Nigerian Journal of Psychological Research, Vol. 7(2011):1-9

Category Membership as a Factor in Verbal Memory

Philip C. Mefoh & Charles T. Orjiakor
Department of Psychology,
Faculty of the Social Sciences
University of Nigeria, Nsukka

Abstract

This study examined the effect of category membership on verbal memory. Eighty (80) participants composed of 40 males and 40 females were sampled from a mixed secondary school. All the participants were either in senior secondary class I or H. Their ages ranged between 14 and 18 years, with a mean age of 15.72 years. The study adopted a two-randomized-group design. Results of independent groups t-test showed that recall performance was better in the organized category condition than in the randomized category condition: t = -5.67, df = 78, P < .001. The result supports previous studies, which demonstrated that organization was critical for memory performance. The present researchers argue that organizing information into categories was not only important at the time of encoding, but also at retrieval.

There is an interesting variety of topics in the study of human memory. All have in common the properties that something is learned, retained over time, and then used in some particular situations. Some researchers (e.g., Atkinson & Shiffrin, 1968; Baddeley, 2002) recognized three distinct stages to memory: sensory memory, short-term memory, and long-term memory. Incoming information resides in sensory memory for a brief period (generally less than a second) in a relatively unanalyzed form. If a message is to be stored for further analysis, it is converted to a different form, usually verb at and stored in short-term memory. Information in this stage is forgotten in about 30 seconds if rehearsal is prevented. The nature of long-term memory is less well understood. Long-term memory is generally believed to refer to retrieval of memories that have disappeared from consciousness after their initial perception. That is, long-term memory is relatively permanent and nothing is ever lost from it (Sternberg, 2003), although, gaining access to a particular piece of data may be difficult.

The ability to carry out daily tasks and respond appropriately to environmental stimuli is dependent on people's ability to access previously acquired information and how they apply them to solve problems. Remembering may be measured with either recall (e.g., serial recall, free recall, and paired-associate

Author contact: Philip C. Mefoh, Ph.D, (Philip.mefoh@unn.edu.ng), Department of Psychology, University of Nigeria, Nsukka.

recall) or recognition (e.g., yes/no recognition tests and forced-choice recognition tests). Free recall would be used in this study to investigate whether organizing verbal items into related category would improve memory. Free recall, in which a participant recalls items from a list in any order, provides a useful context for the study of retrieval mechanisms. The environment is flooded with stimuli of different kinds, and as memory is powerfully affected by structural factors (Richardson, 2007), information about the world need to be organized in some deliberate pattern to prevent avoidable confusion. Verbal concepts are useful because they summarize stimuli and present them in one block. This provides an efficient way of representing the knowledge of the world and the objects in it (Eysenck & Keane, 2005; Woods, Kishiyama, Yund, Herron, Edwards, Poliva, Hink, & Reed, 2011). Verbal concept reduces the amount of information about an object needed to be stored in memory or described when communicating to other people. This abstraction has been described as cognitive economy, because it divides the world into classes of things and decrease the amount of information required to learn, perceive, remember and recognize information (Coley, Arran, & Merdin, 1997).

Two classical experiments in this area are reviewed hereunder. In one, Bousfield (1953) observed that in a free recall task, participants tend to recall words on a list in clusters of related items even if those words were not clustered together in the study list. The researcher used sixty (60) item lists of related words, fifteen (15) words each from categories of animals, personal names, vegetable and professions. Participants were asked to memorize the list of words and then later asked to recall as many words as possible. Although the words were presented in a randomized order, participants tended to recall them by their categories. Bousfield interpreted this pattern of recall as the "greater-than-change" grouping of items into clusters. This may seem like a trivial finding, but the study showed that the *rememberer* is not a passive agent; instead the individual draws on his or her word knowledge in searching memory.

In another vintage experiment, Bower, Clark, Lesgold, and Winzenz (1969) examined the effect of organizing items into categories would have on memory. Participants were randomly assigned into two groups. Each group saw a total of one hundred and twelve (112) words, presented in four cards. One group saw cards on which the words were presented randomly on the branches, while the other group saw cards on which the words were presented in logical branding diagrams. The process of studying the cards and recalling as many words as they could was repeated four (4) times. The group whose cards had been presented in a logical manner recalled all 112 words in the final two recalls, participants in the other group recalled an average of 70 words on the final recall. In consonance with the two (2) studies, Bower and colleagues maintained that

materials presented in logical categories are more easily stored and recalled from memory than one that were randomly given.

More recently, Greenstein, Blachstein, and Vakil (2010) correlated several measures of attention (e.g., sustained and divided attention) and measures of verbal memory (e.g., immediate and delayed memory) in children aged 8-17 years. The researchers found that most correlations between attention and verbal memory were mediated by age. After removing the contribution of age, relationships were found between attentional and memory measures only in the younger age groups (8-12) but not in the older age groups (13-17). For the younger children, different attentional tests predicted different aspects of verbal memory. Furthermore, boys and girls showed different patterns of attention-memory" relationships.

