position 2, it can be inferred that the primacy effect contributed to higher recall.

There was a three-way interaction between item, list structure, and priority, F (2, 83) = 3.90, MSE = .468, $p = .022$, $\eta_p^2 = .044$. Recall of high priority targets isolated by category (M = .85) significantly exceeded recall of high priority targets in homogeneous lists [M = .66, t (84) = 2.95]. Recall of low priority targets isolated by category (M = .62) was not significantly different than recall of low priority targets in homogeneous lists [*M* = .69, *t* (84) = -.97]. Recall of high priority targets in 50/50 lists (*M* = .74) did not significantly exceed recall of high priority targets in homogeneous lists [*M* = .66, *t* (84) = 1.26]. Recall of high priority background words in 50/50 lists (*M* = .66) significantly exceeded recall of high priority background words in homogeneous lists [*M* = .61, *t* (84) = 2.32]. High priority background words (*M* = .66) were better recalled than low priority background words [*M* = .59, *t* (84) = 3.26] in 50/50 lists, but high priority targets (*M* = .74) were not better recalled than low priority targets [*M* = .66, *t* (84) = -1.123]. There was no effect of priority on the homogenous lists. This was expected, as all target words in homogenous lists were given the same priority as the remaining words in the list. See figures 1 and 2 in Appendix B.

CHAPTER IV: DISCUSSION

The goal of this research was to evaluate the effects of priority and distinctiveness on memory while utilizing participants' categorical semantic network. Numerous studies suggest that making a stimulus distinctive enhances memory for that item (see Schmidt & Schmidt, 2017 for a review). Other studies have found that memory increases when the stimulus presented is given high priority (Bellezza & Hofstetter, 1974; Castel, Benjamin, Craik, & Watkins, 2002; Fisk & Wickens, 1979; Friedman & Castel, 2013; Tulving, 1969). In the current study, memory was the highest for isolated, high priority words (M = .82). This finding supports the importance of both isolation and priority in determining word recall.

The most important finding from this research is that participants were able to effectively remember more high priority than low priority words when category priority was assigned after list presentation. High priority targets and background words were better recalled than low priority words in 50/50 lists. This finding indicated that participants were able to remember the presented words according to their categories and assign high or low priority to recall of the words based on category membership. The effect of priority was not observed in homogeneous lists because all words in these lists were given the same priority (ie., they were all high or all low priority, see Table 1).

The results of this research are consistent with research by Bousfield and Sedgewick (1944) and Bousfield (1953). Categorical names (such as occupations, fruit, etc.) elicit a response that activates other words in the same category, contributing to better recall. Notably, this occurs even when the categorical name is viewed after seeing the stimuli. The results of the current experiment can be contrasted with the results of

Experiment 2 in the Schmidt et al. (in prep.) research. Experiment 2 participants were told whether red or black words were high priority after viewing the words. Participants were unable to prioritize word recall according to word color. Further, high-priority targets in isolated lists were not better remembered than target words in homogeneous lists. In fact, memory for high-priority targets was actually better in the homogeneous lists than in the isolation lists in Experiment 2 (Schmidt et al., in prep). The opposite happened in the current experiment, likely due to category information being a more useful tool than color for organizing recall after list presentation. Because participants already have a semantic network for the stimuli they saw, they were able to retrieve members of the high-priority category without engaging in extra processing of these words during encoding (viewing high vs low priority values beforehand). Further, target words isolated by category in the present research were better remembered than target words in 50/50 or homogeneous lists.

The results of the present research suggest that distinctiveness aids memory for high priority words; however, the same cannot be said for low priority words. Low-priority distinctive targets were not better recalled than low-priority non-distinctive targets. In fact, isolated low-priority targets were recalled more poorly than low-priority targets in the 50/50 and homogeneous lists. Experiment 1 of the Schmidt et al. (in prep.) research also demonstrated that distinctiveness only benefits memory for high priority items when color priority is assigned before list presentation. The findings of the first two Schmidt et al. (in prep.) studies, combined with the results of the current study, suggest that priority is a stronger factor for enhancing recall than distinctiveness.

