Are personal cues more effective than provided cues for remembering a set of tasks?

COSC366 FINAL REPORT

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Abstract:

A person's memory is a vital component in every day life, as it allows people to organise their lives in a systematic way giving them the ability to plan future events and recall past events as if they were chapters in a book of their life. The importance of a person's memory seems to be taken for granted and research on such topics appears to be limited for a topic of such societal importance. Previous research indicates that cues help a person's prospective and retrospective memory as it reinforces their intention to execute a task.

This research project focuses on a person's ability to recall events which they are going to perform in the future, with the aid of personal or provided cues. The cues were recorded with the aid of visualization techniques. This study found that participant's personal cues were more beneficial than provided cues in aiding remembrance of a prospective task.

Contents:

Chapter 1

Introduction

1.1 Project Motivation

Why conduct this research?

The aim of this research is to discover whether personal cues are more effective than provided cues for a set of prospective memory tasks when testing retrospective memory. This study is just a small contribution towards the Adaptive Computer-Based Post-Stroke Rehabilitation Project run by the Intelligent Computer Tutoring group where researchers are developing the most effective ways in which to rehabilitate patient's cognitive abilities that have become impaired after strokes through the use of home-based intelligent tutoring programs. By determining the most effective cues this will allow the group to find the most effective way of helping stroke patients remember to complete certain tasks and concurrently help rehabilitate their memories.

What is a stroke?

A stroke occurs when the brain is not receiving enough blood and if this flow is stopped for any longer than a few small seconds the brain cannot get oxygen and brain cells can die, causing irreversible damage [1]. This is why a stroke is often called a "brain attack" [1]. A stroke can have the same effect to the brain as a heart attack can have to a heart, thus it can be fatal.

Why conduct research on it?

The importance of this research is globally significant as having a stroke is the third-ranked cause of death in New Zealand after heart disease and cancer and a leading cause of long term disability in the world [2]. There is no specific medical treatment for people who have suffered memory loss after a stroke and it is professionally thought that rehabilitation is their best chance at recovery [3]. It is estimated that one third of stroke victim's will develop memory problems and experience difficulties in their everyday lives as a stroke can badly damage a person's speech, vision and cognitive abilities[3]. These memory problems can be visual or verbal and may effect either their long-term or short- term memory, all depending on which part of the brain has been affected. This research is focusing on the best technique for helping patients remember to do prospective tasks in their long- term memory as most patients will be able to organize their own lives once rehabilitated. This would be our main hope that patients can live independently as over half of people who have strokes are able to function and live at home. [1]

Chapter 2

Background Research

2.1 Societal Importance of Project

Basic Memory Information

Everyday we use our memories in almost every aspect of our lives and are often blissfully unaware that we are even using them. Memory in definition refers to all the information in a person's mind and the mind's capacity to store and retrieve that information [4]. This information can be stored in two places: the working memory and the long-term memory. Long-term memory storage is the main focus of this research as it is a stored representation of all that a person knows and can be thought of as a person's day to day notion of memory [4]. This research project is looking at exploring the difference between personal and provided cues when testing long term retrospective memory with reference to prospective memory events. Are personal cues more effective? Is it those personal touches that make events more concrete in our minds?

Why is it important?

The importance of prospective memory in our everyday lives is evident and the consequences of living without it are inconceivable. Pilots for example rely heavily on their prospective and retrospective memories to operate aircraft as they have to perform a vast number of procedures which they must complete before and after take off and landing. Previous research stated that in the United States five out of twenty seven major airline accidents were caused by prospective memory failures [5]. Prospective memory is also very important for every day people, who have to organize their lives and is essential for living independently. For people with brain impairments, losing their prospective memory can have life threatening consequences, such as forgetting to take their medication or not going to the doctor, both of which can be fatal mistakes.

2.2 Prospective and Retrospective memory

Definition

To understand the context of this study one needs to understand all the major components which play a vital role within it. The actual task remembrance itself is related to a person's ability for storage and recall within their prospective and retrospective memory. Prospective memory can be thought of as "remembering to remember" [6] cited in [5], as it is the notion of remembering to do events at a specified time in the future; for example remembering to go to a doctor's appointment

tomorrow afternoon or remembering that you have a hair appointment on Friday, they may seem like simple tasks but these are vital in organizing our lives. Retrospective memory relates very closely to prospective memory in the instance of this research project, as retrospective memory is remembering what these events consist of and the time frame which they need to be done. Thus to successfully access your retrospective memory, one needs the content of the intention and the time of successful prospective remembering [7].

Studies of Prospective Memory:

Prospective memory is an interesting and compelling topic that has been significantly studied after traumatic events where brain injury has occurred [8] and in normal aging, [9] cited in [12]. It is interesting to note that prospective memory has not been widely studied following the event of a stroke [10] cited in [12]. A stroke is one of the major killers in New Zealand so it is surprising more research has not been done looking at the two. A stroke can have a huge impact on a person's frontal lobes and executive functions; this is where prospective memory is most prevalent [11] cited in [12]. Studies of prospective memory so far have mostly been conducted in laboratory settings with naturalistic observation and are measured through self rated questionnaires, on a scale such as "I found this hard to remember" and this "easier to remember" [12]. A recent study has been conducted where they used a virtual week. This virtual week has some similarities to this research as a virtual week uses a board game with cues and occasions with times and events allowing for realistic time based tasks [12]. This same approach is used in this study because we want to make the events as realistic as possible; this was done by making the tasks everyday events that could occur in peoples lives such as "going to the doctor" compared to unrealistic events such as "going to Disney Land". The most common way of measuring retrospective and prospective memory in the past has been done through the use of the "Prospective and Retrospective Memory Questionnaire" [13] cited in [12], which involves a 16 item questionnaire. The length of this questionnaire helped us to make the decision of how long to make the task list in our project.

The relationship between Retrospective and Prospective Memory

These two types of memory are so heavily interconnected there has been an immense amount of study on their relationship as the status of their relationship remains some what controversial. Researchers are divided on whether prospective memory is just a part of retrospective memory [14][15] cited in [12], because of their great similarity, or whether they are two completely different components of our brain. This second idea was put fourth in a recent study by West, McNerney and Krauss [16] where they looked at a person with multiple sclerosis and found that this participant did poorly on prospective memory tasks and yet still performed quite well with retrospective memory, showing that one can remain in tack while the other can be severely impaired.

