

*The aim of this*  
*investigation is to*  
*investigate the short-term*  
*memory, and how long*  
*it can store an*  
*information*

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## ABSTRACT

Short-term memory was investigated and how information was encoded or placed into our memories. The Atkinson & Shiffrin 1968 multi-store model proposed the idea which compared mental processes of humans to that of computer operations. It was described that there were many stages, one of which was the short-term memory. The processes of attention and rehearsal controlled the flow of information between these stages.

Atkinson & Shiffrin said that a distraction here would cause forgetting or prevent rehearsal.

The Independent Variable (IV) in the experiment was the distraction added in the form of music for 1 minute.

The Dependant Variable (DV) in the experiment was the number of words recalled.

Target population was students of 17 years of age from Brinsworth Sixth Form.

A field experiment was conducted.

The mean average recorded for group 1 (with no distraction) was 8.5 which when compared to the mean of group 2 (with and added distraction in form of music) being 7 shows that group 1 performed better in the recall test. Here it was found they recalled more words on average than group 2.

It was concluded that the music distraction did have an effect on group 2's recall results as it was found they performed worse when compared to group 1's results where the distraction was absent.

The results of the investigation support the predictive hypothesis as it was predicted the distraction being music for the period of a minute would prevent the rehearsal of the word list therefore causing some to be forgotten.

## INTRODUCTION

Memory consists of two areas; short-term memory and long-term memory.

The short-term memory will be investigated for this theory, and all research carried out will relate to short-term memory. For this study, the experimenter will look at how information is encoded and placed in our memories. Memory is defined as the storage of information over a certain period of time. So the experimenter will examine how information is recalled from short-term memory.

A distraction will be added giving the possibility of recall being affected by the distraction. This will investigate the process of displacement, which is retrieval failure in the short-term memory.

Atkinson & Shiffrin (1968) proposed the idea of a multi-store model. This compares the mental procedures of humans to that of computer operations. In their research, they suggested that there was a series of information processing stages one after another. The stores were the sensory memory, short-term memory and long-term memory. Atkinson & Shiffrin agreed that the processes of attention and rehearsal were responsible for controlling the flow of information between the stages or stores. Atkinson & Shiffrin also found the measurements of human short term memory capacity to have a  $7 \pm 2$  limit. The short-term memory is capable of holding around 2 seconds of sound therefore a person can remember around 5 or 9 words from the word list given to them.

As the investigated memory is the short-term memory, it was said that the information passing the sensory memory to the short-term memory had to be given attention. Atkinson & Shiffrin said that there are two main characteristics of the short-term memory which was that it had very limited capacity and that applying a distraction would cause the information to be forgotten... This is due to us paying some or more attention to the distraction and therefore not paying the required attention to the information we are meant to remember, therefore causing us to lose & forget the information.

Brown & Peterson (1956) also proposed this idea. In their research, participants heard various tri grams. Immediately after, they were instructed to recall what they just heard, and to count backwards in 3 straight afterwards. The obtained result showed that after 18 seconds the idea that without rehearsal, the duration of the short-term memory is shorter, therefore causing us to forget.

Alan Baddeley (1966) investigated short-term memory. In his study, he investigated the coding of words. This word included the ones that sounded the same, and the ones with the same meaning. The participants were asked to recall these words immediately after and the obtained result showed that errors had occurred with the similar sounding words but not the similar meaning words. Baddeley came up with the idea that coding in the short-term memory was based on the sound of the word or Acoustic memory. The study made by Atkinson & Shiffrin can be linked to Baddeley study. The investigation being carried out by the experimenter will include some sort of distraction from Atkinson & Shiffrin study to test if it has an effect on the overall recall. And the words being recalled will relate to the words sounding and meaning the same as in Baddeley's study.

The Baddeley study consists of many weaknesses as well as strengths.

Weaknesses of this study are the view that different factors affect the recall, such as whom the information is learnt from.

Where the information was learnt was also said to affect the recall which was later discovered by Godden & Baddeley (1975). It was also found that the information was recalled if it had personal importance or specific meaning to the participant.

The study also lacks mundane realism as people rarely learn lists of words therefore it is unable to be generalised to real life situation.

Acoustic and semantic coding are not the only types of coding, other coding may have been used and therefore ignored thus being unreliable.

Strengths of this study are that the investigation supports the view of Baddeley that short-term memory uses an acoustic code. This means that it stores information on how things sound. It also supports the theory that long term memory uses a semantic code which means information is stored due to its meaning.

One other strength of the Baddeley study is that it also leads to other investigations being carried out to support this theory or ones that gives criticisms.

Finally it can also explain how people remember information and the code used in the process.

As the study is being based on the Baddeley study, the two groups will be given a list of 10 words in which they will be given a minute to look at them. The word selection will include words that sound alike and ones that mean the same also. As group 1 will be given the words only their recall results will be recorded straight away.

The distraction will be music and given to group 2. The participants will be given music to listen to for a period of a minute immediately after looking at the words. This group of people will then be asked for the recall of the words remembered. These will also be recorded.