References

Bellezza, F. S., & Hofstetter, G. P. (1974). Isolation, serial position, and rehearsal in free recall. *Bulletin of the Psychonomic Society*, *3*(5), 362-364. doi: 10.3758/BF03333498

Bousfield, W. A., & Sedgewick, C. H. W. (1944). An analysis of sequences of restricted associative responses. *The Journal of General Psychology*, *30*(2), 149-165. doi: 10.1080/00221309.1944.10544467

Bousfield, W. A. (1953). The occurrence of clustering in the recall of randomly arranged associates. *The Journal of General Psychology*, *49*(2), 229-240. doi: 10.1080/00221309.1953.9710088

Bousfield, W. A., & Cohen, B. H. (1953). The effects of reinforcement on the occurrence of clustering in the recall of randomly arranged associates. *The Journal of Psychology*, *36*(1), 67-81. doi: 10.1080/00223980.1953.9712878

Bousfield, W. A., & Sedgewick, C. H. W. (1944). An analysis of sequences of restricted associative responses. *The Journal of General Psychology*, *30*(2), 149-165. doi: 10.1080/00221309.1944.10544467

Castel, A. D., Benjamin, A. S., Craik, F. I., & Watkins, M. J. (2002). The effects of aging on selectivity and control in short-term recall. *Memory & Cognition*, *30*(7), 1078-1085. doi: 10.3758/BF03194325

Crowder, Robert G. (1976). *Principles of learning and memory*. Hillsdale, N.J.: New York: Lawrence Erlbaum Associates; distributed by the Halsted Press

Epstein, M. L., Phillips, W. D., & Johnson, S. J. (1975). Recall of related and unrelated word pairs as a function of processing level. *Journal of Experimental Psychology: Human Learning and Memory*, *1*(2), 149. doi: 10.1037/0278-7393.1.2.149

Fisk, A. D., & Wickens, D. D. (1979). On the locus of the Tulving retrograde amnesia effect. *Bulletin of the Psychonomic Society*, *14*(1), 3-6. doi: 10.3758/BF03329383

Friedman, M. C., & Castel, A. D. (2013). Memory, priority encoding, and overcoming high-value proactive interference in younger and older adults. *Aging, Neuropsychology, and Cognition*, *20*(6), 660-683. doi: 10.1080/13825585.2012.762083

Green, R. T. (1956). Surprise as a factor in the von Restorff effect. *Journal of Experimental Psychology*, *52*(5), 340. doi: 10.1037/h0047496

Hebb, D. O. (1949). The organization of behavior: A neurophysiological approach. New York: Wiley, 1949. doi: 10.1177/000271625027100159

Hunt, R. R. (1995). The subtlety of distinctiveness: What von Restorff really did. *Psychonomic Bulletin & Review*, *2*(1), 105-112. doi: 10.3758/BF03214414

Hunt, R. R. (2006). The concept of distinctiveness in memory research. *Distinctiveness and memory*, 3-25. doi: 10.1093/acprof:oso/9780195169669.003.0001

Jenkins, J. J., & Russell, W. A. (1952). Associative clustering during recall. *The Journal of Abnormal and Social Psychology*, *47*(4), 818. doi: 10.1037/h0063149

Kelley, M., & Nairne, J. (2001). von Restorff revisited: Isolation, generation, and memory for order. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 27(1), 54. doi: 10.1037/0278-7393.27.1.54

Pillsbury, W. B. and Rausch, H. L. 1943. An extension of the Koler-Restorff inhibition phenomenon. *American Journal of Psychology*, 56: 293–298. doi: 10.2307/1417511

Rundus, D. (1971). Analysis of rehearsal processes in free recall. *Journal of experimental psychology*, *89*(1), 63. doi: 10.1037/h0031185

Schmidt, S. R. (1985). Encoding and retrieval processes in the memory for conceptually distinctive events. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 11*(3), 565-578. doi: 10.1037/0278-7393.11.3.565

Schmidt, S. R. (1991). Can we have a distinctive theory of memory? *Memory & cognition*, *19*(6), 523-542. doi: 10.3758/BF03197149

Schmidt, S., & Schmidt, C. (2017). Revisiting von Restorff's early isolation effect. *Memory & Cognition*, *45*(2), 194-207. doi: 10.3758/s13421-016-0651-6

Schmidt, S. R., Schmidt, C. R., and Wilson, K. (2019). Priority versus distinctiveness in free recall of words. Manuscript in preparation.