2.3 Cue Information

Definition of a cue

To be able to use your prospective memory successfully one needs to have a goal, a level of intention to achieve this goal and a cue. Cues are simply prompters that help people remember these events and when they need to occur. There are two types of cues; self-generated cues and environmental cues. Environmental cues are cues which are drawn from our surrounding environment and self-generated cues are cues which come from ourselves and rely on internal retrieval processes for successful remembering [17] cited in [20].

Cues: Retrospective and Prospective Memory

Prospective memory is particularly dependant on self generated cues. In this research project participants have to form their own self-generated cues in the form of visualisation in the experimental condition. Previous researchers tried to explain the phenomenon of how remembering events can simply "pop into one's head", via the use of cues. Since an intention for a task is initiated by a cue, when a person perceives that cue, it delivers the information previously associated with the cue to consciousness allowing the person to suddenly remember the event [18]. However one cannot truly study the effects of these cues on retrospective and prospective memory, for in the real world the request to remember is not always prompted [19] cited in [20]. Prospective memory can be enhanced with the aid of cues and when these events are activated and cues are strong it allows people to be able to remember tasks or events more successfully [21]. In one of the conditions of this research the cues are going to be activated via the use of personal cues.

2.4 Visualization

Definition:

Visualization in definition means to recall or form mental images or pictures.

History of Visualization:

One of the first studies conducted looking at prospective and retrospective memory was in 1990. In this study [22], a set of participants had to remember a set of tasks which they had to retain and perform later. They found that memory for a future task is enhanced by verbal rehearsal and verbal recitation of the performance of the task itself. There are two types of rehearsal for encoding prospective tasks to memory; these consist of maintenance rehearsal and encoding rehearsal. Maintenance rehearsal only allows a person to hold information for a certain period of time, whereas encoding rehearsal allows a person to encode information into their long term memory [4]. Previous research suggests that some of the most effective techniques for encoding to long term memory involve elaboration, organization and visualization [4]. This research project is going to focus on the visualization technique to aid participant's remembrance for a set of prospective events. Visual and verbal memory are interlinking in our every day lives and research suggests that people can improve their memory for storing verbal information if they encode it visually as well. Visualization provides a distinct visual memory trace to aid the verbal memory trace consequently increasing the changes of that particular memory being recalled in the future [23].

Real life application of Visualization:

Visualization is used in everyday life a lot more than people think. Have you ever lost your keys and tried to think where you left them and form a mental image in you head of where you have been? This is one common occurrence of visualization in real life but they are used in many other ways. One of the most common places which visualization is used in the real world is at the World Memory Championships. They use the mental trace technique as they have to memorize long lists of items which they have to later recall. They do this by using a mental walk technique where they imagine themselves walking down a road picking up all these items in a certain order [24].

2.4.1 Mnemonics

Definition

This is a similar technique to the visualization technique performed in this research where participants visualize themselves performing these tasks, therefore making the tasks more concrete in their minds. For the visualization aspect of this research visual mnemonics is going to be used. Visual mnemonics is the technique of using imagery to describe a personal unique background experience. Mnemonics generally refers to all methods of memory improvement.

Historical Significance:

Mnemonics has a long history of being used in our race, yet it has only really been properly studied in the last 15 years or so [25]. Scientists did not conduct much research in this area as there was an unspoken prejudice towards mnemonics in earlier studies of memory as they were widely thought of as trickery and deception. In 1960 researchers observed this prejudice as they recorded that the "antagonistic attitude of experimental psychologists towards mnemonics is even more violent than their attitude towards their subject's word associations; mnemonics are immoral tricks suited only for evil gypsies and stage magicians" [26] cited in [25]. The earliest study of mnemonics was conducted in 1894, when a substantial difference was found between subjects who studied the name of the object compared to subjects who studied the object itself. It was found that the subjects who studied the object were seven times as likely to recall the object later [27]. So it was concluded that pictures of objects are more memorable than names of objects in both adults and children [28] cited in [25]. There are obviously other factors that effect ones memory of such object's; e.g. if you are associating a task with a mental image it needs to be clear and understandable. Studies suggest that visual associations should be "vivid" to be remembered [29] cited in [25]. In a study in the early seventies, people had to rate the vividness of the images they were memorizing and unsurprisingly when participants were recalling the images, researchers found the images which rated highly in vividness were more likely to be recalled [29]. In 1969 a similar study was conducted where students who were instructed to make vivid, active mental images remembered sets of items better than students just making plain mental images and experienced greater performance [30]. Memory is facilitated greatly by the use of vivid visual mental images [31].

How is all of this relevant to this study?

Many researchers in more recent years have used the technique of visual mnemonics in their studies via the idea of mental time travel, where one can relive past experiences by thinking back or projecting oneself into the future through imagination [32]. Visual mnemonics is going to be used for recording the personal cues in the experimental group of this research. In the control group the provided cues were also visualizations without the use of visual mnemonics as these visualizations will be not relevant to the person themself assumingly not making the tasks as concrete in their memory. A person's ability to visualize differs immensely from person to person as people do not all associate the same mental images with different tasks. The research conducted regarding people constructing their own associations and images yields very mixed results. Some research has found that self generated imagery was slightly better than provided imagery. Whereas other research has found that people who are not able to construct their own imagery are more suited to the imagery being provided for them [33].

2.5 Time based vs. Event Based Tasks

There are two types of tasks that can be given to participants to test their retrospective memory in regards to prospective memory events. One of which is time-based tasks, where participants are asked to complete a task at a specific time. An example of a time-based task would be “Tegan go and pick up milk at 5pm”. The other type is event-based tasks where an event acts as a cue triggering a specific action to be performed. Event based task example would be “When you finish work, go pick up milk”. Time based tasks are often thought of as more difficult than event based tasks since no cue is given for the time based case [9]. In this research project time-based events are used as participants do not have to physically perform the task, they just have to recall it so event-based would not be adequate. Also the experimenter will be prompting participants to remember events in conscious awareness and event-based requires participants to remember events on their own, outside of conscious awareness. Although the events will not be too time specific as participants will find it too hard to remember so many different times.

2.6 Predictions

Due to previous research which has been discussed above I predict personal cues will be more effective for participants remembering a set of prospective memory tasks due to the tasks becoming more activated and concrete in their minds.

Chapter 3:

Method

3.1 Participants

The participants of this study were 20 randomly selected people and undergraduate students. The participation of this study was voluntary. Participants were over 18 and there was no gender restriction of participants. Participants were excluded from the study if they maintained a digit span score of less than six. Participants were randomly assigned into two groups. In the control group participants listened to the provided cues and in the experimental group participants listened to their own personal cues.