This investigation will add to the ones conducted already as this should give evidence for Baddeley's research. This showed that short-term memory used acoustic memory, which meant that the recall of the word was due to its sound. This should also add to evidence supporting the Atkinson & Shiffrin theory which included the idea that in order to recall information in the short term memory the information has to be first given attention in order to be passed on to short term. The recall result therefore depends on the amount of time rehearsed. This study may also prove to be conflicting evidence to one of the study's mentioned or discussed above.

### AIM

The aim of this investigation is to investigate the short-term memory, and how it long it can store an information

In this study the experimenter will look at how information is encoded in our short-term memory.

### PREDICTIVE HYPOTHESIS

When a distraction is added, less word will be recalled. This is due to the information not being directly rehearsed and therefore slightly forgotten.

### NULL HYPOTHESIS

There will be no difference in the amount of words recalled between groups 1 and 2. Any difference in recall will be due to chance factors.

This means that any difference in the dependant variable, this being the recall amount is not due to the independent variable and that it is due to chance factors. Therefore the distraction of music has not affected the results.

The predictive hypothesis is one tailed as a clear prediction has been made and it has been stated the direction the results are likely to turn – the distracted participants will remember less.

It is also clear that a link has been made by saying the distraction will affect the recall.

This hypothesis was decided on because it will be interesting to see how effective the short-term memory is, because the short-term memory is useful and essential in most of our everyday life – it's inevitable.

This aim was chosen because it is interesting to see whether a distraction will affect the short term memory and prove that if the information is not rehearsed then it can't be stored in the short-term memory therefore causing the participant to forget the information.

## METHOD

### DESIGN

An experiment was conducted for this investigation. The type of experiment used was a lab experiment, as it was conducted in controlling and manipulating the independent variable. A field experiment is better for the investigation, as a laboratory experiment is more controlled, which could lead to a change in behaviour of the participants, and this could affect the end results of the investigation. To get the needed result for this investigation, the independent variable needs to be manipulated.

The design used was the independent groups design, as 2 groups of participants were needed for each condition.

This investigation consisted of two groups of 10 (with 5 males and females), in each group.

Participants were randomly picked, and 10 of each sex were randomly chosen so as to ensure a fair testing. This would also avoid experimenter bias within the sampling, as there will be an equal number of males and females.

The independent variable (IV) (manipulated in the experiment by the experimenter, was the distraction added in the form of music to test) whether the participants were subjected to distraction or not.

The dependent variable (DV) (which was measured in this experiment was) the number of words recalled from the list of 10 words.

The extraneous variable (EV) which could have caused a change in the DV in this experiment could be;

Any background noise that is occurring while the experiment is taking place can provide possibility of a distraction in the rehearsal. To control this, an empty classroom was used, with all doors and windows closed, providing an absolute silent. The participants themselves were asked to keep silent through the testing period.

Another EV that could have affected the DV is the time of the day the experiment took place, as in the morning, participants tend to be more alert than in the afternoon. The control for this EV was that the experiment was conducted in the morning, when all participants are the most alert.

No pilot study was carried out.

### PARTICIPANTS

20 participants were used in this investigation. These participants were chosen by random selection. This meant that everyone in the target population have an equal chance of being selected. 30 names of participants of the target population were put into separate bowl; each bowl consisting of 15 names of each sex, then 10 names of each sex was randomly picked out of a bowl. The 20 participants drawn randomly were put into 2 groups of 10 (consisting of 5 of each sex in each group), each names for each group were selected randomly again.

Group 1 were given the list containing the 10 words and were given 1 minute to look and learn them before being asked for a recall test.

Group 2 were given the 10 words in a list whilst listening to music. The music was played simultaneously after looking at and learning the words for a minute.

This target population of 17 years old was seen as a suitable age for the investigation and generalisation can be made on this age set, from the set of data derived for this investigation.

The target population were all sixth form students from Brinsworth Comprehensive School, Rotherham, South Yorkshire.

### MATERIALS

Materials are essential for this investigation to occur.

A list of 10 words was needed. The experimenter for each group would read them out. This list included words that sounded the same and has similar meanings. The 10 words were; log, fast, dog, sign, lip, teeth, last, hip, line, sweet. (See appendix 4).

20 consent forms were needed as participants had to give their consent before participating

20 briefing sheets were also needed to inform the participants of what they are actually taking part in, so they can withdraw if they don't want to partake in the investigation. (See appendix 3)

The consent form was merged in with the briefing sheet, and given to participant as one document

20 debriefing sheets were also required to inform the participants of what their result showed after the experiment. (See appendix 6)

A stopwatch was also needed as both groups were given exactly 1 minute to look and learn the words. And the stopwatch allowed the investigation to be more precise and accurate. Groups 2 were given music to listen to after the 1 minute period, so a music player was needed.

Pens and paper were also needed as the participants needed to record their result on them. Each participant has 1 pen and a scoring sheet (See appendix 5). This was handed out at the beginning of the investigation.

As group 2 were tested after group 1, they would reuse the pens.

Bowls were also required because names of people in each sex were drawn out of each bowl.

A calculator is needed to calculate the mean for the result.

A result table was needed to record the obtained result from the recall. (See appendix 3)

## PROCEDURE

The topic area been investigated on was the aspect first chosen. How information is encoded into our memory, and how a distraction would affect the recall of the encoded information is the chosen area for the experimenter.

Participants are needed for this investigation to take place. For this investigation the age of the target population was agreed at 17 years old.

