Memory: Rote Rehearsal and Mental Imagery

Abstract

Memory has been the focus of psychology research since the beginning of psychology.
Investigators have focused on the structure of memory and factors that aid or inhibit the ability to store and retrieve information.
Bower's research (1972) found that that mental imagery of unrelated word pairs affected its retrieval
The aim of my investigation was to replicate Bower's reserah (procedure). My alternative hypothesis was that there would be a significant difference in the number of words retrieved by participants who had used mental imagery to learn the word pairs than to participants who had been given rote rehearsal as the form of memorisation. Ten male and ten female participants were tested. The participants were 16-18 year old students at small heath sixth form in Birmingham. The sample I used was the opportunistic sample whereby I obtained those participants who were available to me at that time.
I will be testing a representative sample of 20 students. The study will be carried out in a field setting. All participants were given 20 word pairs, the participants were asked to memorise and recall some (pre-selected) words by imagery and the others by rote rehearsal. The results showed that more words were recalled from the group who had used mental imagery. The words that were correctly remembered with the associated word were written down on the sheet. The participants were taken into a separate room so that other participants were not around, thus avoiding conferring and distraction.

Introduction

Short-term memory concerns information being encoded and held for several seconds or minutes for use straight away, or is instead prepared for permanent storage in long-term memory. Long-term memory is concerned with items that have been retained over a long period of time, which can range widely; from several minutes to several years. The aim of my research is to find out weather imagery is a better form of storing information than rote rehearsal-I will do this by relicating bower and winzers research and see if come to the same findings as them.
Craik and Watkins distinguished between maintenance rehearsal and elaborative rehearsal.

- Maintenance rehearsal, in which material is rehearsed in the form in which it was presented (rote)
- Elaborative rehearsal, which elaborate the material in some way, e.g. by giving it a meaning or linking it with pre-existing knowledge

The Atkinson and Schiffrin Model was a theory where there were three stages to memory. First, sensory, input went into the sensory memory, this input would go through to short-term memory. Then, only if this input were rehearsed, it would be encoded into long-term memory. This theory was heavily criticised by many other psychologists for being too simple. Eysenck pointed out that not all factors could be explained by the Atkinson and Shiffrin Model. He said that any theory should be able to explain all known facts.

Baddeley believed that short-term memory did not just hold information received from the sensory memory, rather that it was a mental working space in which we can keep information without rehearsal and using long term memory. He called this theory the

Working Memory. Information in the working memory is held until sense can be made. For example, when listening to a friend, we must hold information from the beginning of the sentence until the sentence has been completed so that we can make sense of the sentence as a whole. If Atkinson and Schiffrin were correct then we would have to rehearse each thing our friend said to us for it to make sense.

In 1977, Craik showed that participants remembered far better when they were asked questions about themselves. This was because the material they were asked to recallhad a semantic meaning to the individual. This is a similar effect to the effect of mental imagery on memory of material. The Atkinson and Schiffrin model does not explain why when unrelated words are easily committed to memory through mental imagery. This is clearly shown in Bower's experiment of 1972.

Subjects were given a set of one hundred word cards with a pair of unrelated nouns, such as 'dog' – 'hat', written on them. The 'imagery' group was asked to form a mental image of the two words interacting with one another, i.e to form the mental image of a dog wearing a hat. The control group was instructed to learn the word pairs by rehearsing them. Then both groups were shown the first word of each word pair and asked to recall the second word. The imagery group recalled 80% of the pairs, whilst the other group only recalled 33%. This illustrated the influence of mental imagery on recall of material.

This provides evidence to suggest that mental imagery helps in the encoding, storage and retrieval of information. Bower's experiment can be used for the basis for my own memory experiment. The aim of this research is to replicate Bower's study and investigate the effect of mental imagery and rote rehearsall on memory. Therefore my hypothesis is based on Bowers findings: that imagery will be a better form of memorization then rehearsal as that is what bower found.