3.2 Materials

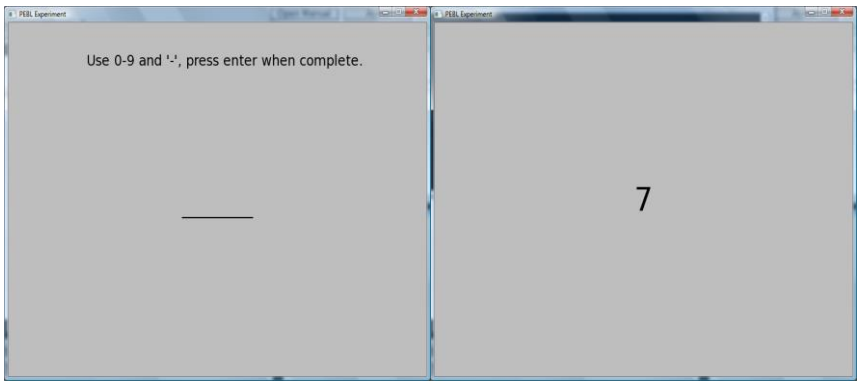
The participants first used a computer program called "PEBL" where they sat there "Digit Span Test" (See Figure 2.1 a) to test for memory impairment. The program was displayed on a Dell 17 inch laptop and participants also used headphones for better sound quality. The participants sat approximately 45cm away from the screen. In the Digit Span Test" a digit is flashed at a rate of one digit per second and a voice also says each digit aloud in a sequence of digits. Once the sequence has finished, participants have to then type in the digits in the correct order which they were shown.

The provided cues are a set of cues recorded by myself which participants in the control group listened to, whereas the personal cues are cues which participants recorded in the experimental condition. Then participants used a second program; this is the program which participants were able to record or listen to cues for a given set of tasks. This computer program was written by Tegan Harrison in the Java language. This program presented the participant with three screens, the first of which presents the instructions. The second is a practice screen (see Figure2.2 a), which displayed 2 practice tasks for participants to record. There will be 8 buttons on the screen; a play, record, stop and clear button each for the concrete cues and visualization cues. For the visualization cues participation used the technique of visualization, imagining themselves performing the task as discussed earlier. The concrete cue is one or two words making the task more detailed in the participants mind. There is also a series of check boxes beside the tasks and progress bars for each question so the participant can be updated of their progress. At the bottom of the screen an instruction button is available so participants can navigate their way back to the instruction page if they forget the instructions. There is also a "done" button for when they have finished practicing. On the third screen participants will be presented with 15 tasks, with the same layout as the practice screen. (See Figure2.2 b and c). After recording the cues participants then opened up the computer

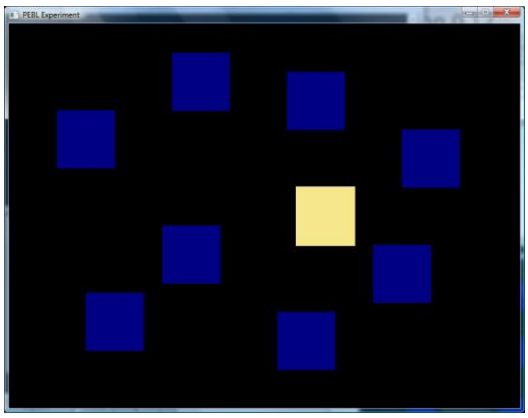
program “PEBL” once again and ran a “CORSI” test which is a spatial memory test (See Figure 2.1 b). This test will show a set of instructions at the beginning of the test and a series of boxes will appear on screen, these boxes will then flash white in a certain sequence and the participant must click on these in the same order as the sequence. This test is used to distract participants from the initial task of remembering the events so that we can be certain participants have stored these events to their long term memory.

In the next phase of the experiment participants then used the memory recall program (See Figure 2.3).This program was written by Tegan Harrison in the Java Language. First the program displays a set of instructions on how to use the program. Unlike the first task the participants did not get a practice run. The second screen has 15 blank text boxes on the left hand side which the participant can enter their answers. There are two buttons for each of these tasks; a “play concrete button” and a “play visualization cue” button. These two buttons are placed next to each of the boxes on the right hand side of the screen. There is also a stop button on the far right hand side for the participants to stop the playback for any of these buttons. The finish button lies underneath this for when participants want to submit their answers.

The control group uses exactly the same Digit Span Test and CORSI test. It has the exact same structure as the experimental group, but it only has the play button available for the participants as they will only be listening to the provided cues not recording their own ones. (See Figure (2.1 d and e). The visualization cue will be divided up into a series of 4 stages given the cue’s total length. If a participant uses a cue, each time they pass a certain stage one more point will be deducted from their score. A correctly recalled answer without using any cues will receive 20 points. If participants choose to listen to the full visualization cue and successfully recall the task then 4 points gets deducted and they receive 16 points. Participants will be encouraged not to use the concrete cue unless they have used the visualization cue first so the penalty for use of the concrete cue is a deduction in 8 points. However if they do not successfully recall the task then the participant receives no points. Consequently meaning participants will obtain a score out of 300. This scoring system allows for the researcher to be able to distinguish between participants who listen to the whole cue and those who only listen to a part of the cue to distinguish how effective the cues are.

