

Imagery in Paired Associate Recall

Renu Rathee*

Abstract

Memory is cognitive processes that defines the dimensions of our mental organization and enable us to encode, store, retain and recall the information from past experiences. Since ages this topic fascinates the researchers and they are trying to know more about the information processing system in memory. Knowing more about how memory works, scientist can develop human centered interfaces which correspondent to the natural abilities of the users, save their efforts and increase usability. In memory the nature and form of learned material plays an important role in determining that how much material we would be able to recall after presenting that material. Paired associate recall is one the basic paradigm of memory that is used to understand how people encode and retrieve the newly formed association among the stimuli. The present paper is an attempt to investigate the role of imagery in paired associate recall.

Key words: Memory, information processing, paired associate recall, imagery.

Introduction

In some writings (Atkinson & Shriffrin, 1971; Shriffrin & Geisler 1971; Shriffrin 1975, 1976) the sensory register has been combined with short term store. One of the major reason for this change was rapidly accumulating evidence that information arriving at the sense organ undergoes many stages of recording and the stage persists for varying duration (Crowder and Morton, 1969; Massaro, 1970). There are three structural components of memory: the sensory register, the short term memory and long term store. Incoming sensory information first enters in sensory register, where it resides for a very brief period of time, then it decays and lost. Information in short term memory store decays completely and is lost within a period of 30 seconds but rehearsal can maintain a limited amount of information in the store as long as the subject desires. The long term store is fairly permanent repository for information which is transferred from the short term store.

*Associate Professor, Psychology, Dayanand College Hisar-125001, Email: drrenurathee1997@gmail.com

In 1966 Montage performed a study on mediators. Pairs of nonsense syllables were presented to the subjects who have to write down any neutral mediator which occurred to them. It was found that proportion of correct items on which the neutral language mediator was retained 70% while negligible for items where neutral language mediator was forgotten. A different encoding technique was examined by (Clark & Bower, 1969). Subjects were required to learn several lists of paired associate items in which each item was a pair of a familiar word. It was found that experimental group performed 40% better than the control group.

There are two basic methods for testing memory which are recognition and recall test, in addition, there are numerous variation of these techniques such as, forced choice method and other modification etc. In paired associate learning the subject learns a list of stimulus- response pair. In the pair, the first word serves as (stimulus) S for the recall of the second number of the pair which is traditionally called the response word. The subject learns to perform the conditioned R (response) when the conditioned S is presented.

Historical Review

Previously many studies have been conducted in this context. Morelli et al. (1971) Observed that the Ss' who rated themselves pictorializers vs verbalize ears were related to paired associate learning only in the pictures -imposed imagery condition. Similarly an experiment was conducted by Anderson and Richard (1971) which suggested that imagery instructions facilitated learning by causing the subjects to process the sentence in a meaningful fashion. A wide range of cognitive psychology research exists which proves that pictures are retained better in our memory than words because picture enhances recollection as compared to words (Curran, T., 2011). Shrivastava and Purohit (1983) also found that recognition was better for pictures as compared to the words. Joseph et al. (1984) compared free recall grouping pictures: picture's name and complete form were remembered better than both types of word stimuli and supported the dual coding hypothesis. Mecklenbranker and Silvia Conducted another study in 1984 on the influence of imagery on memory recall and found that the free recall performance as well then low imagery ones on the semantic elaboration of words. Similarly many studies have conducted and most studies suggested that the recall of inter-related pictorial material was better than the other types of the material.

Design and methodology:

The present study was conducted in two ways mainly i.e the picture and the words. Each picture and words manner of presentation was varied in two levels. There were four conditions:

Condition I

The first condition was concerned with the separate picture.

Condition II

It was concerned with the interacting picture condition.

Condition III

The third condition was concerned with the interacting sentence group.

Condition IV

It was concerned with the subject who participated in verbal repetition condition.

A 2x2 factorial design was used in the present study.

Sample:

40 female subjects of 17 to 19 years from MDU, Rohtak, were selected on random basis and different groups of 10 subjects participated in different conditions.

Material:

A list of 20 different words almost of equal length, 10 cards containing interacting pictures of these respective words separately on a card of size 4.9 X 2.8 inches each (Pictures were made with black line drawings), 10 cards containing interact interacting sentences of these respective words, 10 cards containing single word of each pair, all were presented tachistoscopically and a stopwatch was used to note down the reaction time.

Procedure:

The arrangement for the four conditions was made accordingly. For each condition there was a large table, tachistoscope was placed on the table at a distance of three feet from the subject. A

total 50 cards were also kept there. The job of the experimenter was to expose the card 1 by 1 tachistoscopally and to note down the answer and the reaction time of the subject. In the first part of the first condition, the subject was to look at the tachistoscope, see 10 cards, each containing 2 unrelated words and each card was presented for 8 seconds. In the second part of the first condition, the job of the subject was to see the separate pictures of 10 respective cards by the same way and for the same duration. After this the subject was presented 10 cards which were containing a single word of that respective pair and the subject was asked to recall the second word of that pair. No rest pause was given between these parts of the condition.