Hypotheses

Alternative Hypothesis:

There will be a significant difference between the number of words recalled by participants who are asked to form a mental image of the word pairs compared with participants who were asked to recall the word pair using rehearsal.

Null Hypothesis:

There will not be a significant difference between the number of words recalled by participants who are asked to form a mental image of the word pairs compared with participants who were asked to recall the word using rote rehearsal. Any differences will be down to chance alone.

Design

To prove this theory, 20 volunteers were asked to learn 20 word pairs. These were nouns consisting of 20 pairs of unrelated words. The word pairs were split into two groups, those words to be learnt by imagery and those words to be learnt by rite rehearsal (See appendix 1). However paticpants went thru bth conditions-therefore being a repeated measures design. This was justified because this would have reduced any order effects caused.

Condition A	Condition B
Participant 1	Participant 1
Participant 2	Participant 2
Participant 3	Participant 3

There is a great advantage to the repeated measures design, as the individual differences are removed so there s re no longer any confounding variables, also a fewer number of participants a re needed as the data can be collected from the same participants. The biggest disadvantage of this design is that there may be order effects, after going through condition the participants may become bored or tired while going through the seconed condition. However order effects can be rduced through counter balancing and randomizing. I will be using the technique of counterbalancing, this is when the participants take the tasks in different orders.

Each participant was asked to learn these words, however the participants were asked to learn some words using imagery, and other words using rote rehearsal. The particpant was then asked to turn the list over and wait for a couple of minutes. This was like a distracter task. Then the participants were asked to write as many words from their list as they could with no regard to the order, spelling or time**.** (See appendix). Each group consisted of ten males, and ten female and all participants were aged between 16-18 as that is the age range of the pupils in my 6^{th} form. The independent variable in this experiment was one group's use of mental imagery, and the control group using rote rehearsal. The dependant variable was the number of words recalled from the memory test.

Extraneous variables can affect the findings of my research. To control these the room was quiet, and participants were in separate rooms, as different levels of noise would have distracted the participant and some would have been more prone to distraction than others. The room was also lit well so that the participants would have no problem with reading any of the information given to them. Had this been otherwise, this would have led to incorrect preception of the words and this would have led to apparent memory mistakes, as the word would have been mistaken for some other word.

Standardised instructions (see appendix) and a casual seating arrangement were used to minimise the 'experimenter effect'. As the experimenter expectations could have influenced the results through body language or though slight modifications to the instructions. All the word cards were written in the same font, times new roman, size 14, on Microsoft Word. As this may affect the participants understanding of the words and therefore, their ability to learn the words pairs correctly.

This experiment was an Independent measures design, which was useful because the same material could be used for experimental and controlled conditions. It also made sure that there was no possibility of participant guessing the hypothesis and so avoids some of the possible demand characteristics.

Participants

Participants aged between 16-18 were chosen because they were the only participants available to me for the experiment. Also none of the younger children from school we used as children have to have parental consent for ethical reasons, also children may have different learning styles to those of adults or the material might be too difficult for some of them. This would have added to the effect of the extraneous variable.

Participants were chosen by means of an Opportunity Sample largely because it was

convenient and also because the experiment was to be done on a small scale. The participants were all chosen from the North West of England and a range of occupational groups were included equal number of males and females were selected. This counter balanced any effect of gender.

Ethics

Children were not used in the experiment as the issue of ethics would have been raised because they could not give their own consent for participation. Confidentiality was a major issue, as that was an important factor to our participants, to overcome this we did not take the names of any of our participants. Another issue was the consent of the participants to take part in the experiment, so each participant gave informed consent. All participants had the right to leave during the experiment and the right to withdraw their results at anytime during the research.