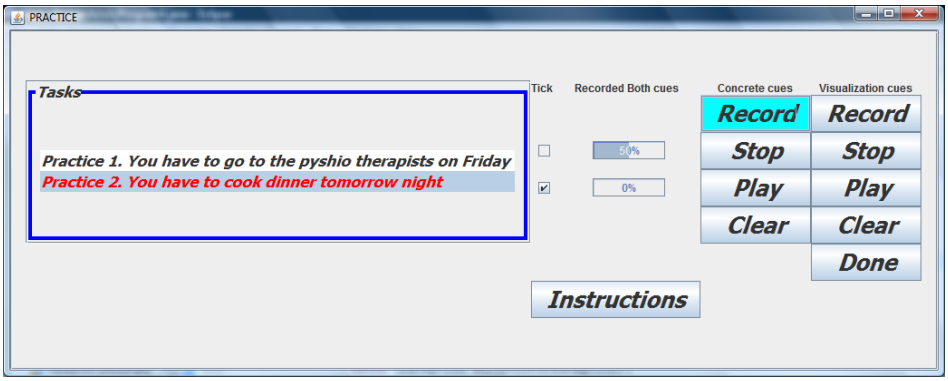


(a) Digit Span Test

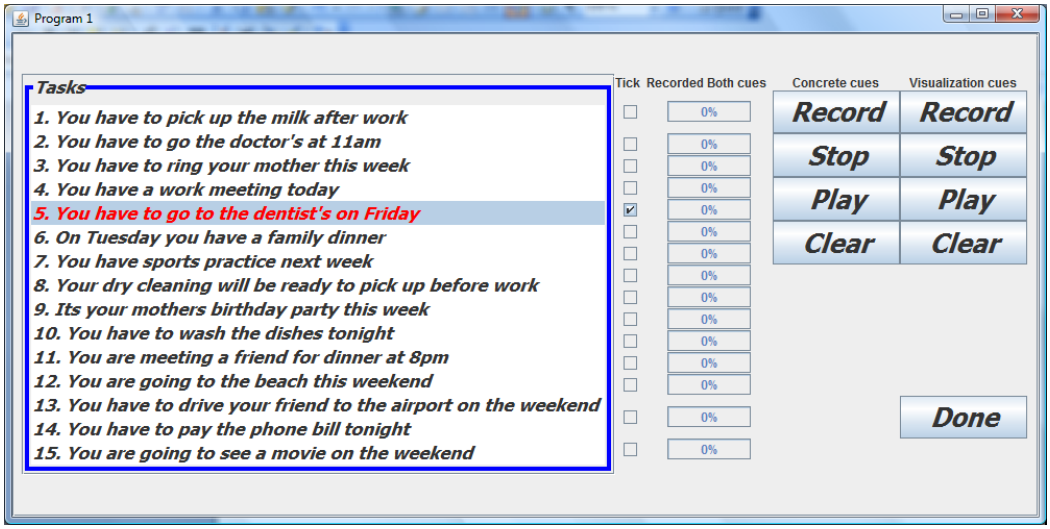


(b) CORSI Spatial Test

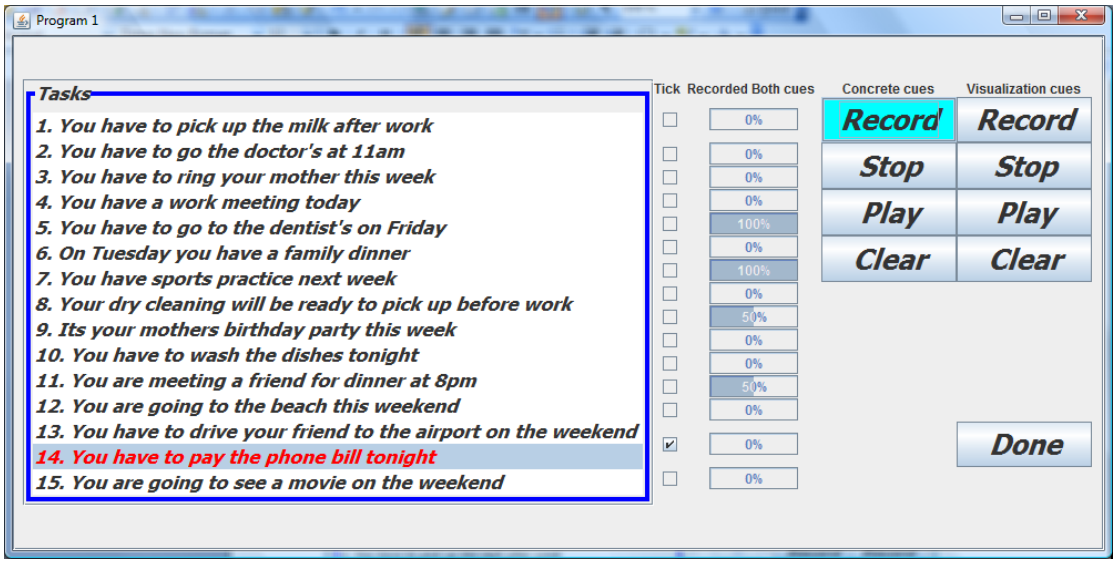
Figure 2.1: PEBL Tests



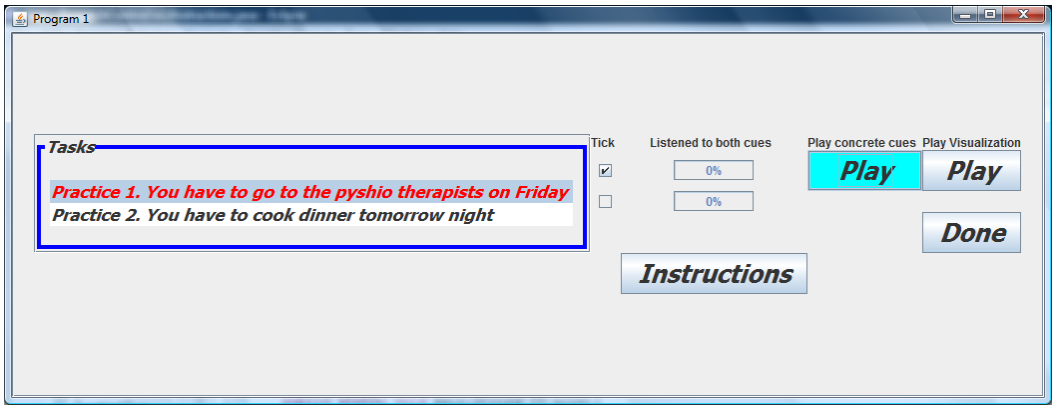
(a) Program 1 Practice (Experimental) Task Screen



