

The effectiveness of pictures and words on memory recall



Abstract

This experiment was designed to investigate whether people would be able to recall pictures or words more after seeing them for a brief period of time. To carry out this study, 52 subjects with the same age were divided into two groups, Group A and Group B. During the test, group A was asked to see a list of 20 pictures, while the other group was asked to see a list of 20 words. Subjects were given one minute to review their items. After a four minute-long filter task, the subjects were given one minute to recall the items. Taking a general overview, results showed that subjects were significantly able to recall more if the items are presented as pictures rather than if the items were presented as words. T-test that compared the means of the two sets of data showed that there was sufficient evidence to suggest that the mean score in memory test for pictures recalled was greater than words recalled, concurring with the experimental hypothesis.

Null Hypothesis

There will be no significant difference between the number of pictures or words recalled.

Experimental hypothesis

The number of pictures of recalled will be significantly greater than number of words recalled.

Research and Rationale

This experiment was designed to investigate the effect of pictures versus words on memory recall, hence the effectiveness of either method on learning. Memory can be defined as retention of information over time <https://assignbuster.com/the-effectiveness-of-pictures-and-words-on-memory-recall/>

through three processes, which is encoding (input), storage (throughput) and retrieval (output).[1]

Retrieval-calling back stored information.

Storage- retaining information in sensory memory, short-term memory or long -term memory.

Encoding- receive, process and combine perceived information into memory to be stored within the brain.

Figure 1 shows three main stages in the formation and retrieval of memory

There are three types of memories, namely sensory memories(SM), short-term memory (STM) and long-term memory (LTM).

Maintenance rehearsal

Long-term memory

Secondary Tertiary

memory memory

Transferred

Short-term memory

Attention

Incoming info

Sensory memory

Retrieval

Cerebral cortex(FACT MEMORY)

Cerebral and cerebellar cortex (SKILL MEMORY)

Permanent loss due to neural fatigue, shock, interference by other stimuli

Temporary loss

Permanent loss

Figure 2 shows how memory is stored and the conversion from sensory memory into short-term memory and long-term memory.

Our memory begins when sensory information from environment, such as sight, sound, smell, taste and touch arrive at our sensory receptors. This information coming into the brain is hold by sensory memory.[2]Sensory memory has only retention potential of maximum three seconds unless attention is given to transfer the information into short term memory or long term memory. In this experiment, the pictures and words that were given to the subjects were visual stimulus which were detected by sensory memory (iconic memory) and converted to short term memory if attention is given to this stimulus.

Incidentally, short-term memory is actually a component of working memory. Working memory is needed to hold information in mind which is needed to do reasoning, learning or comprehension. The subjects use working memory to understand and learn the pictures and words given. According to Alan Baddeley and Graham Hitch working memory model, this model is made up of four components: the central executive to supervise information

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integration and for coordinating the slave systems, the phonological loop which deal with sounds and phonology information, visual-spatial sketchpad which hold the information that we seen and episodic buffer which combine information from two slave systems with long term-memory.[3]In this case, words given would be stored in phonological loop while pictures given were associated with visual-spatial sketchpad slave system.

Memory is formed when stimulation at facilitator terminal and sensory terminal at the same time causes releasing of serotonin at facilitator synapse on the sensory presynaptic terminal which activate enzyme thus forming of cyclic adenosine monophosphate(cAMP). The cAMP form block potassium conductance channels in the sensory terminal reducing flowing of potassium ions out thus causing prolonged effect of action potential. Prolonged effect of action potential activates calcium channel for longer times, allowing tremendous calcium ions into sensory terminal, thus greatly increase releasing of transmitter into synapse. Thus, this transmission at presynaptic terminal indirectly causing prolonged change in sensory terminal, producing memory traces.[4]As long as there is continuous reverberation of signals within the brains and the signals go around the neurons circuit for times after the incoming sensory information is gone and the reverberation persists, the information can last long in the person's head.

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Figure 3 shows memory system that has been discovered in snail *Aplysia*

A project that is done by Srivastava and Purohit (1979) has proved the

superiority effect of pictures on memory recalled. Research also showed that <https://assignbuster.com/the-effectiveness-of-pictures-and-words-on-memory-recall/>

when filter task was given, both pictures and words recalled decreased, but word recalled showed a more significance decrease. Another study had been done by Rusted and Coltheart (1979) on nine to ten years old children who read various passages that with pictures or passages that without pictures. The outcome was that children tend to remember the passage better if pictures were presented together with the passage.

Results get from these studies benefit to a number of situations, especially in finding the best teaching method as well as an aid for studying. Educators could present the teaching materials in pictures form especially in the main content of the lesson. An example like if diagram of chloroplast is shown, students tend to remember it better rather than if a word " chloroplast' is shown. Thus, pictures can facilitate better retention of information in students' mind. Students can also draw pictures at the side of a vocabulary or a new-learned term to help them remember better. Besides, a vast information need to be remembered in text books, an adding of pictures alongside can help students understand and memorize batter the information present.

Planning

Several trial experiments were conducted to find the best experimental procedure. A sample of eight subjects with aged 20 was taken to conduct these trials.

