Lucy Harvey 12CD

Memory and Mental Imagery

Abstract

Memory has been the focus of psychology research for several decades. Investigators have focused on the structure of memory and factors that aid or inhibit the ability to store and retrieve information.

Bower (1972) demonstrated that mental imagery of unrelated word pairs affected its retrieval

The aim of this investigation was to replicate Bower's findings. The 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 to participants who had been given no reference to mental imagery. Ten male and ten female participants where tested. The participants were adult from a city in the North West of England. All participants were given 20 word pairs, half the participants were asked to learn the pairs using mental imagery of the two words interacting with one another and the control group were given no reference to mental imagery.

The results demonstrated that more words were recalled from the group who had used mental imagery. The median score from the mental imagery group was 16 compared to a score of 10 from the control group.

It was concluded that mental imagery aids memory and this supported Bower's experiment.

Introduction

Short-term memory concerns information being encoded and held for several seconds or minutes for immediate use, or is prepared for permanent storage in the long-term memory. Long-term memory is concerned with items that have been retained over a long period of time, ranging from several minutes to several years.

The Atkinson and Schiffrin Model was a systems theory where there were three stages to memory. First, sensory input went into the sensory memory where, if attention were paid, 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 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 subjects remembered far better when they were asked questions about themselves. This was because the material they were asked to recall was meaningful 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. (For instance, to form the mental image of a dog wearing a hat). The control group was instructed to learn the word pairs with no reference to imagery. Both groups were then given the same amount of time to learn the word pairs. 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 control 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 our own memory experiment. The aim of this research is to replicate Bower's study and investigate the effect of mental imagery on memory.

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 are not asked to form a mental image of the word pairs.

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 are not asked to form a mental image of the word pairs. Any differences will be down to chance.

Design

To prove this theory, 20 volunteers were asked to learn 20 word pair cards. The cards consisted of 20 pairs of unrelated nouns. The participants were split into two groups, an imagery group and a control group who were given the following word cards. (See appendix)

Each participant was given two minutes to learn these words, however the imagery group was asked to form a mental image of the two nouns interacting whilst the control were given no reference to mental imagery. Both groups were then asked to turn the list over and perform a distracter task. This distracter task involved asking the participant to write the number '432' onto a plain piece of paper and then asking them to subtract three until they were told to stop. This distracter task took two minutes. Then they 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 18 or above.

The independent variable in this experiment was one group's use of mental imagery, and the control group not using mental imagery. The dependant variable was the number of words recalled from the memory test.

Extraneous variables can affect the result. To control these the room was quiet as different levels of noise would have distracted the participant and some would have been more prone to distraction than others. This would have affected the initial learning and

consequently the final scores on the memory test. The room was also brightly lit so participants would have no problem with reading the information. Had this been otherwise, this would have led to incorrect perception of the words and this would have led to apparent memory mistakes.

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 inadvertent reinforcement using body language or though slight modifications to the instructions. All the word cards were written in the same font, Arial, size 24, bold on Microsoft Word. As this might affect the participants understanding of the words and therefore, their ability to learn the words.

Two pencils were provided in the case of one breaking; this would have affected the time the participant had to learn the words, therefore their initial learning and the final results would have been affected.

This experiment was an Independent Subject design, which was beneficial because the same material could be used for experimental and controlled conditions. It also lessened the possibility of participant guessing the hypothesis and so avoids some of the possible demand characteristics.

Participants

Participants aged over 18 were chosen because they could give their own consent to take part in the experiment. Children have to have parental consent for ethical reasons. 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 thus confusing the results.

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. Ten males and ten females were selected. This counter balanced any effect or gender; for instance, males may react differently to females.

Ethics

Children were not used in the experiment because they could not give their own consent for participation. Confidentiality was an issue; to overcome this we did not take the names of 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; otherwise this would infringe their ethical rights.

Apparatus and Materials

(See appendix)
Twenty word cards containing 20 pairs of unrelated nouns
Lined A4 paper
Two pencils
A stop clock

Procedure

Data was obtained by approaching possible participants and asking them if they would take part in an experiment to prove a theory. The same standardised instructions were followed for each participant, read in a 'blank' voice.

The brief asked them to help the experimenter with their psychology coursework, (see Instructions 1) and explained briefly that the experiment was to investigate a theory about memory. The participants were told that they would be asked to learn twenty word pairs and later asked to recall them. It was stressed that the experiment was a test of a theory not a test of their memory. They were informed that their name would not be taken, all information was to remain confidential and that the experiment would not take longer than 15 minutes.

A coin was tossed to see whether the participant would perform the experiment with the use of mental imagery or without. The task instructions (see Instructions 2) told the participants what to do. They were told that they were to learn the word cards set in front of them for two minutes. The experiment group were told to use mental imagery to learn the words, to imagine the two words on each word card interacting together. (See instructions 2 II.) The control group were given no reference to mental imagery. (See instructions 2 I.) It was made sure that they understood the instructions before allowing them to learn the words. After two minutes of learning the word pairs, the participants were instructed to turn over the cards and perform a distracter task. The distracter task involved writing the number '432' down on a lined piece of paper and subtracting '3' for 2 minutes. After this the participants were finally asked to write down as many of the word pairs as they could remember. They were informed that it did not matter how they were spelt or what order they were in and that they had as long as they liked to recall and write down the words.