30 participants gave their consent for this investigation. Only 20 participants were needed for this investigation, so the final 20 names of the needed participants were drawn out of a bowl. These 20 names consisted of 10 males and 10 females. Leaving 10 participants unneeded.

The 20 selected participants were then put into 2 groups resulting in 5 of each sex in each group. Group 1 was just for the word recall only, and group 2 is for the word recall, but with an added distraction in form of music.

A location for this investigation was decided on, and an empty classroom seemed like the appropriate location.

All the selected participants were called into the classroom and asked to "please sit". They were all given a briefing sheet and asked to "read and asked question(s) if unclear of any information written on the sheet". The briefing sheet consisted of information that tells the participants what they will be participating in if they agreed to give their consent in participating and how they are required to participate. It also tells them the format of the experiment. The briefing sheet of group 1 differed from group 2 as a distraction was added for group 2 (See appendix 3)

Along with the briefing sheet, the same consent form was given to the two groups. The participants were asked by the experimenter to "read, fill in the required section, and you've got the right to object to any aspect in the sheet given to you". This consent form was given out to participants to read and decide if they want to participate in the investigation, because they've got the right to make any objection at any time. And it explains what the participants will be agreeing to, if they give us their consent to participate. (See appendix 3)

Before the investigation occurs, the participants were told "you have 100% right to withdraw from this investigation at anytime if required".

Group 1 were the first to be tested. On entry, they were told to "please sit at separate desks". Each participant is given writing equipment, and a score sheet to write down their recall result. Again the participants were reminded that they have the right to withdraw from the investigation at anytime.

Once seated and absolute quietness established, the participants were told "the investigation will start as the first word is called out, and the list will be read out twice". The stopwatch was started simultaneously as the first word was read out by the experimenter, and a 3 seconds gap was given between each word in the list. By 30 seconds, the word list has all been read out. The 10 words were read out again at the same pace, and altogether, 60 seconds was used in calling out the words. The stopwatch was stopped after the words were all called out. (See appendix 4)

After this, the participants are informed to “now write down any words that you can recall at the sound of a beep”. The beep was used to make it a fair investigation, so that no participant has a head start ahead of the other. The beep sound was made simultaneously as the stopwatch was pressed.

The participants were asked to “please stop writing” after the 60 seconds ended. Their recall results were collected into a pile.

The 10 participants were told “thank you for taking part, can you please wait outside to get the result for this investigation”. They were then escorted out of the classroom with no contact with group 2.

Group 2 were the next to be tested. They were told to sit at separated desk, and maintain an absolute quietness. And they were told that “after the words has all been read out, without informing you, music will be played”. They were given a pen, and a scoring sheet, and were told that they have the absolute right to withdraw from the investigation at anytime. They were told when the investigation will be starting. And the stopwatch was pressed simultaneously as the first word was read out. Again, a 3 seconds gap was given between each word in the list. Once the 60 seconds was due, the music was played. The music was stopped after 60 seconds, and the participants were told to “write down as many words a you can recall after the beep”. The beep sound was again used, to make the investigation fair for all the participants. They were given another 60 seconds to recall and record the information in the scoring sheet. After the time was due, they were told to “stop writing” and their scoring sheet was collected. They were then escorted out of the classroom.

All the materials were collected. The recall sheet for the two groups was put into piles, because they will be analysed differently before been compared.

2 days after the recall result was analysed, compared, and a conclusion was obtained, a debriefing sheet was given to each participants that participated This informed them of what each of their individual results showed, and what conclusion we have made from their result in relation to the aim of the investigation. And it thanked them all for participating in the investigation. *(See appendix 6)*



## ETHICAL ISSUES

In this investigation ethical issues have to be addressed to ensure participants are comfortable in taking part and that the investigator has their full consent. It is also important that nothing is kept from participants as this could affect the final outcome of the investigation, and may lead to participants pulling out of the study. The experimenter will be addressing all ethical issues arising from this study, so that it is in line with British Psychological Society (BPS) guidelines.

Ethical issues state that the experimenter can conduct the investigation with the BPS criteria met. Evidence of the guidelines being met was based on the judgement of a sixth form psychology teacher who thoroughly knows the BPS guidelines.

This study should and can be conducted because Alan Baddeley (1966) has conducted a similar experiment to this one, which brought about controllable ethical issues.

The most appropriate way to carry out this study is to ensure that it fully meets the BPS guidelines, these of which are; informed consent, deception, briefing, withdrawal from the investigation, confidentiality and protection of participants from harm. Following these guidelines means the experimenter can be assured that the experiment is ethical and the participants are fully aware of the process involved, and understand the reasons for the investigation.

The experimenter is fully aware of how the investigation is to be carried out and the fair treatment of participants.

In the study, the experimenter gained the participants' informed consent through the consent forms given out. The participants were also asked to read the briefing sheet to inform them on what they will be participating in. Participants' signatures were used as a means of the participants agreeing to all the process involved in the experiment, although participants will be referred to by numbers in the write up.

The experimenter will ensure that all information collected from the participants remains confidential and anonymous. This will ensure that the investigation still meets the BPS guidelines. This will also protect the participants. Participant confidentiality is assured because information from participants will not be shared with anyone else. Also, participants will be referred to as numbers not names to ensure anonymity. Duplicates of the information will not be made as this will increase the chance of an unauthorised person viewing it.