Similarly, differences in environment and in particular educational experiences play a part in the relative ease or difficulty with which children remember verbal material. Abdelhameed and Porter (2010) examined the performance of 26 Egyptian pupils with Down syndrome and 26 Egyptian typically developing children on two verbal short-term memory tests: digit recall and non-word repetition tasks. The findings revealed that typically developing children showed superior performance on these tasks to that of pupils with Down syndrome, whose performance was both lower and revealed narrower range of attainment. The results suggested that, while deficits in verbal short-term memory in Down syndrome may well be universal, it is important to recognize that performances may vary as a consequence of culture and educational experiences.

Olofsson and Backrnan (1993) examined plausible predictors of prose recall in adulthood and in three groups of older adults (young-old, old, old-old). The participants were tested in immediate recall of random versus organized words, and immediate versus delayed recall of prose passages. Results showed that all groups of older adults recalled less from the prose passages and the word recall tasks than the younger adults. That is, there were no performance differences among the three older adult samples. All age groups showed an increase in the recall of organized words compared to the random words. These results suggest that all age groups utilized the organizational strategy to the same extent, and that forgetting rate was not influenced by age.

Yamauchi and Markman (2000) investigated the effects of classification, inference, and structural alignment on retrieval. Participants were asked "in the study to learn categories in which individual features were depicted with several different instances. The results of the study indicated that participants had significant difficulty learning these categories when they were given a standard classification learning tasks. In contrast, participants learnt the same category

when they were given an inference learning task. In inference task, participants learn the categories by predicting the missing feature of a stimulus when given the category label and information about the other creature. Participants who were allowed to compare stimuli during learning were able to learn categories than participants who were not. These results suggest that a common description of different instances emerges in the process of aligning stimuli.

Mikulincer, Kedem and Paz (1990), in a series of four studies, assessed the relationship between trait anxiety and the way people categorize natural objects. Study 1 examined the relationship between trait anxiety and the rejection of non-prototype members of categories. Study 2 examined whether trait anxiety was related to the narrowing of the breadth of categories. Studies 3 and 4 assessed the relationship between trait anxiety and the perceived relatedness of members of same and different categories. Results showed that as trait anxiety increases, more non-prototype members are rejected from membership in a category, the width of mental categories was narrowed, and the perceived relatedness of members of the same and different categories was reduced.

The review of literature demonstrates that organization of information is a critical feature of mental operation. A participant, who studies material once tend to remember more information in a list if the list was organized than if it was randomized. The moral is clear: organization is a skill that can facilitate memory performance. Since category membership involves similar attributes and features of members, it is hypothesized that in this study, verbal concepts from the same category would be better recalled.

Method

Participants

Eighty (80) participants consisting of 40 male and 40 female senior secondary school students (in SS1 and SS2 classes) of Marist Comprehensive Academy, Uturu, in Imo state, Nigeria, were involved in the study. The participants were randomly selected from 180 students who volunteered to participate in the study. Their ages were between 14 and 18 years, with a mean age of 15.72 years. Table of random numbers was used to assign participants to the two category membership conditions: organized category and randomized category.

Materials

The stimulus material for this study was adapted from the Rosch and Mervis (1975) 120 noun item list. Other materials that were used in the study include:

2 DLP projectors and 2HP lap top computers. The typicality (i.e., 120 noun) item list were classified along 6 category lines of furniture, weapon, clothing, fruits, vehicle, and vegetable. There were 20 items in each category. In other to make the stimulus material culturally relevant, the researchers piloted the instrument with 57 senior secondary school students in a school different from the school of the participants used in the main study. There were 25 males and 32 females, between the age range of 14-20 in the mock study. Participants were asked to underline any of the 120 noun item that they do not understand in reference to their categories.

Analyses of their responses showed that the mean score of the 6 categories vary between 1.18 and 6.19 (higher mean indicate that the category is less well understood). Furniture and clothing, whose mean scores were the lowest (1.18 and 1.56 respectively) were the best understood categories. The 2 categories were selected; however, items in these categories that were underlined as "not understood" by two-third of the participants were removed from the list. Thus, the words "vase", "sofa", and "closet" were removed from the furniture list because 33.310, 35 and 25'10 of the participants failed to understand them. Similarly, "bathing suit" and "mittens" were removed from the clothing list because 25 and 85 of the participants found them unfamiliar in reference to the category. Thirty-five (35) items (18 from the clothing list and 17 from the furniture list), formed the stimulus materials that was used in this study. Three (3) Judges were requested to validate the stimulus material and they approved the use of the 35 items as possessing both face and content validities.