(b) Program 1 (Experimental) initial Screen



(c) Program 1 (Experimental) After recording



(d) Program 1 Practice (Control) Task Screen

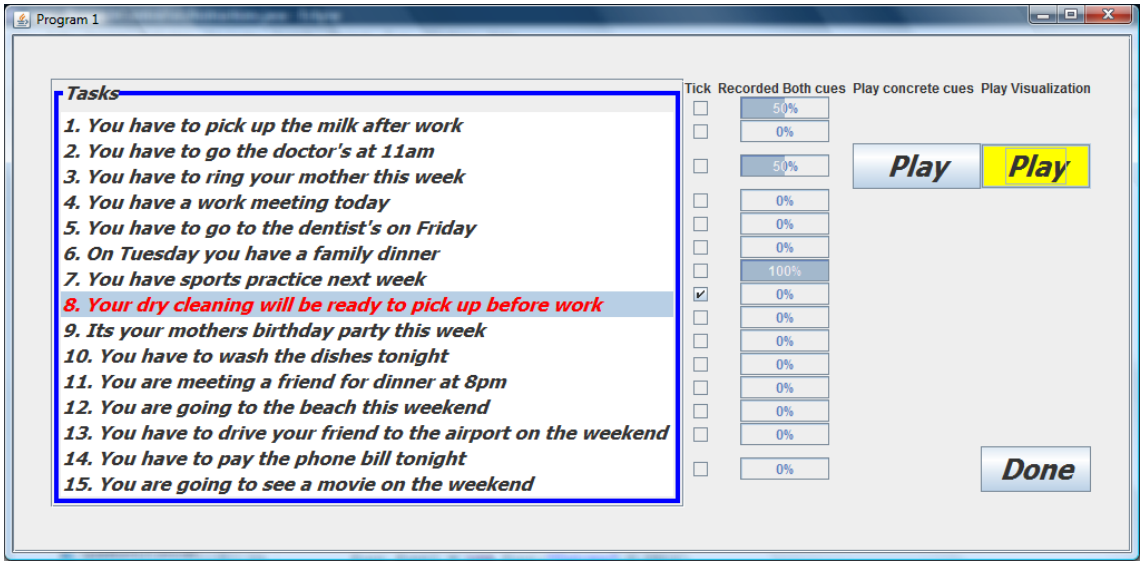


Figure 2.2: The Initial Programs (Experimental and Control Groups)

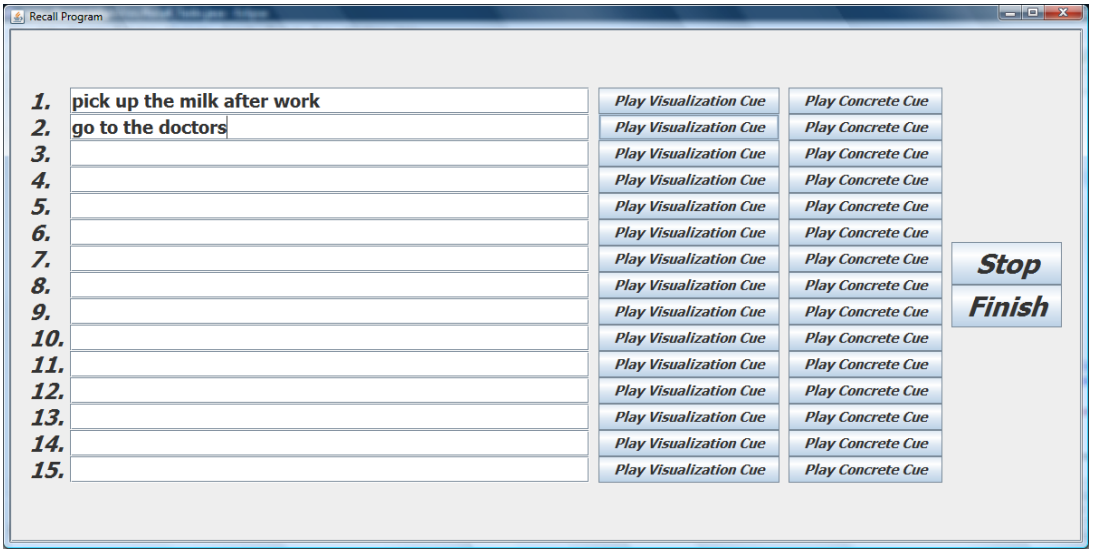


Figure 2.3: The Recall Program for both Groups.

3.3 Design

I tested participants one at a time to eliminate the extraneous variable of unwanted background noise and participant communication. All the participants were tested under the same conditions. Participants were randomly assigned to a condition. The participants could only be in one group, hence a between subjects design. The independent variable was the type of cue which the participants used and the dependant variable was the effectiveness of these cues measured by a scoring system and the amount of time participants listen to the visualization cues.

3.4 Procedure

On average each participant took around one hour to complete the experiment. First each participant received brief introduction to the topic and were given an information sheet to read over. Once participants read this sheet then they were given a consent form to sign. Participants were then shown to a desk and there they completed a digit span test. A Normal person's digit span is 7 plus or minus two [13] but previous research has stated that people with a memory span below 6 have an impaired memory. This test lasted around 10 minutes. The results of the digit span test were collected and quickly examined to determine if the participant had a digit span over 6 or not. If their digit span was not over six they were referred to Christchurch memory Clinic for further testing and rehabilitation. One participant had a memory less than 6 but continued with the experiment and then referred to the clinic. If their result was over six then they continue onto the next stage in the experiment. Participants were then read an explanation on visualization, this included what it meant to visualize and included two examples. It also explained the concept of making cues concrete and what a cue actually was. Then participants started up the program and read the first screen of instructions, which told them how to use the following programs. Once participants were aware of what to do, they pressed the "ok" button. From there participants got the opportunity to practice using the software. Participants in each group were instructed to read the task in their head then also say the task aloud as well. Participations in the experimental group then recorded, stopped and played back their cues they imagined for each of the tasks. Once participants were happy with the software and understood how to use it and what their task entailed they pressed the "Finish" button and went onto completing the actual task. The initial recording stage took around 10 to 25 minutes for the experimental group. Participants in the control group had to play the two provided cues for each task. Once they were happy with the software participants in this group also moved on to the actual task. The task for the control group took on average 10-15 minutes because all they had to do was listen to the cues.

After this stage participants were instructed to complete a "CORSI" test. Once participants had completed this task they were then instructed to open up the recall program where they were given a set of instructions on the rules of recalling the tasks. Participants then went on to recall the tasks, typing the tasks in the provided spaces and listening to the visualization and concrete cues when necessary. If a participant knew what the task was at the start of the visualization cue they pressed the stop button and they got less points deducted. Once participants recalled as many tasks as they could, they pressed the finish button and were thanked for their participation. Participants then had

to fill out a questionnaire with a few simple questions regarding the research and their age range. Once participants completed this questionnaire, they were given a $20 dollar voucher as appreciation for their participation.

Chapter 4:

Results

4.1 Results

I conducted a T test unpaired sample assuming unequal variances as one participant had to be left out of the study due to low digit span score(5). There was a statistically significantly difference in the scores of control group participants who listened to the provided cues(127.7 +- 49.7) compared to the experimental group participants who recorded their own personal cues (185.7 +- 41.5) (t(16) = -2.74, P = 0.014) (refer to Figure 3.1 a and b). This is a very significant result as it is correct up to p = 0.01. This finding confirms my hypothesis that personal cues are more effective than provided cues, for people remembering a set of prospective tasks.