The experimenter will ensure that his conduct is professional in this study, following and checking all BPS ethical issues guidelines. The experimenter will also give out a consent form, briefing sheet and debriefing sheet to all participants. The experimenter will also speak politely to all participants, arrive on time, dress appropriately, treat all participants equally, and give the same instructions to all participants.

## HOW THE ETHICAL ISSUES IMPACT ON THE STUDY AND HOW THE STUDY DEALT WITH THEM IS SHOWN BELOW.

BPS Guidelines on Ethical Issue	Definition	How it impacts on this study	How study has dealt with the issue
Informed consent	Participants should be informed on the objectives of the investigation and all other aspects of the research which might reasonably affect their willingness to participate.	It's a fundamental important part of this investigation because participants are giving their consent to the investigation. People can only take part in this experiment if they give their consent. Participants cannot give informed consent if they don't know the aims.	Here detailed consent forms were handed out to participants informing them of how they will be participating in this study and the objectives of this study. The participants signed the consent forms to show their approval. (See appendix 3).
Deception	Where the participants of a study are misled or wrongly informed about	This may sometimes be the case in an experiment, as the	Consent forms issued to participants is very precise, stating the

	the aims of the research.	experimenter may not want the participants to adjust their behaviour to fit the expectations of what the experimenter is looking for. Deceiving the participants makes them feel devalued. If participants were deceived, and they ended up knowing about it, then they may withdraw their result from the investigation, affecting the overall result, or meaning the experimenter may have to find more participants.	objectives and everything else the participant needs to know about the study. (See appendix 3).
Briefing	Before participating in a study there must be a full explanation of its aims and purposes. The experimenter must ensure that the participants fully understand the purpose and their role for the investigation.	The participants are aware of their role, so they will not be surprised when asked to do something in the investigation. They will also know their role as stated in the briefing sheet. This in summary will make the conducting of the experiment much quicker. Participants will also feel informed about the study therefore know whether they are happy to take part or not.	Here a briefing sheet was issued to the participants before the experiment to tell them about the aims, hypothesis and their role for this study. (See appendix 3).
Withdrawal from the investigation	From the start an investigation, participants must be aware of their right to stop participating in the study at any time without giving any reason and with no consequence arising from their decision to quit. Participants can withdraw before, during, or after the investigation.	This gives the participants the freedom to withdraw if they intend to at anytime before, during, or after the experiment. If people are pressured into an experiment, and not given the right to quit, the result of the experiment will be affected, and it is essential that this is avoided. And if participants pull out from this investigation, then other participants will be needed to take their place.	The participants are informed of this from the start of the investigation. The experimenter is prepared for this at all times. In the consent forms given to participants, it states that they have the right to withdraw for the investigation at anytime, with no consequences and no reason needs to be given.
Confidentiality	Participants must be aware that the	Participants may feel pressured if their details	Anonymity will be ensured, as the

	<p>information provided for the investigation is confidential: they must be assured that all data is anonymous and no names will be used in the report.</p>	<p>were to be used, and this could affect the result of the investigation. It is essential that the participants feel comfortable about taking part in the experiment. They will feel that they can take part anonymously and therefore may be more willing to do so.</p>	<p>participants names will not be used, they will be referred to as numbers, so information of any kind cannot be identified. Only names of participants were taken and signature, no personal details, so this increases the confidentiality. And the information of the participants will only be known by the experimenter.</p>
<p>Protection of participants</p>	<p>Participants have right to expect that their participation will not cause them any physical or mental harm and they will leave the experiment the same way they came into it. Participants should be or feel no worse off after an experiment.</p>	<p>Participants will feel safe if they are aware that no harm of any kind will come to them during their involvement, and so less chance of the result being affected. Because if participants do not feel safe, then they will not be fully committed to the study which could affect the end result of the experiment or resulting in the participant quitting the experiment meaning another participant will have to be found to replace them/</p>	<p>The investigation has been assessed by a psychology student and a teacher to ensure it's safe. No dangerous materials are used that can cause any harm to the participants due to the nature of the study. The nature of the study ensures no psychological or physical harm upon participants.</p>

## RESULTS

### DESCRIPTIVE RESULTS

In this investigation, the experimenter found that group 1 overall recalled more words from the list than group 2 did. The results clearly showed that group 1 without the music distraction recalled the words from the list better than group 2 with the music distraction. Conducting this experiment showed that the music as an added distraction affected the rehearsal process for the words. In both groups, the males were found to perform better at recall than the females in both groups. For group 1, the lowest number of words they were able to recall was 7, whereas for group 2 it was 5 words.