In the second condition, the first part of the condition was performed exactly like the first part of the first condition. In the second part the subject was to see 10 interacting picture of those respective words. And then the subject was presented the same card which were containing one word of that pair (which were also presented in the first condition in the recall phase) and was asked to recall the other pair of that pair. And similarly no rest pause was given in this condition also.

In the third condition also the first part was similar to the first two conditions and in the second part of the third condition the subject was presented 10 cards containing interacting sentence of those interacting pictures the same way and for the same duration. In the recording phase the same cards were presented which were presented in the recording phase of the first two conditions and the subject was asked to recall the other word of the pair.

Finally, in the 4th and the last condition, the first part was conducted in the same way (like I, II and III condition) and in the second part of the condition the subject was to repeat verbally the words of the cards (the words were the same, which were on those cards, which have been presented in the first part of the all conditions) for 14 seconds each. After this in the last condition the subject was to see the words (one member of the pair, which was in the first part in all the conditions) and was asked to recall the other word. No rest pause was given on any of these parts of the condition. In the recalling phase every time reaction time and the response given by the subjects were noted down. These way 10 different subjects were used in each different condition.

Results and Discussion

The analysis of variance of correct responses was applied and it revealed significant main effects and non-significant interacting ones (table II). The condition of presentation (i.e. picture/word) was found to be significant beyond .01 level of confidence (F. 9.43, 1/36). The correct response is for picture condition was significantly higher than that for words. The presentation form (separate vs. interacting) was also found to be Significant at .001 level of confidence (F. 15.31, 1/36) whereas, the interaction between the two variables were found to be non-significant. The number of correct responses was more in the picture condition in comparison to the word condition. But the mean of interacting presentation is more in both the picture as well as the word condition then in the separate condition. The interaction between these two is not observed since they are parallel to each other. As far as the judgment time is concerned, the presentation condition (picture vs. word) was found to be non-significant (table 4). Similarly, the main effect of presentation form as related to reaction time is also observed to be non-significant. However, the interaction between the two presentation conditions and the form of presentation is found to be non-significant predicting no difference between the pictures vs. words condition. Along with this the separate and mediation level of presentation form found on significant indicates the same thing.

The mean RT in picture condition is less than word condition. Similarly the main RT in interacting presentation form is somewhat less than the separate presentation (Table III).

The t test was applied in all the four conditions to compare one with another: The t test was applied first on I and II condition ($t = 17.24$ Significant at .01 level) then on I and III condition ($t = 2.205 < .05$) then on I and IV condition ($t = 6.2 < .01$) then on II and IV condition ($t = 17.12 < .01$) and finally on III and IV condition ($t = 7.14, < .01$ level).

When the t was applied on three and four conditions for individual comparison (t was 7.3, $< .01$) there was found a difference between these two conditions (interacting sentence and verbal repetition condition).

On the basis of all these comparisons, we can say that all these four conditions are different from one another.

Table- I

Showing means of correct response in different conditions

	Picture	Words	X̄
Separate	7.1	6.8	6.95
Interacting	9.3	8.1	8.7
X̄	8.20	7.45	

Table –II

Showing Summary of ANOVA of correct conditions

	Ss'	df..	Ms	F	P
A	5.63	1	5.63	9.43	<0.1
B	30.63	1	30.63	51.31	<.001
AB	2.02	1	2.02	3.38	ns
WS _s	21.5	36	0.597		

Table-III

Showing means of RT for different conditions

	Picture	Words	X̄
Separate	15.95	17.38	16.66
Interacting	16.62	17.08	16.39
X̄	16.13	17.22	

Table-IV

Showing summary of ANOVA of RT

	Ss'	df.	Ms	F	P
A	0.117	1	0.117	1.5	ns
B	0	1	0	0	ns
AB	0.012	1	0.012	0.15	ns
WS _s	2.81	36	0.078		

These results are strongly supported by the study conducted by Beg et al. in 1984 showing the contribution of imagery context. And similar results were obtained by Rungquist and Peggy (1970). When he observed the cluster in free recall. The stimulus and the response team clustering were increased when the Ss' had "associate" learning prior to it .

The overall differences among the conditions are found to be significant which indicates that all four conditions are different from one another. The greater number of correct responses and interacting picture condition again supported the view of paired associate learning as well as the pictorial superiority in the recall.