Data Analysis of Participants		
	Control	Experimental
Number of Participants	10	10
Number actually Used	9	10
Age	41-50	19-30
Score		
Mean	127.67	185.7
Standard Deviation	49.75	41.58
Time		
Mean	3.33	3.17
Standard Deviation	0.36	0.29
Test Statistic		-2.742
P Value		0.014

Figure 3.1 (a) Data Analysis

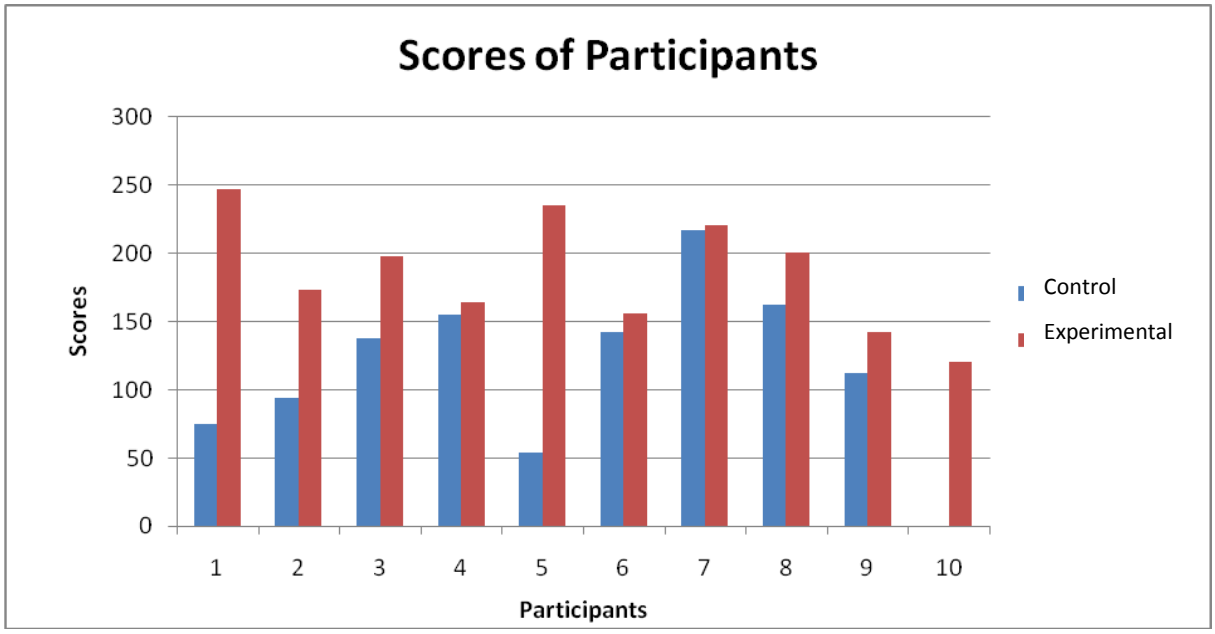


Figure 3.1 (b) Participants Scores of Control and Experimental Groups

The other dependant variable which I measured was the time which participants spent listening to the visualization cue in each of the conditions. This was measured by splitting up the listening time into four sections, one being they listen to a quarter of the cue, 2 listening to a half, 3 listening to three quarters and 4 meaning they listened to the whole cue. It was an interesting finding as it was not what was expected and does not really complement the previous finding but is interesting nevertheless. It was found that participants in the control group do not spend significantly more time listening to the cues than participants in the experimental group as $p = 0.17$ and this is not significant to $p < 0.05$. However if the significance level was made higher this could be slightly significant. As one can see from the data analysis table (refer to Figure 3.1 a and c) there is a slight difference in the mean and participants in the experimental control listened to the cues slightly less than the control group. However this difference is so small with the control group at 3.33 and the experimental group 3.17 it probably would not affect their score. This shows that participants in each group listened to the cues for the same amount of time and there is no significant difference

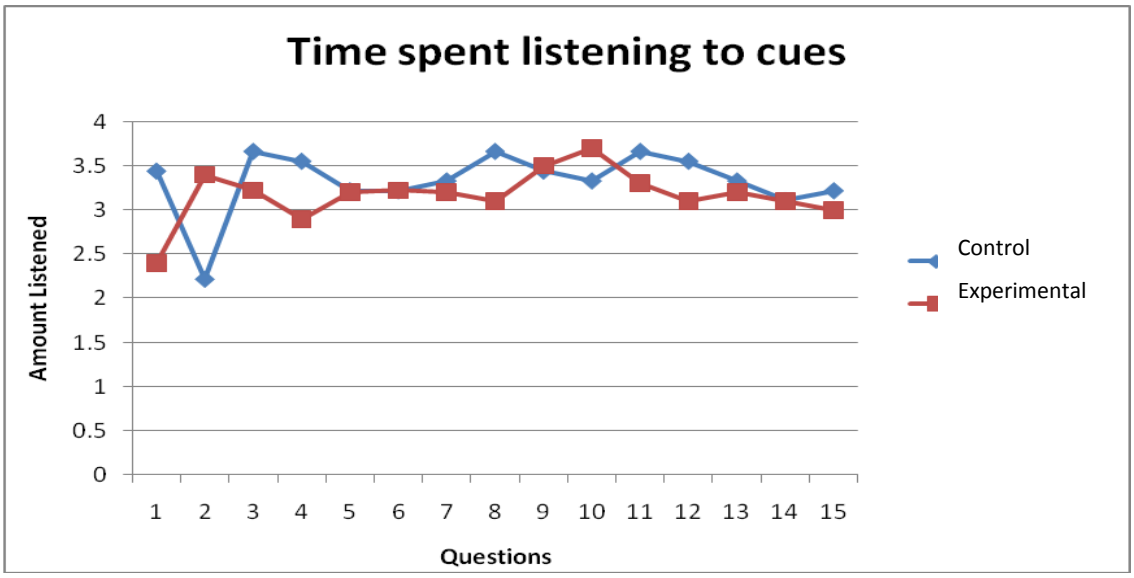


Figure 3.1 (c) Time participants Spent Listening to Cues

between the two groups.