#### A TABLE TO SHOW DIFFERENCE IN AVERAGES CLACULATED USING THE RECALL TEST GIVEN TO TWO GROUPS (OF 10 PARTICIPANTS) UNDER DIFFERENT CONDITIONS

<b>Measure of central tendency</b>	<b>Condition 1: immediate recall</b>	<b>Condition 2: with an added distraction</b>
Mean	8.5	7
Median	8.5	6.5
Mode	8 and 9	6 and 9
Standard deviation	3.5	8

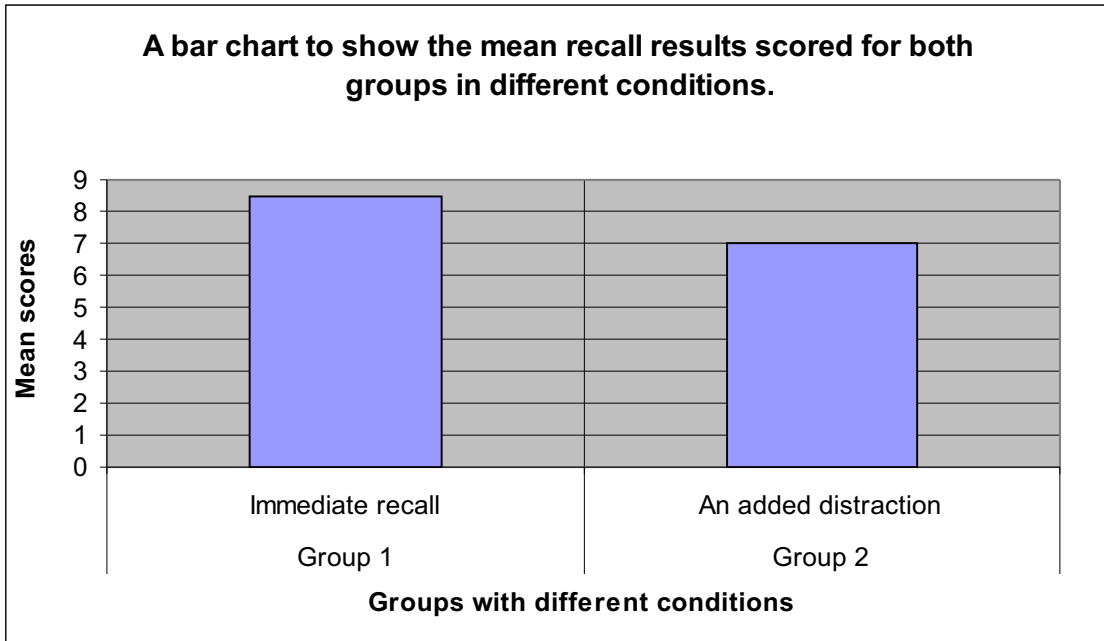
*(For calculations see Appendix 1 & 2)*

The results table shows that group 1 more words overall than group 2. This is evident in the two mean averages with group 1 having 8.5 and group 2 having 7. This is a difference of 1.5 and it shows that overall, group 1 recalled more words. The mean was calculated by adding up all the values, and dividing it by how many of the value there is.

The median again shows that group 1 performed better having a median of 8.5 whereas group 2 has a median of 6.5. This was calculated by listing the scores in numerical order and finding the middle number.

The mode shows that 8 and 9 words were the most frequent number words the participants were able to recall from group 1, and in comparison to group 2, 6 and 9 words were the most frequent number of words participant were able to remember.

The standard deviation shows how far away or how close the results are to the mean thus showing the reliability of each set of results. The closer the standard deviation is to zero, the better and more reliable the result is. The standard deviation calculated for group 1 is 3.5; this shows that the results collected here are fairly reliable in relation to the mean. However, the standard deviation calculated for group 2 shows that the results are not reliable. For this condition the standard deviation was 8 showing a not very reliable result, as it shows the results are widely spread around the mean. This could also relate to the mean result collected for group 2 not very reliable and resulting in the standard deviation being widely spread out.



The graph shows the mean averages of both group's sets of data. It is clear that group 1 scored better recalls overall than those of group 2 as they has a higher mean shown on the graph. This was an average of 8.5 which when compared to an average of 7 demonstrates the difference between the two sets of data. However as both were out of a possible 10 it does show the recalls were fairly high in both groups. Group 2's poor performance may have been due to the distraction added to their experiment.

## DISCUSSION

The results generally shows that when distraction was added to group 2's experiment, their recall results declined, which is reflected in their mean averages. This shows that the added distraction in form of music for group 2, made it difficult for them to remember the words from the list than group 1 who had no distraction. Using no distraction for group 1 made their overall performance better than group 2.

In comparison using the mean averages result, group 1 had a mean recall score of 8.5 out of a possible 10, whereas group 2 managed a mean score of 7. Comparing both results shows a 1.5 difference, meaning that more participants in group 1 were able to recall more words than group 2 did.

Using the mode calculations where it was found that 8 and 9 were the most frequent number of words recalled in group 1, however, scores of 6 and 9 were found to be the most frequent for group 2. This mode result shows that group 1 recalled more number of words on average than group 2, however, this thus shows that group two performed alright, but not as consistent as group 1.

The median for group 1 is 8.5 which is close to the mean result (8.5) and also close to the mode calculation for group 1 (8 and 9). This shows that the results for this group are very close and hereby reliable. However for group 2, which has a median result of 6.5 thus showing a close relationship with the mean result (7), and a close result to one of the mode result.

Finally, the standard deviation calculations shows that the result recorded for group 1 are more reliable than those recorded for group 2. With group 1 having a standard deviation of 3.5 which is slightly closer to zero, making the result more reliable than group 2's result with 8 which is far from reliable because it's not close to the mean average calculated.