Afterwards, all participants were debriefed (see Instructions 3). They were told that the experiment was trying to discover whether people remember more when information is aided by mental imagery. Any questions they had were answered and comments were noted. They were allowed to see the final results if they wished.

Standardised instructions helped to control the variables that may bias the experiment. Two pencils were provided in the case of one breaking, as sharpening might alter the results. Distractions were avoided by conducting the experiment in a quiet room. All participants were given lined paper and the seating arrangement was casual to avoid making the participant feel uncomfortable. All participants were given the same amounts of time for the learning and distracter tasks.

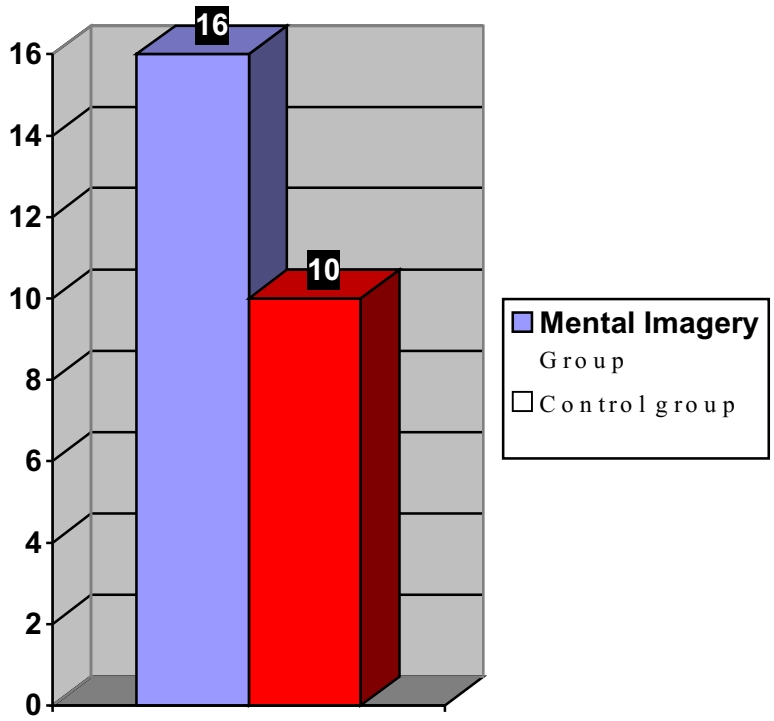
Table to show the scores obtained by participants, aided by mental imagery or without, and the recalling of word pairs

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	17	16	6
Control	10	10	5

Bar chart to show the median values of words recalled by the 'mental imagery' group and the control group



Discussion

It seems that those participants who learned the word pairs with the aid of mental imagery did better than those who learned with out the use of mental imagery. There is a significant difference and the alternative hypothesis can be accepted.

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

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 over 18, all those under 18 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, although over 18's were asked to participate, the large majority of these were likely to be parents and relatives of similar ages, age groups such as the 20-30 range and the 70+ range may have been left out. The experiment was culturally biased towards the White Caucasian British and 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 other and therefore found it easier to imagine the word pairs interacting with one another. This is certainly a extraneous variable in the case of the control group. However, this was the case with 3 of the participants who commented that using mental imagery was their normal way of learning words. One participant commented that he had imagined a 'horse in a dress' and a 'fork sat on a chair' and that it was such strange images that helped him to remember. To avoid such a extraneous variable the control group could be given a list of words with no pairing at all, in a random order, so they would not be encouraged to employ mental imagery of the words interacting. The mental imagery could then be give a list containing the pairs, as opposed to word cards to eliminate any extraneous variables in the different formats of lists and word cards. The lists might look like this:

dog
hat
horse
dress
roof
tree
chair
fork
ants
…..

dog	hat
horse	dress
roof	tree
chair	fork
ants	ball
car	leaf
nail	sausage
pen	fly
pig	river
plate	…..

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 adults in the North West of England.

References

Author	*Date*	*Title*	*Publisher*
Baddeley	1993	The Users Guide to Memory	United Kingdom Prion
G.H. Bower	1972	Cognition in Learning and Memory	Wiley
'Cognition in Learning and Memory' Cited in: C.B Dobson, M. Hardy, S. Heyes, A. Humphreys and P. Humpheys	1981	Understanding Psychology	Weidenfield & Nicolson
Craik and Lockhart	1972	Levels of Processing	

Ora	1965	Characteristics of the Volunteer for Psychological Investigations.	Technical Report 27
'Levels of Processing' & Ora (1965) Cited in: Atkinson, Atkinson, Smith, Bem	1990	Introduction to Psychology	Harcourt College Publishers

Appendix

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

Instructions 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."

Instructions 2

Task instructions:
I. Control Group:

"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 turn over the cards, here is a number, "432", write this number on your sheet and subtract three until I tell you to stop. This will take no longer than two minutes.

"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."

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 turn over the cards, here is a number, "432", write this number on your sheet and subtract three until I tell you to stop. This will take no longer than two minutes.

"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."

Instructions 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?"