Procedure

Participants were randomly assigned to two conditions of category membership, namely: organized category and random category conditions. Forty (40) participants (20 males and 20 females) were randomly assigned to each condition. Category membership was manipulated by presenting the 35 words differently to participants in the 2 conditions. For participants in the organized category condition, the word list was presented in block formal. That is, words in the same category were all together, but the category name/label (i.e., furniture and clothing) were not given: For participants in the randomized category condition, the word list was scrambled. "That is, words from the 2 category lists were randomized.

Participants in the 2 category membership conditions received the following instruction, "Some words would be displayed on the white-board, your task is category condition, the word list was scrambled. That is, words from the 2 category lists were randomized.

Participants in the 2 category membership conditions received the following instruction, "Some words would be displayed on the white-board, your task is to study the words carefully. The words would be on display for only 5 minutes, after which you would be required to answer a few questions about the words that were presented". When all the participants had understood the instruction, they were asked to look at the white-board. Five (5) seconds later, the stimulus material was projected. The block format arrangement was shown to participants in the organized category condition, while the randomized format arrangement was shown to participants in the randomized category condition. At the expiration of 5 minutes, the words were withdrawn. There was a waiting period (i.e., retention interval (RI) of 5 minutes before the start of the test session.

After the RI, participants in the 2 conditions were given plain A4 white paper each. They were asked to write down on the paper, words they had remembered from the word list. They were informed that the test would take 5 minutes, and that they have the freedom to recall words on the list in any order they want. Before the researchers commenced the test, they reminded the participants that the task was purely for research purpose, and that participants need not look into another's work. At the end of the test, participants' responses were collected for analysis. Thereafter, participants were told the purpose of the experiment, and were asked if they would have participated in the research had they been informed of the purpose earlier. All the participants said they would still have participated, and stated that they (now) understand why minimal deception was necessary in the study.

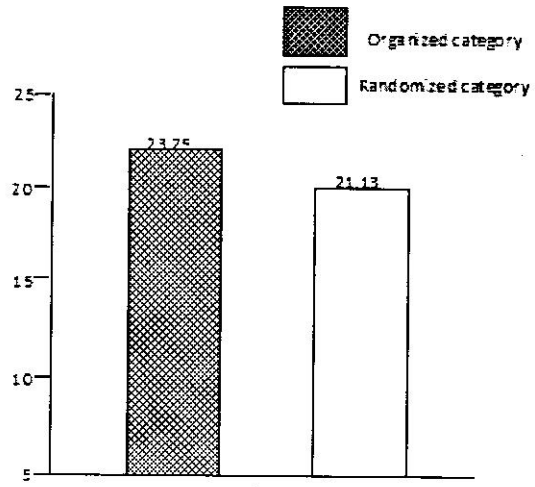
Design/Statistic

The design of the study was a two-randomized-group design. The t-test for independent samples was employed to compare the difference in the sample means of the two category membership conditions.

Result

The bar chart shows that organization facilitates memory performance. Participants in the organized category condition remembered more words (M = 23.25) compared to participants in the randomized category condition (M = 21.13). Result of the independent t-test indicates that the difference between the two independent sample mean scores was statistically significant, $t = -5.67$, $df = 78$, $P < .001$. Recall performance was better in the organized category condition than in the randomized category condition.

Figure 1



Discussion

This study investigated the effect of category membership on verbal memory. Category membership was characterized into two conditions, namely organized category condition and randomized category condition. Analysis of data showed that participants in the organized category condition recalled more words compared to participants in randomized category condition. This result tends to support previous studies (e.g., Coley et.al. 1997; Mikulincer et.al. 1990; Olofsson & Backman, 1993), which demonstrated the importance of organization in retrieval operation. Researchers were aware that organizing or categorizing information facilitates memory performance, but they were not sure whether this was important only at the time of encoding, only at the time of retrieval or at both times. Organization, storage, and retrieval of information are critical features of memory processes, and the present researchers argue that organizing material was not only useful during the process of placing information into long-term memory (encoding), but also during retrieval.

Learners use different kinds of learning tactics in a highly strategic manner to regulate their learning (Woods et.al, 2011). Organizing information into categories is an essential skill or tactics that allow learners to keep the to-be-remembered (TBR) information active in memory. For example, in peg mnemonics, learners memorize a series of "pegs" on which to-be-learned information can be hung. Learners who have mastered the peg method can use it to learn lists of items, like the ones presented in this study. Categorizing lists of unrelated terms and concepts. Learners should be encouraged to use other methods, however, when learning complex materials (Bruning, Schraw, & Ronning, 1999; Gathercole, Pickering, Ambridge, & Wearing, 2004).