Apparatus and Materials

20 copies of the answe sheet (See appendix)
word pairs on paper for the experimentor and for the participant
standard instruction (appendix)
Pencils/pens (more than 1 each so no time is wasted if a pen runs out or pencil breaks)

Procedure

Data was obtained by approaching possible participants, and I asking them if they would take part in a psychology experiment. The same standard instructions were given and explained to each participant.
I then asked them to help us with our psychology coursework, (see appendix) and explained that the experiment was to investigate recall using memory and rehearsal. The participants were told that they would be asked to learn twenty word pairs and that they would later be asked to recall them using different memorization techniques. It was stressed that the experiment was to prove/disprove a psychological theory and not a test of THEIR memory. They participants were informed that their name would not be written down in the coursework anymore, all information was to remain confidential and that the experiment would not take longer than 15-20 minutes.
A coin was tossed to see which words the participant would be asked to memorise using imagery and which using rote rehearsal. The task instructions (see Instructions 2) told the participants what to do. They were told that they were to learn the words in front of them for two minutes using the appropriate memorisation technique. The participants were to use mental imagery words by imagining the two word-pairs interacting together. The words that the participants were to memorise using rehersal were asked to rehearse the words again and again. It was made sure that they understood the instructions before allowing them to learn the words so that the words were not memorized using the wrong technique. After two minutes of learning the word pairs, the participants were instructed to turn over the word pairs and perform a distracter task. The distracter task was just making the participants think about something else and was stopping them from looking at the word pairs. After this the participants were finally asked to recall as many of the word pairs as they could remember. They were then asked to write down their answers on the answer sheet so that they could be used to see and discuss the findings.

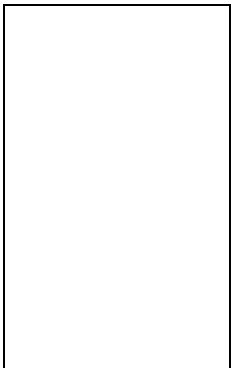
Afterwards, all participants were debriefed. They were told that the experiment was trying to discover whether people remember more when information is aided by mental imagery or when using the rote rehearsal method. Any questions they had were answered and comments were noted. They were allowed to see the final results if they wished to do so, but ofcourse names of participants would not be mentioned - just the overall findings would be displayed.
The standardised instructions helped to control the variables that may have biased the experiment. Distractions were avoided by conducting the experiment in a quiet room. All the participants were given the same amounts of time for the learning and distracter tasks, and also the same amount of time for each word pair wheather using imagery or rote rehersal as the memorisation technique.

Table to show the scores obtained by participants, aided by mental imagery or without, and the recalling of word pairs

Mental Imagery Group	Control Group (No mental imagery)
16	10
15	12
18	11
12	9
12	13
16	10
17	12
18	8
17	10
17	9

Table to show central measures and range of scores obtained by participants who were either aided by mental imagery in the learning of word pairs and the control group

	Mode	Median	Range
Mental Imagery			
Rote Rehearsal			



Discussion

It seems that the that participants learned more words with the aid of imagery than using rote rehearsal. There is a significant difference and the alternative hypothesis can be accepted, and the null hypothesis can be rejected.

These results support the background theory that mental imagery helps in the encoding, storage and retrieval of information. This also backs up Bower's experiment in which the 'mental imagery' group also showed a significantly higher pattern of item recall than the control group (the imagery group recalled 80% of the pairs, whilst the control group only recalled 33%). Although this is true for the general results if we look at the individual results: participant 6 re-called three words using rehearsal but only one using imagery, this is true for several other participants. This could be due to the fact that the participants were actually using the imagery technique instead of rote rehearsal even though we had asked them not to. This is a point that needs to be taken into consideration if a repetition of the experiment is to be done. However it could be that rehearsal may actually be a better technique of memorisation, as some psychological research has found this to be correct.

Some psychologists who found rehearsal is better technique for recall are Atkinson and Shiffrin, they found that rehearsal was a better technique for memorisation rather then imagery. They believed that memory traces in STM are fragile and can be lost within about 30 seconds unless they are repeated (rehearsed), if this is done them the materials remain for a lifetime.

Participants could not have been rehearsing the word pairs whilst they were performing the distracter task, it must have been stored whilst this task was being carried out. This also supports Baddeley's idea of information being stored in the working memory or, more precisely, in the phonological loop, until it is needed later. The phonological loop is a tempory memory for words.