One of the relationships which I looked at during my research is the relationship between a participant's digit span score and recall score (refer to Figure 3.1 d). This is comparing a person's working memory score to long term memory score. The r squared value is 0.008 which means there is very little correlation between the two variables. This is an interesting result as one would think the better a person performs on a digit span the better a persons long term memory would be except these are two very different components of the brain.

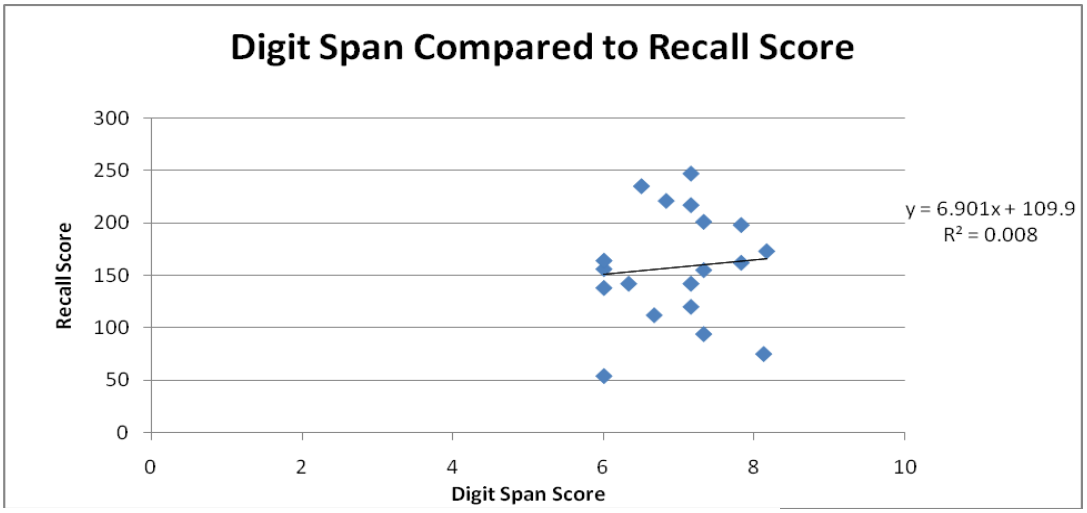
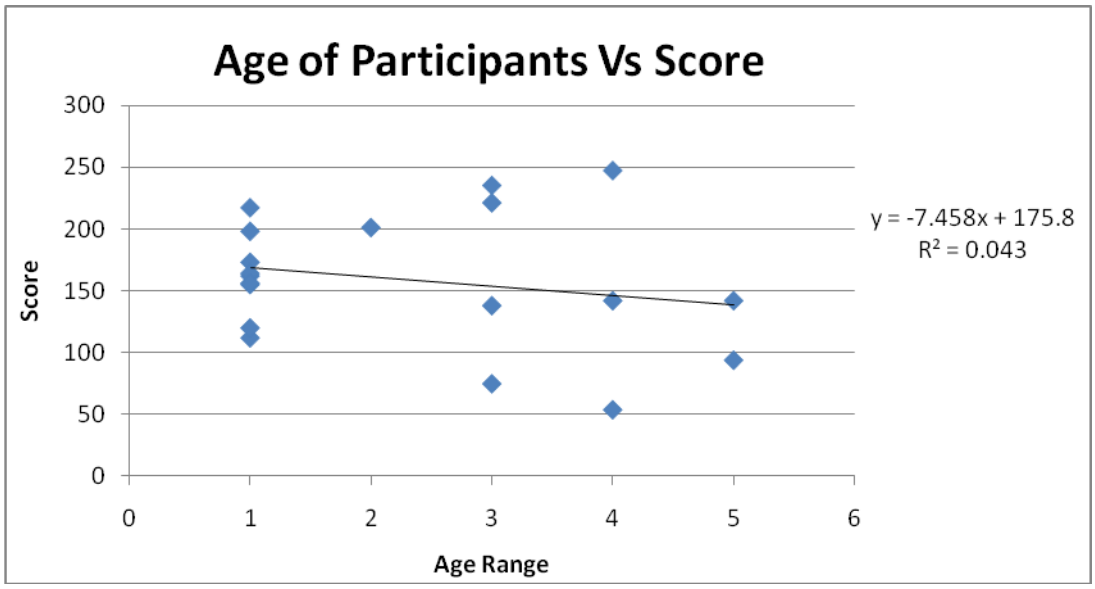


Figure 3.1 (d) Time spent by participants listening to cues.

Ar [illegible] heir score. Age is sectioned into 6 se [illegible] . As one can see in Figure 3.1 (a) th [illegible] er than that of the experimental gr [illegible] is this a causing factor of why pa [illegible] In Figure 3.1 (e) their looks to be a [illegible] is 0.043 suggesting there is little correlation between these two variables of age and score. The formula also shows that on average for every increase in age bracket there is a decrease in score by 7.458.



Chapter 5:

Conclusions

As previous research indicated visualization is one of the best ways to help people remember a prospective task. I found it was quite hard for some people to remember both the event and the time. As previous research stated, time-based events are harder for people to remember than purely event based events. So were personal cues more effective than provided cues? In the context of remembering prospective tasks the results of this study indicate this to be the case. However, it was found that participants did not listen to the provided cues more than the personal cues; they were just remember more of the task, such as the time and event, rather than just one or the other. Participants in the experimental group on average scored better even though they listened to the cues the same amount of time.

Interestingly, a person's digit span has no effect on their ability to recall these prospective tasks, stored to the long term memory. The digit span shows whether or not a person has an impaired memory but is not a good predictor for people's scores in recalling prospective memory tasks. Digit span focuses on peoples working memory and the recall of tasks relates to a person's long-term memory and the two do not really interlink as one can be impaired while the other can remain completely intact as proven through examination of memory diseases. The other interesting point about this study is that a lot of people did really well in the recall program suggesting that participants did actually store the tasks to their long-term memory and the distracter task did its job in discerning those who stored it in their long -term and those who stored it in their working memory.

Looking over the questionnaires participants filled out it was fascinating to note the great variety in age range of participants. Interestingly it was found that no substantial correlation between age and score existed. One of the oldest participants in age bracket 5 received a high score and the participant who received the highest score was in age bracket 4, so age was not really a factor as much as many thought it would be.

One of the participants had to be left out of the analysis as they received a score less than 6; this meant that their memory was impaired. This study has social and global importance as we now know the best way to help people remember. The implications of this study will be used by the Intelligent Computer Tutoring group for the stroke rehabilitation project. This group will now be able to use the results found from this research to help rehabilitate stroke patient's memory, helping them to remember these prospective tasks which they have to undertake. This study will also help everyday people with impaired memory such as people with dementia to live independent and healthy lives.