Trial 1: The number of pictures that should be given

The first trail to carry out was to investigate the appropriate number of

pictures for the memory test. Four participants were given ten pictures while <https://assignbuster.com/the-effectiveness-of-pictures-and-words-on-memory-recall/>

the other four were given 30 pictures. The pictures given for the two groups were the same which was going to be used in the actual experiment. After reviewing the pictures for one minute, the participants were required to do a 4-minute filter task, comprising of mathematical calculations. After that, the subjects were asked to write down as many pictures they could remember in one minute given time.

Number of pictures

Replicate one

Replicate 2

Score

Percentage

Score

Percentage

10

10 out of 10

100.00%

10 out of 10

100.00%

30

16 out of 30

53. 33%

18 out of 30

60. 00%

Table 1: results of experiment trial one

The results show that the subjects who were given a list of fewer pictures (10) had full score while the subjects with 30 pictures hardly recall the pictures that they had seen. Hence, I decided to use moderate number of pictures that is 20 pictures in the actual experiment. This trial was carried out for pictures as the items for recall as the effect of the factor investigated was assumed to be the same for both pictures and words tests.

Trial 2: Coloured items versus grayscale items

Another trial experiment was done to find out either the items used for recalled should be printed in black (on white paper) or in colour. The first four subjects were given a list of 20 coloured pictures and one minute to look at them. They are then asked to recall the pictures after four minutes of filter task as in the previous trial. This procedure was repeated with new list of pictures which were printed black.

Colours of pictures

Score

Percentage

Coloured

20 out of 20

100.00%

Grayscale

14 out of 20

70.00%

Table 2a) Results of experiment trial 2

The list of pictures was then replaced with 20 coloured words. Another four subjects were given one minute to review the items and asked to recall after a similar 4-minute filter task. This was then replaced by new set of grayscale words.

Colours of words

Score

Percentage

Coloured

19 out of 20

95.00%

Grayscale

10 out of 20

50.00%

Table 2b) Results of experiment trial 2

From table 2a) and 2b), a more significant difference was obtained from using grayscale items rather than coloured items. So, grayscale items in pictures and words from were chosen as the items for recall.

Trial 3: Duration of Filter Task

This trial experiment was done to determine the suitable duration for filter task after being presented with information before proceeding to the recall test. The subjects were asked to recall items remembered after doing filter task which last for two minutes. The same procedures were repeated for same set of pictures and filter task which last for three minutes, four minutes and five minutes.

Duration of Filter Task (minute(s))

Score

Percentage

2

19 out of 20

95.00%

3

17 out of 20

85.00%

4

16 out of 20

80.00%

5

11 out of 20

55.00%

Table 3: Results of experiment trial 3

The table shows that when the filter task was carried out up to four minutes, the percentage scores were relatively constant. However, the score decreased when the duration was increased to five minutes. Thus, four-minute of filter task was chosen to distract the subjects and prevent the subjects from rehearsing the information that they just received.

Experimental method

A random sample of 52 subjects aged 20 was selected from the A-level students in my college.

The subjects were divided into two groups, which is Group A and Group B, with each group consisting of 26 subjects.

Participants of Group A were provided with three sheets of paper beforehand, one with 20 pictures, the other one with filter task consisting of mathematical problems, as shown in Appendix 3, and the last one was blank recall sheet.

Participants of Group B were given the same sets of paper except they were given 20 items presented as words instead of pictures.

The test was conducted at the same time for both groups. Both groups were given one minute to review their items.

Next, the 50 subjects were asked to perform the 4-minute filter task, after which Group A was given one minute to recall as many pictures as possible while Group B was asked to recall as many words as they could.

The recall sheets were collected and the scores for participants from each group were recorded.

Both the memory tests were carried out in quiet and private environment.

Risk Assessment

This experiment was a low risk procedure. Before the experiment, the subjects were informed that the results obtained was not used to test one's intelligent or memory capacity but for a scientific investigation. As such, the participants could decide whether to take the test or not and hence getting their permission to use their results. Besides, this can prevent causing any

stress in participants. To preserve confidentiality of the subjects, their details and results used in this experiment were kept anonymous.

Results

Number of items recalled

Number of people, \bar{X} '

Pictures (Group A)

Words (Group B)

0

0

0

1

0

0

2

0

0

3

0

1

4

0

0

5

0

1

6

0

1

7

0

2

8

0

2

9

0

3

10

1

5

11

2

4

12

3

4

13

3

2

14

6

1

15

5

0

16

3

0

17

2

0

18

1

0

19

0

0

20

0

0

Table 4 shows frequency of number of items recalled.

Graph 1: Comparing Effectiveness between Pictures and Words on Memory

Number of people

0

3

6

9

12

15

18

Pictures

Words

Graph 2: Number of pictures or words recalled in both types of memory tests

Statistical Analysis

Independent t-test with equal variance was used to compare means of two samples. T test was conducted to test either the differences between means of null hypothesis and experimental hypothesis is 0. 0 or greater than 0. 0.