Tulving, E. (1969). Retrograde amnesia in free recall. *Science*, *164*(3875), 88-90. doi: 10.1126/science.164.3875.88

Van Overschelde, J. P., Rawson, K. A., & Dunlosky, J. (2004). Category norms: An updated and expanded version of the Battig and Montague (1969) norms. *Journal of memory and language*, *50*(3), 289-335. doi: 10.1016/j.jml.2003.10.003

Von Restorff, H. (1933). Über die wirkung von bereichsbildungen im spurenfeld. *Psychologische Forschung*, *18*(1), 299-342. doi: 10.1007/BF02409636

APPENDICES

Appendix A

Table 1

Target and background item memory as a function of list structure and word priority.

	Priority	
List Type	High	Low
	Target Items	
Isolation	.85 (.04) [a]	.62 (.05)
Homogeneous	.66 (.05)	.69 (.05)
50/50	.74 (.05)	.66 (.05)
	Background Items	
Isolation	.58 (.02)	.59 (.02)
Homogeneous	.61 (.02)	.60 (.02)
50/50	.66 (.02)	.59 (.02)

[a]Parenthetical values are standard errors of the means.

Appendix B

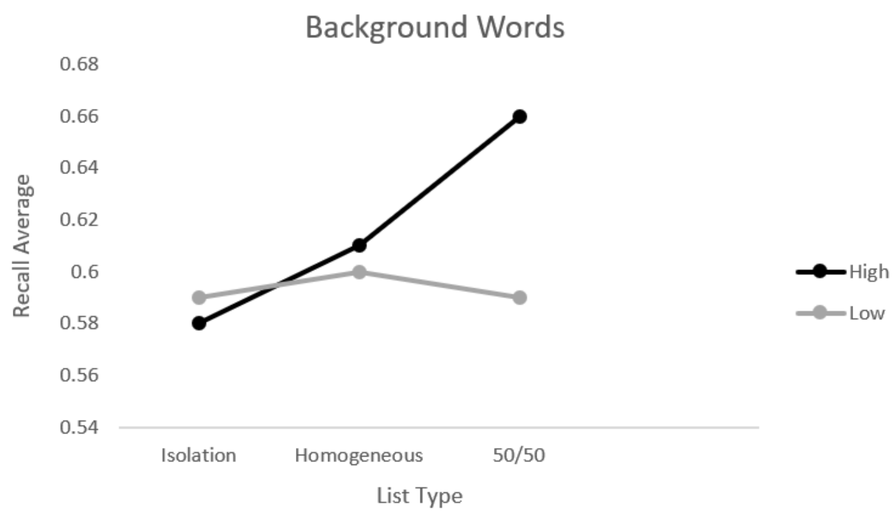

Figure 1. Graph showing the recall averages for background words by list type.

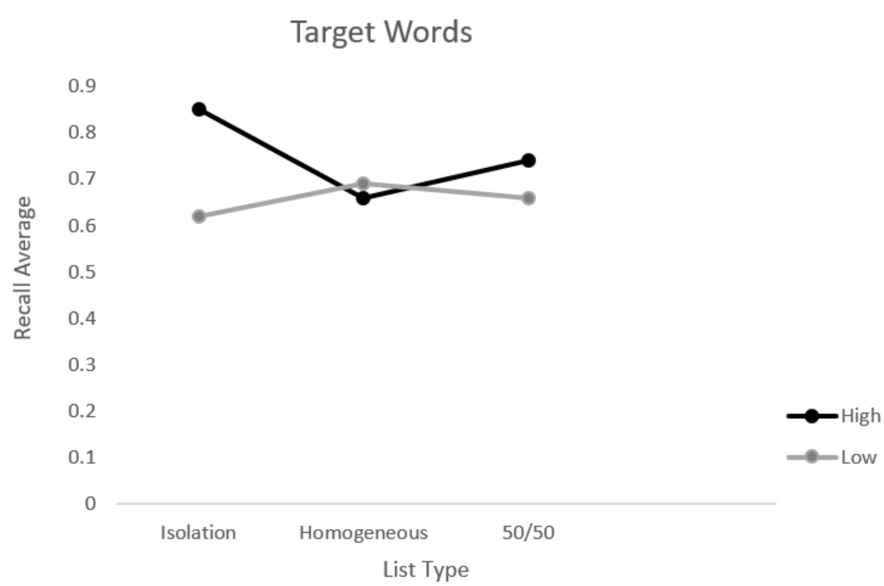

Figure 2. Graph showing the recall averages for target words by list type.