Predictive hypothesis supports the fact that when a distraction is added to group 2's experiment, their result would be affected in some way. The result derived from the experiment supports the predictive hypothesis as the distraction did affect group 2's recall result, as they were generally lower than those recall result for group 1. This means that the distraction affected the participants in group 2 from rehearsing and therefore making the recall result low. All the results collected using the mean, mode, median, and standard deviation supports the idea that the music was definitely an added distraction.

Using Alan Baddeley's study and his findings on short-term memory coding, he said errors will be made with words similar sounds. In both groups, very few mistakes were made for words with similar sounds. As a result, no trend can be identified or related to Alan Baddeley.

The results recorded for the investigation do support some aspects of the background studies mentioned in the introduction. Atkinson & Shiffrin proposed the idea of a multi-store model, which compares the mental procedures of human to that of computer operations. Here they suggested that there was a series of information processing stages one after another. These were the sensory memory, short-term memory and long-term memory and the processes of attention and rehearsal were responsible for controlling the flow of information between the stages. The results of the study do support this model as in the second condition where the distraction was added, information was lost as a result of it not being rehearsed enough. This means the distraction prevented the participants from going over the information they had just heard and resulting in the information not been store. This is visible in the low recall results recorded. In contrast the participants of condition 1 showed that when information rehearsal is not interrupted information could be more easily recalled. This can be identified with the high recall results recorded for the condition. Here the mean score was calculated to be 8.5, which clearly reflects the high recalls scored.

Alan Baddeley (1966) came up with the idea that coding in short term memory was based on the sound of the word or Acoustic memory, which was concluded after his study. Links can also be made between this study and the Atkinson & Shiffrin study in 1968. The results of the study can support this concept as the words (information) read out to both sets of participants was stored in the short term memory; this is shown in the results recorded. The difference is that group 1 participants had the recall without the distraction therefore

able to rehearse the words more successfully. The high scores again reflect that a phonological code was used as many of the words sounded similar and as mentioned above few mistakes were made recalling the words throughout the investigation. Thus meaning the words that were able to be recalled were stored using a phonological code.

The Brown and Peterson study proposed the idea that without rehearsal the duration of the short-term memory is shorter therefore causing forgetting. The results of the investigation can also support this, as it is evident in the 2<sup>nd</sup> condition. Here when the distraction was added generally fewer words were recalled. This is due to the words not being rehearsed enough causing a shorter short-term memory eventually resulting in the forgetting of the words. Again the flip side to this is that if the information is rehearsed enough then it will be stored and therefore easily recalled. This occurred in the 1<sup>st</sup> condition.

The experiment conducted at this stage can be noted for its good points and also for its bad points. These are divided into the strengths of the research and weaknesses and are listed below.

A strength of the research is that it can be clearly distinguished that group 1 performed better in the recall test compared to group 2, it is also important to mention that this was predicted so it is a strength that the research matched my assumptions from the beginning and that there were no big surprises.

The 2<sup>nd</sup> strength of the research is that the standard deviation calculated for group 1 was 3.5. This means the results recorded for this condition are fairly reliable making it easier to conclude and generalise.

Discussing my experiment it is also important to list as strength that extraneous variables or confounding variables were controlled due all ethical issues being addressed. No one participating in the study was harmed physically, emotionally or mentally also. To ensure this, participants were constantly reminded in the experiment that they could withdraw at any stage, which ensured the legitimacy of the experiment.

It is a strength also that almost all research obtained supports the relevant background theories listed above which help explain the findings of the investigation.

The experimenter ensured that participants were treated and explained to clearly and equally.

Random sample was used and it is strength of his experiment because its representative of the target population and everyone has an equal chance of being chosen.

On the other hand there are also weaknesses of the research obtained; one of these is that the standard deviation calculated for the 2<sup>nd</sup> condition. This was 8; relatively speaking this show the results here are unreliable because it shows that the results varied from mean. This is a weakness as it is not possible to generalise the information collected and come to a conclusion.

Another weakness of the research is that few mistakes were made with the similar sounding words of the list, it was predicted that many mistakes would be made here as was found in the Alan Baddeley study.

It can also be labelled as a weakness that the mean averages share little difference, this is a bad point as it was expected that the added distraction would have more of an effect on the results. This makes it difficult to come to a clear conclusion based on the findings of the investigation.

It can also be noted that the words on the list are too similar sounding which could be why participants of the 2<sup>nd</sup> condition still managed to score high recalls.

Another weakness of the research is that the results obtained are of too a widely spread of data for example in the 2<sup>nd</sup> condition the standard deviation was high which refers to the mean not being reliable and therefore results being far from it.

A less wide spread of data would help us come to more detailed conclusion in which less mistakes would have occurred. This is because all participants were mainly from the same area.

Human error may have also caused the research to have some weaknesses as it was hard to for the experimenter to stop the clock precisely after each appropriate time resulting in some participants having more time to rehearse the words.

Same target population was used, and a small sample size of participants was used when conducting this experiment, so the experiment cannot be generalised.

If the investigation was to be made better for a 2<sup>nd</sup> attempt it would be given some thought to how different distractions affect memory recall. Here an added improvement could be that before the actual study was carried out different distractions be tested to find which was the most effective. For example as mentioned in the Brown & Peterson experiment participants could be asked to count backwards in 3's or 7's. In contrast

participants could be asked to watch television or play a game. The game here would involve mental ability to avoid the rehearsal of the information.