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The mean score of pictures stimuli (14. 0769) is generally higher than mean score of words stimuli (9. 7308). Assuming equal variances, the calculated t-value is 6. 73144($p < 0. 05$, d. f= 25). Therefore the experimental hypothesis is accepted and null hypothesis is rejected.

Formulae

Number of items recalled

Pictures (Group A)

Words (Group B)

348

259

n

26

26

14. 0769

9. 7308

99. 8462

171. 1154

3. 9938

6. 8446

2. 3279

= 6. 7314

Table 4: calculation for t-test

Where is mean of Group A

is mean of Group B

is variance of Group A

is variance of Group B

is sample size of Group A

is sample size of Group B

Interpreting and evaluation

Graph two shows that the number of pictures recalled was generally higher than number of words recalled. For pictures memory recall test, the scores ranged from 10 to 18, with mode 14 scored by six subjects while for words memory recall test, the scores achieved was noticeably lower, ranging from 3 to 14 and with the mode 10 achieved by five subjects. Generally, the results indicate that subjects tend to remember more pictures than words in a given time.

There is an anomalous score present in group B. One explanation for the subject who only scored three correct answers out of twenty is that the

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subject probably had been distracted during the memory test. The subject might feel uncomfortable during the test. This can be due to a headache or stomachache that cause the subject cannot concentrate fully.

Paivio (1991) proposed a dual coding model to explain the superiority effect of pictures on memory. Pictures were better to be remembered than words as pictures elicit two specific codes (pictorial and verbal) while words encoded only a single code (verbal). The extra pictorial code enables pictures to be better remembered. Paivio claimed that pictures are amenable to semantic coding through two different routes while words are only processed through one way. [5] There are more ways to retrieve pictures than words thus pictures will be superior to words.

According to the model-transfer appropriate processing theory by Weldon and Roediger (1987), it is the type of processing during retrieval that determines whether pictures or words are better remembered. The items that are encoded with conceptual processing will be better remembered and recalled compared to items that do not have any or less conceptual meaning. [6] Pictures are believed to be associated with more conceptual processing and thus better retrieved than words.

Recently, one finding suggested that it is the filter task that gives pictures an advantage over words. A filter task will have an effect on printed words as it would draw some resources from the storage of printed words. This is because while doing mathematics questions, some intermediate results might be stored in verbally thus interfere with the words that are stored in the verbal buffer.

[7]However, pictures that were stored on visual spatial sketchpad would not be affected.

There is another explanation that make use of fMRI which suggest that when subject recalls pictures, there is an increase in activity in right frontal lobe and parahippocampal cortex on both sides while when subject recalls words, there is increase activity in left frontal lobe and parahippocampal cortex on left side only. Thus, pictures are recalled more than words.

Evaluation

A large sample of 52 subjects was chosen to minimize errors in this experiment. A large sample was needed to have an accurate, precise and reliable statistical result. Besides, gender was set to be consistent in this experiment. As such number of male subjects and female subjects was divided equally in this experiment with each group consisting of 13 male subjects and 13 female subjects.

In addition, the age of the subjects chosen was kept constant. This factor had to be kept constant as loss of memory in aged person might provide unreliable result. The level of education was kept constant in this experiment, which small children were not chosen as they might have difficulties in understanding pictures and words given.

As well as that, subjects that have attention or memory deficit disorders were withdrew from this experiment to reduce anomalous result. In addition, the subjects were carefully chosen in this experiment. Subjects that were sick or lack of sleeping were eliminated from this experiment. Subjects also

required having breakfast before experiment. These were kept constant to make sure subjects could performance normally in the memory test.

Furthermore, the time of conducting the experiment was kept constant. All subjects were required to do memory test at the same time as effectiveness of learning and memorizing could be differed throughout the day. The test was conducted in a close room to provide a quiet environment to the subjects besides avoiding any unnecessary distraction to the subjects.

Limitations and modifications

In this experiment, the subjects were divided into two groups with one group doing pictures memory test and another group doing words memory test.

One assumption that was being made is that the variations of memory capacity among individuals of both groups of subjects do not affect the reliability of the result. To make the result more precise and accurate, modification could be done by having same group of subjects doing both pictures and words memory tests.

Another limitation that could be found in this experiment is that only college-aged subjects were involved. In other words, the validity and reliability of the results were limited to college-aged students. Hence, subjects of different ages should be taken to investigate the superiority of pictures on memory. As well as that, the subjects were chosen from one college only, which mean the results only valid for that college only. To improve this, subjects from different college should be taken.

Besides, it was very hard to control how the subjects going to memorize the pictures and words given. Some of the subjects choose to memorize items by <https://assignbuster.com/the-effectiveness-of-pictures-and-words-on-memory-recall/>

making a story to link or connect the items together. Although filter task was given to prevent the subjects from rehearsing, some subjects still repeated the pictures or words given to them unconsciously.

A further research can be carried out to have a closer look at age differences on short term memory recalled. Study can also be done by comparing memory capacities between male subjects and female subjects. In addition, other method to test one's memory can be carried out, which a recognition test can be tried out instead of recall test.