Appendix C

Category Word Bank

Music	Occupations
Drum	Doctor
Guitar	Teacher
Flute	Lawyer
Piano	Nurse
Trumpet	Firefighter
Clarinet	Professor
Saxophone	Accountant
Violin	Dentist
Trombone	Engineer
Tuba	Secretary

Clothing	Fish
Shirt	Salmon
Pants	Trout
Socks	Goldfish
Underwear	Bass
Shoes	Catfish
Shorts	Tuna
Jacket	Shark
Sweater	Flounder
Skirt	Swordfish
Jeans	Herring

Animals	Sports
Horse	Football
Lion	Basketball
Bear	Soccer
Tiger	Baseball
Elephant	Tennis
Deer	Hockey
Mouse	Swimming
Giraffe	Golf
Squirrel	Volleyball
Rabbit	Lacrosse

Tools	Countries
Hammer	Canada
Nail	France
Screwdriver	Mexico
Drill	England
Wrench	Germany
Level	Spain
Ruler	Italy
Sander	China
Measurer	Japan
Knife	Russia

Earth Formations	Fruit
Mountain	Apple
River	Orange
Ocean	Banana
Volcano	Grape
Lake	Pear
Canyon	Peach
Plateau	Strawberry
Tree	Kiwi
Plain	Pineapple
Cave	Watermelon

Appendix D

Informed Consent

Middle Tennessee State University

Project Title: Categorically Enhanced Free Recall

Purpose of Project: The purpose of this project is to examine the relationship between attention and memory for categorical words.

Procedures: You will respond to words printed on a computer screen. You will then complete a memory test.

Risks/Benefits: There are no expected risks for this study. Participants will be able to experience a psychology experiment and may gain knowledge regarding memory and attention.

Confidentiality: All responses will be kept confidential. There will be no links between identity and data.

Principal Investigator/ Contact Information: Kara Wilson, kaw6e@mtmail.mtsu.edu

Participating in this project is voluntary, and refusal to participate or withdrawing from participation at any time during the project will involve no penalty or loss of benefits to which the subject is otherwise entitled. All efforts, within reason, will be made to keep the personal information in your research record private but total privacy cannot be promised, for example, your information may be shared with the Middle Tennessee State University Institutional Review Board. In the event of questions or difficulties of any kind during or following participation, the subject may contact the Principal Investigator as indicated above. For additional information about giving consent or your rights as a participant in this study, please feel free to contact the MTSU Office of Compliance at (615) 494-8918.

Consent

I have read the above information and my questions have been answered satisfactorily by project staff. I believe I understand the purpose, benefits, and risks of the study and give my informed and free consent to be a participant.

____ ____________________

SIGNATURE DATE

____

Printed Name (in order to give you credit in the SONA system, I must be able to read your name)

Appendix E

MIDDLE TENNESSEE
STATE UNIVERSITY

8/1/2014

Investigator(s): Dr. Stephen R. Schmidt
Department: Psychology
Investigator(s) Email Address: Stephen.Schmidt@mtsu.edu

Protocol Title: The Dual Task Isolation Effect

Protocol Number: #15-021

Dear Investigator(s),

Your study has been designated to be exempt. The exemption is pursuant to 45 CFR 46.101(b)(2) Educational Tests, Surveys, Interviews, or Observations.

We will contact you annually on the status of your project. If it is completed, we will close it out of our system. You do not need to complete a progress report and you will not need to complete a final report. It is important to note that your study is approved for the life of the project and does not have an expiration date.

The following changes must be reported to the Office of Compliance before they are initiated:

- Adding new subject population
- Adding a new investigator
- Adding new procedures (e.g., new survey; new questions to your survey)
- A change in funding source
- Any change that makes the study no longer eligible for exemption.

The following changes do not need to be reported to the Office of Compliance:

- Editorial or administrative revisions to the consent or other study documents
- Increasing or decreasing the number of subjects from your proposed population

If you encounter any serious unanticipated problems to participants, or if you have any questions as you conduct your research, please do not hesitate to contact us.

Sincerely,

Lauren K. Qualls, Graduate Assistant
Office of Compliance
615-494-8918