The superiority of interacting picture condition over interacting sentence conditions suggested by the view of Anderson and Richard in 1970 that imagery facilitated learning by causing subjects to process the, sentence in a meaningful fashion. The results (interacting picture response are better than verbal repetition condition) are also supported by Groninjer and Lowell (1976) and Morries and Steven (1975). Willhosh and Lorraine in their study have stated that pictorial superiority is even observed in four year old children.

The contextual information observed to the best of all condition is also supported by various researcher (Hall et al. 1984; Tulving, E, 1972), when they found the advantages of interactive imagery over separate ones in which Ss' was instructed to form images . Nemours empirical findings suggest that when a word can evoke an image or have a semantic relation with a pictorial representation, verbal and image codes are stored in interconnected way in memory system (Paivio A. 2012). The effectiveness of a pictorial presentation can improve memory for word, because semantic elaboration can increase the pictorial superiority effect (Cherry, K. et al, 2012). While analyzing the obtained results, the researcher finds non-significant difference among the four presentation condition as far as reaction time is concerned. It indicates that in all conditions Ss' took almost equal judgment time in recalling the objects/things. But the difference in all the four condition is quite apparent when correct responses are obtained in the same. Therefore, it can be stated that the only cause of superiority of interacting picture stimuli over other condition is due to contextual items or it can be explained in a similar manner of linking the items to cohesiveness of the material, thus after analyzing the result we can state that the recall of interactive pictorial material is better than the interactive sentence and separated words.

References:

- Anderson & Richard (1971). Imagery and Sentence Learning. *Journal of Educational Psychology*, (62), 526-530.
- Atkinson, R.C. & Shiffrin, R. M. (1971). The control of short term memory. *Scientific American*, 225 (2), 273-290.
- Bower, G & Clark, M. (1969). Narrative stories as mediators for serial learning. *Psychology .Psychonomic Science*.
- Cherry K. E., Silva Brown J., Jackson Walker E., et al. (2012). Semantic encoding enhances the pictorial superiority in the oldest-old. *Aging, Neuropsychology, and cognition*. 19(1-2)319-337.
- Crowder, R.G. & Morton, J. (1969). Pre-categorical Acoustic Storage (PAS) Perception and Psychophysics. 5, 365
- Groniger, Lowell, D. (1974). The role of images within the memory system: Storage or retrieval. *Journal of Experimental Psychology*.
- Curran T., Doyle J. (2011). Picture superiority dissociates the EPR correlates of recollection and familiarity. *Journal of cognitive neuroscience*. 23(5): 1247-1262.
- Hall Craig, Buckotz (1983). The effect of separate and interactive imagery on the recall of movement pattern. *Canadian journal of Psychology*. 37 (2) 306-312.
- Joseph Charistopher, A. Waln Rohald, F., Stone Devil (1984). R. Effect of free recall grouping pictures, pictures and words, and complete picture discrimination. *Journal of General Psychology*. 110 (1) 69-73.
- Massaro, D. W. (1970). Perceptual auditory images. *Journal of Experimental Psychology*. 85, 411-417.
- Mecktenbranken & Siliva (1984) (West German) Memory recall. *The Influence of Imagery*, 31 (1) 124-138.
- Montague, W. E. Adam J.A. & Kless, H. O. (1966) Forgetting and natural language indication. *Journal of Experimental Psychology*, 79, 829-833.

Morries & P.E. Stevens. (1974) *Linking images and free recall. Journal of Verbal and Verbal Behavior.* 103 (1) 188-190.

Morelli, George and Diana (1971). *Imagery and Pictures in paired associate memory, Perceptual and Motor Skills*, 33, 1247-1250.

Paivio A. (2012). *Mind and Its Evolution: A Dual Coding Theoretical Approach*. New York: Psychology Press.

Renguist, Piggy. A. (1970). *Clustering in free recall following paired associate memory. Journal of Experimental Psychology.* 83 (2) 260-265.

Shiffrin, R. M. & Geister, W. S. (1973). *Visual recognition in theory of information processing*. In R.L.

Solso (Ed). *Contemporary issues in Cognitive Psychology: The Loyala Symposium*, Washington, D.C.: Winston, (Distributed by Halsted Press, Wiley, New York)

Shiffrin, R. M. (1976). *Capacity limitation in information processing, attention and memory*, In W. K. Estrs (Ed). *Handbook of Learning and Cognitive Processes. Volume 4. Memory Processes*. Hilldale, N. J. Lawrence Erlbaum Associates.

Shrivastva: Akahd Purohit (1983). *Short term recognition memory for pictors and words. A dual coding interpretation. International Journal of Psychology in the Orient*, 26 (4), 241-245.

Tulving E. *Organization of Memory*. Academic Press: New York; (1972). *Episodic and semantic memory*; pp. 381-403.