To improve the study even further different durations of the distraction could be tested to see which is the most likely to cause rehearsal failure as for example the participants could be asked to watch television for 5 minutes instead of listening to music for 1. More experimenters could also be added to the experiments while they are occurring to ensure the fairness of the testing through preventing some having more time than others to write the words down. This would also hopefully avoid unreliable results.

Different target audiences could also be tested at the same time for example 15-16 year olds; this would help us see whether age is a variable in such experiments or whether it simply has no affect.

Also if the experiment was to be carried out again more participants should be added, as this would give us more results in which more detailed conclusions could be drawn. This would possibly prevent many similar results being recorded. Instead 20+ participants could be used.

A bigger sample of participants could also be used, which will give more representative results.

It could also be suggested that more complex words should be added to the word list, as this would challenge participants more as simpler words with few letters are generally easy to remember.

A final improvement that would be added would be to test different time of day for the memory recall as it would be interesting to see whether this had affect on how many words you could recall. It would also help identify which time of day participants are more alert on.

As mentioned above the following variables would be added to the investigation: the time of day in which the experiment was carried out, the age of the participants, criteria of distraction and what included doing and finally the duration of the distraction. Different word lengths would also be added to make the memory recall even more difficult.

To be more exact more than 1 study would be conducted in a 2<sup>nd</sup> attempt which would look at the ages 15 - 18 and test to see whether this will be a factor. Here 40 participants of each age group would be tested to give us a larger set of data in which different factors have been investigated. The target population will be 15 - 18 from Brinsworth Comprehensive Sixth Form School.

It has also been discussed that the counting back in 3's distraction and for the period of 3 minutes would be more suitable as here participants would be forced to think about other things where when listening to music they may have not been forced to do. Finally longer words would be added to the current word list as it is felt that these are of too similar sounding as simple meaning. Here 10 more words would be added including gesticulation, eradication and malnourished giving 20 words in the final list. This would help to see whether the same effect of short word recall is the same as that with long words and whether any patterns drawn from this to explain the overall coding of these.

Also the different groups of participants in a 2<sup>nd</sup> study would be asked to the experiment at different time of the day to test whether tiredness or lack of rest affects recall. Here there will be 2 groups of 20 participants. This is split into 2 sets of 10 in which will see 10 do the experiment in the morning and 10 in the afternoon. This will be repeated with the 2<sup>nd</sup> group where the distraction would be tested.

Overall these added would help give a better conclusion for forgetting and how different factors like age affect it.



## **REFERENCES**

### TEXT BOOKS

Pennington, D (2000) 'Introducing Psychology', Hodder Arnold, Oxon.

### WEBSITES

[www.wikipedia.org/atkinson&shiffrin](http://www.wikipedia.org/atkinson&shiffrin)

[www.wikipedia.org/alanbaddeley](http://www.wikipedia.org/alanbaddeley)

## APPENDIXES

### APPENDIX 1

#### Working out of averages for Group 1

##### Mean

Male  $> 8 + 8 + 9 + 9 + 10 = 44$  out of possible 50

Female  $> 7 + 7 + 8 + 9 + 10 = 41$  out of possible 50

$$44 + 41 = 85$$

$$85 \div 10 = 8.5$$

##### Median

7, 7, 8, 8, 8, 9, 9, 9, 10, 10

$$8_{.9} = 8.5$$

##### Mode

8 and 9 were both recorded three times.

##### Standard Deviation

Scores		
7	-1.5	2.25
7	-1.5	2.25
8	-0.5	0.25
8	-0.5	0.25
8	-0.5	0.25
9	+0.5	0.25
9	+0.5	0.25
9	+0.5	0.25
10	+1.5	2.25
10	+1.5	2.25

$$\text{Total (Ed}^2) = 10.5$$

$\text{Ed}^2 \div (N-1)$  N=number of participants

$$10.5^2 \div (10-1)$$

$$110.25 \div 9 = 12.25$$

$$\sqrt{12.25} = 3.5$$

APPENDIX 2

Working out of averages for group 2

Mean

Male >  $5 + 5 + 9 + 9 + 8 = 36$  out of a possible 50

Female >  $9 + 7 + 6 + 6 + 6 = 34$  out of a possible 50

$$36+34 = 70$$
$$70 \div 10 = 7.0$$

Median

5, 5, 6, 6, 6, 7, 8, 9, 9, 9  
 $6.7 = 6.5$

Mode

6 and 9 were both recorded three times.

Standard Deviation

Scores		
5	-2	4
5	-2	4
6	-1	1
6	-1	1
6	-1	1
7	0	0
8	+1	1
9	+2	4
9	+2	4
9	+2	4

$$\text{Total (Ed}^2\text{)} = 24$$

$\text{Ed}^2 \div (N-1)$  N=number of participants

$$24 \div (10-1)$$

$$576 \div 9 = 64$$

$$\sqrt{64} = 8$$

APPENDIX 3

**BRINSWORTH SIXTH FORM COLLEGE  
DEPARTMENT OF PSYCHOLOGY  
BRIEFING/CONSENT FORM**

**Name of Project:** An investigation into memory coding for words with  
Similar sound and meaning in the Short-term memory.  
And what effect a distraction can have with the overall result.