Beyond its use for committing various lists to memory, organizing materials into category has also been shown to be an effective means of retrieval. Rabinowitz and Craik (1986) pointed out that the organization of material and the context in which it is learned have considerable influence on how well the material is remembered. That is, if one processes TBR information in a highly strategic manner, the individual is more likely to remember the information from memory when he or she needs it; otherwise the individual looses the information. This outcome was best demonstrated by the phenomenon of encoding specificity, the idea that remembering is enhanced when conditions at retrieval match those present at encoding. One interesting aspect of this phenomenon is its generality. Researchers (e.g., Tulving, 1983) have demonstrated that retrieval is more efficient when it matches encoding conditions. Context dependent studies (e.g. Cassaday, Bloomfield, & Hayward, 2002; Mefoh, 2006) suggest a very strong relationship between the conditions at encoding and those at retrieval: the more these conditions match, the more likely it is that retrieval will be successful.

Conclusion

Organizing/ categorizing information into related concepts is a memory aid designed to help learners remember information. By implication, the structure of material that students encounter influences memory performance. Well organized materials tend to be better remembered than poorly organized materials. However, learning information does not occur in isolated acts such as "encoding" or "retrieval", rather memory is the result of all these processes. That is, encoding and retrieval are linked; problem in one area would lead to problem in ~other (Abdelhameed & Porter, 2010). The inferences drawn from this study is severely limited by the fact that only a single factor - category membership, was varied. Although the isolation was to exercise strict control over extraneous variables, it is recommended that a better way to replicate this study would be to extend it by adding some new factors. This way, the generality of the finding can be maintained over different independent variables.

References

Abdelhameed, H. & Porter, J. (2010). Verbal short-term memory performance in pupils with Down syndrome. *International Journal of Disability, Development and Education, 57*(4), 427 - 438.

Atkinson, RC & Shiffrin, RM. (1968). Human memory: A proposed system and its control processes. In K. W. Spence & J. T. Spence (Eds.). *The psychology of learning and motivation: Advances in research and theory* (vol. 2, pp. 89-195). San Diego: Academic.

Baddeley, A. (2002). Is working memory still working? European Psychologist, 7, 85-97. Bousfield, W.A (1953). The occurrence of clustering in the recall of randomly arranged associates. *Journal of General Psychology, 49*, 229-240.

Bower, G.H., Clark, M.C, Lesgold, AM., & Winzenz, D. (1969). The effect of organization in memory. *Beginning Psychology,* p.75.

Bruning, R.H., Schraw, G.J., & Ronning, RR (1999). *Cognitive psychology and instruction* (3rd ed.) New Jersey: Prentice-Hall

Cassaday, H.J., Bloomfield, RE., & Hayward, N. (2002). Relaxed conditions can provide memory cues in both undergraduates and primary school children. *British Journal of Educational Psychology, 72*, 531-547

Coley, J.D, Artan S., & Merdin, D.L (1997). Does rank have its privilege? Inductive-inferences within folk biological taxonomies. *Cognition, 64,* 73-112.

Eysenck, M, W. & Keane, M.T (2005*). Cognitive psychology: a students' handbook* (5th ed.). New York: Psychology Press.

Gathercole, S.E., Pickering, S.J., Ambridge, B., & Wearing, H. (2004). The structure of 'working memory from 4 to 5 years of age. *Developmental Psychology, 40,* 177-190.

Mefoh, P.C (2006). Effects of levels of processing, context and gender differences in recall memory. *Nigerian Journal of Psychological Research, 5*, 20- 27.

Mikulincer, M., Kedem, P. & Paz, D. (1990). Anxiety and categorization: The structure and boundaries of mental categories. *Personality and Individual Differences, 8*(2), 805- 814.

Olofsson, M. & Backman, L. (1993) Predictors of prose recall in adulthood and old age. *Archives of Gerontology and Geriatrics, 16*(2), 113-122.

Rabinowitz, j.C, & Craik, F.LM. (1986). Specific enhancement effects associated with word generation. *Journal of Memory and Language, 25*, 226-237.

Richardson, J.T. (2007). Measures of short-term memory: a historical review. *Cortex, 43* (5), 635-650.

Rosch, E. & Mervis, CB. (1975). Family resemblances: studies in the internal structure of categories. *Cognitive Psychology, 8,* 38-439.

Sternberg, RJ. (2003). *Cognitive psychology.* Boston: Wadsworth/Thomson Learning Inc. Tulving, E. (1983). *Elements of episodic memory*. Oxford: OUP.

Woods, D.L., Kishiyama, M.M., Yund, E.W., Herron, T.J., Edwards, B., Poliva, 0., Hink, R.P., & Reed, B. (2011). Improving digit span assessment of short-term verbal memory. *Journal of Clinical and Experimental Neuropsychology, 33*(1), 101-111.

Yamauchi, T. & Markman, A.B. (2000). Learning category composed of varying instances: The effect of classification, inference, and structural alignment. *Memory and Cognition, 28* (1), 64-68.