The aim of my research has been achieved. However, it proves that memory cannot be as simple as the Atkinson and Shiffrin model suggests.

There are limitations to this experiment however, the number of people used was only 20 participants, the results of this experiment may not be the case for the rest of the population, a larger sample would be needed. All the participants were 16-18, all those under 16 were not accounted for and therefore it would not be fair to say that mental imagery affects everyone's memory because these people have not even been included. Also, no over18's were asked to participate, and so I had no results for adults either.The experiment was culturally biased towards the British Asians and so a representative sample of the population was not gained. It should also be noted that the participants were volunteers and is therefore biased towards a 'volunteering' type of person. Ora (1965) believed that volunteers could not be regarded as a typical sample of people. Ora's studies showed that the volunteers used in the studies tended to be abnormally insecure and introverted amongst other things.

Other limitations to the results may be that some participants may have been more familiar with the use of mental imagery than rote rehearsal and therefore found it easier to imagine the word pairs interacting with one another.

One participant in the experiment commented that she felt pressured by the large number in the distracter task. This could be overcome by changing the distracter task, possibly involving a letter based task as opposed to a number based task. Two participants commented that they felt uncomfortable about their results (despite being told the experiment was to test a theory, not the participant's memory and that all information was confidential); saying they felt they would do better had they been told about the distracter task before the start of the experiment. To solve this, the standardised instruction could include more information about what the experiment involved in the approach.

Basic changes to the experiment might include making a representative sample of our town rather than using an Opportunity Sample method of obtaining participants. Also, explaining the experiment in more detail to possible participants before they agree so the experiment is more ethically correct.

Conclusion

The experiment appeared to support Bower's findings and demonstrated that mental imagery used to learn the word pairs produced higher levels of recall than the control group who did not use mental imagery. However, the results needed to be treated with caution because statistical analysis was not performed and the sample was limited to a relatively small number of pupils in Small Heath 6th form in Birmingham, England. Implications of the research: I could re-do this experiment but test imagery with other memory aids such as mnemonics and colour coding. As even though generally participants did better using imagery there were still some participants who did not, so it would be interesting to explore if other methods of recall are even better then memory

Also I could use a much bigger participant sample, as this would allow mw to generalise my findings.

My findings support and strengthen bowers research but question other researchers such as Anderson and Atkinson and Shiffrin. More Research is needed to discover what is the best method for recall.

Appendix

Contents:
20 word cards
20 participant score sheets
Standardised instructions:
-Instructions 1
-Instructions 2
-Instructions 3
Calculations and planning sheets

Instruction 1

Brief:

"Please can you spare some time to help me with my psychology coursework?" [If the answer was yes, then the experiment was carried out] "The coursework is to investigate a theory about memory. You will be asked to learn some word cards that you will later be asked to recall. This is not a test of your memory; it is to test a theory. All information will be confidential. No names will be taken. The investigation will take no more than fifteen minutes."

Instruction 2

Task instructions:

"On the table in front of you is a pile of word cards, you have two minutes to learn these words. Do you understand?" [If the answer was no then some further explanation was given until fully understood.]
Please can you now write down as many of the word pairs as you can remember by using rehearsal. It does not matter the order that they are in. Do not worry about the spelling. You have as long as you like."

II. Experiment/Mental Imagery Group:
On the table in front of you is a pile of word cards, you will be asked to learn these pairs with the aid of mental imagery. Please imagine the two words on each card interacting together. You have two minutes to learn these words. Do you understand?" [If the answer was no then some further explanation was given until fully understood.]Please can you now write down as many of the word pairs as you can remember. It does not matter the order that they are in. Do not worry about the spelling. You have as long as you like."

Instruction 3

Debrief:

"Thank you for helping with the study. We were trying to discover the effect of mental imagery on the remembering and forgetting of information. [Explanation of experiment.]

"Have you any comments to make?"

References

Author	*Date*	*Title*	*Publisher*
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