You are being invited to participate in a study where the coding of information is being investigated and how it is placed into our short-term memory.

The purpose of the study is to establish whether a distraction will affect this process, and how many words from the lists given will be remembered with or without a distraction.

The study is being conducted as the head experimenter and a teacher of the Psychology Department at the Brinsworth Sixth Form College.

This is the contact telephone number for the college if required: 01709 828383

If you decide to participate, you will first be entered into draw. This works by writing your name onto a piece of paper. Based on your gender you will put into either of two bowls consisting of either 14 other male/female names. From this 10 of each sex will be drawn randomly leaving 5 of each sex unselected and therefore unable to take part from this point onwards. In this process you will be allocated to either group 1 or 2 randomly. This procedure should take no longer than 5 minute.

Group 1 will have the job of a simple word recall and Group 2 will have a distraction added before asked to recall any remembered words.

Both groups will be asked to sit in a room and listen to the experimenter read out a list of ten words in 1 minute and then after asked for a recall. However group 2 will be slightly different as a distraction will added directly after the words have been read out, this would be in the form of music for the duration of another minute. Both groups will have 1 minute to recall any words. That means it calculates the group 1 experiment will take up to 2minutes and group2's up to 3 minutes. The music provided will be from a radio and a stopwatch will be needed also to time the participants accurately.

Any information or personal details gathered in the course of this study will remain confidential. No individual shall be identified in any publication of any results. Only the experimenter will have access to the data, however a Psychology teacher will also be asked to assess the experiment and ensure it is ethical. To sum up anonymity will remain as the names of the participants shall not be included nor needed.

If you decide to participate you are free to withdraw your consent and to discontinue participation at any time without having to give a reason and without consequence.

I ..... have read and understand the information above and any questions I have asked have been answered to meet my satisfaction. I agree to participate in this research knowing that I can withdraw at any time without consequence. I have been given a copy of this form to keep.

Participant's Name:

Participant's Signature:

Date:

Investigator's Name:

Investigator's Signature:

## APPENDIX 4

### Word List for group 1&2

The word chosen include ones with the similar meaning and similar sound.

This was essential as the coding for words was what was being investigated, also stated in the hypothesis it was predicted that errors would be made with similar sounding words due to the Alan Baddely experiment.

The list included 10 words these were;

- Log
- Fast
- Dog
- Sign
- Lip
- Teeth
- Last
- Hip
- Line
- Sweet

APPENDIX 5

Scoring system for recall results

Note: This piece of paper is purely for the recording of recall results.

To Participants: Write down any words you can recall from the list in any order.

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APPENDIX 6

## DEBRIEFING SHEET

### **BRINSWORTH SIXTH FORM COLLEGE DEPARTMENT OF PSYCHOLOGY DEBRIEFING SHEET**

**Name of Project:** An investigation into memory coding for words with similar sound and meaning in the Short-term memory. And what effect a distraction can have with the overall result.

The aim of the study is to investigate and look at how information is encoded or placed into our memories. The definition of memory is the storage of information over a certain period of time therefore it will be examined how information is recalled from short-term memory. What will be tested is how information is recalled and whether mistakes will be made; a distraction will be added therefore possibly resulting in recall being affected. It has been decided that the listening to music shall provide a suitable distraction.

Alan Baddeley 1966 is one of many people who investigated short-term memory, in this study he carried out a study to investigate the coding of words. Participants were given lists of words, which included ones that sounded the same and ones with the same meaning. They were asked to recall these immediately after and the results showed that errors had been made with the similar sounding words but not the similar meaning words. Baddeley came up with the idea that coding in short term memory was based on the sound of the word or Acoustic memory. Links can also be made between this study and the Atkinson & Shiffrin study in 1968. They used the systematic model of memory to help suggest ideas. This study is one of relevance to the investigation being carried out.

However the investigation being carried out now is also going to include a distraction to test if it has an effect on the recall.

The study carried out by Conrad also supports the theory of short-term memory being based on a phonological code.

For this study, the results showed that group 1 (without the added distraction), performed better than group 2 (with the distraction in form of music). This supports the fact that a distraction affects the recall because the brain is taking away the information (which is the list of words) from the sensory memory and replacing it with the music, this in turn, makes it difficult for participants in group 2 to remember more words than participants in group 1. The memory topic was investigated, because memory is part of our everyday life. And it can explain in a way why we forget some information given to us.

Your contribution to this study is therefore very valuable and very much appreciated. Because it has shown that if more rehearsal time was given to participants (in both groups), then the recall result would be higher (especially in group 2).

If you would like to read an article on this general topic, then please see:

Pennington, D (2000) 'Introducing Psychology', Hodder Arnold, Oxon.

If, for whatever reason, you later decide that you no longer want your responses to be part of this study, then please contact Abi Lugboso (at Brinsworth sixth form, Rotherham) to have your data removed from the study and destroyed. As a final point, all data collected in this study will be analysed in an aggregated form – your responses will not be singled out; only averaged results will be reported in any future publications. You will remain anonymous.

Thank you again for participating and helping with this study. However, **please do not show this debriefing sheet or discuss any aspect of the study with other students**. In order for this study to work, it is important that future participants do not have this information or any particular expectations.

Thanks!

Abi Lugboso  
(Investigator)