If this study was to be conducted again I would change a couple of things. Firstly, I would have a larger sample size. Although twenty participants is a reasonable amount, it is not entirely

representative of a population. Another idea would be to test it on a few people who have had strokes to see if it is relevant to the victims as well. Another possibility would be to add more tasks for participants to remember as some people commented that that the task was too easy and some reported that the task was difficult, so possibly more tasks might be an option. I think the study was very representative of the population in regards to age, as I have had participants aged from 19 to 70 who have participated in this study. It was also suggested in the questionnaire that two of the tasks used a reference to “mum” and that a variety of family members would provide a more diverse task list as two references to “mum” could aid learning and allow participants to guess. This was also the case for a couple of tasks that referred to “the weekend” as a time frame; this allowed participants to guess when certain tasks occurred as opposed to actually knowing. Although a large majority of events outside of work occur during the weekend as most people work during the week, so it was necessary in order to make the tasks as close to real life situations as possible.

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Appendix A

Work Log

A.1 Work Log: 2011

Date	Subject	Hours
17/11/2011	Check Question. Is this question original?	3
18/11/2011	Task Design.	2
21/11/2011	Find an initial memory test, and discuss why you choose it.	2
21/11/2011	Project Proposal. Write up.	3.5
21/11/2011	Relevance and Degree of Research. -Background Research	1
22/11/2011	Project Proposal. Write up.	5.5
24/11/2011	Project Proposal. Write up.	3
28/11/2011	Project Proposal. Write up.	3
28/11/2011	Is a person listening to part of cue different from a person listening to whole cue?	1
28/11/2011	Decide how many tasks there are going to be.	1
28/11/2011	Program first recording program.	1
29/11/2011	Project Proposal. Write up.	2
29/11/2011	Background research.	1
29/11/2011	Write up method in English.	1
1/12/2011	Write up method in English	1.5
1/12/2011	Program first recording program.	2
1/12/2011	Project Proposal. Write up.	2
2/12/2011	Write up method in English.	0.16
2/12/2011	Program first recording program.	2
2/12/2011	Background research.	2
5/12/2011	Program first recording program.	1
5/12/2011	Program first recording program.	1
5/12/2011	Write down the tasks.	1
5/12/2011	Write down the tasks.	1
5/12/2011	Justifications. Why are you doing what you are doing?	0.5
8/12/2011	Program distracter task.	3
8/12/2011	Program first recording program.	2
8/12/2011	Working on PowerPoint presentation to group.	2
9/12/2011	Program distracter task.	2.5
9/12/2011	Working on PowerPoint presentation to group.	2
9/12/2011	Relevance and Degree of Research. -Background Research	1
13/12/2011	PowerPoint presentation1	4

13/12/2011	Testing the number of tasks	1
13/12/2011	Working on PowerPoint presentation to group.	0.34
13/12/2011	Working on PowerPoint presentation to group.	3
13/12/2011	Programming the recall program - initial programming and planning.	1.5
15/12/2011	Programming the recall program - initial programming and planning.	3
15/12/2011	Working out scoring bug.	3
15/12/2011	Working out scoring algorithm.	1
16/12/2011	No cohesion with selected task and recording button -Fix bug.	2
16/12/2011	No playback - Fix bug.	2
16/12/2011	Can only record one thing - Fix bug.	2
16/12/2011	Programming recording function.	2
19/12/2011	Interim report - write up.	3
19/12/2011	Can only record one thing - Fix bug.	2
20/12/2011	Programming recording functions.	2
22/12/2011	Allowing playback for initial program.	3.5

A.2 Work Log: 2012

Date	Subject	Hours
9/01/2012	Interim report - write up.	2
9/01/2012	Allowing playback for initial program.	4
9/01/2012	Write up experiment plan and ethics sheets.	2
10/01/2012	Programming the recall program - initial programming and planning.	2
10/01/2012	Reading an audio file for playback.	3
11/01/2012	Reading an audio file for playback.	3.5
12/01/2012	Stop recording for a file - making the record button stop.	2
12/01/2012	Recall program - Find out the amount of time participants spend listening to the cue.	3
12/01/2012	Getting the clear button working.	0.5
12/01/2012	Practice of study - Testing out study on self and family to anticipate length of study.	1
13/01/2012	Program only allow cue to be played once, add Feature.	1
13/01/2012	Add statement that makes participants have to play visualization cue first.	1
13/01/2012	Error messages to make the program more user friendly.	1
13/01/2012	Programming the recall program - initial programming and planning.	1
16/01/2012	Final Report. Start writing final report.	2
16/01/2012	Play a line with no cue and nothing happens - add a catch statement.	1.5
16/01/2012	When trying to record with no item selected program throws errors - Fixing bug.	1.5
16/01/2012	Cancel option on distracter program throws errors- Fixing bug.	1
17/01/2012	Meeting with Tanja, Show Tanja what I have accomplished so far.	1
17/01/2012	Creating a Control program.	2
17/01/2012	Reading an audio file for playback for the recall program.	2
17/01/2012	Timing for file - Find out how much participants listen to.	2
19/01/2012	Adding progress bars allowing participants to see their progress.	1
19/01/2012	Adding checkboxes to make more user friendly.	3
19/01/2012	Improving the Graphical user interface. Add colours when buttons	1.5

	pressed etc.	
19/01/2012	Fix practice program.	2
19/01/2012	Applied for ethical consent.	1
19/01/2012	Change colours when users click on buttons.	1
20/01/2012	Final Report	2.5
20/01/2012	Fix practice program.	1
20/01/2012	Instruction page for initial program.	2
20/01/2012	Improving the Graphical user interface. Add colours when buttons pressed etc.	1.5
24/01/2012	Final Report.	2.5
24/01/2012	Having timestamps.	3
24/01/2012	Improving the Graphical user interface. Add colours when buttons pressed etc.	3
25/01/2012	Control program only play once - Figuring out bug	2
25/01/2012	Creating instructions and practice program for control program.	2
26/01/2012	Recording provided cues - thinking up cues and recording them.	1
26/01/2012	General fix up of program - maintenance.	3
26/01/2012	Meeting with Moffat - Discuss how to test participants.	0.5
26/01/2012	Setting up room for experiment.	2
30/01/2012	Final Report - Calculating Scores and Times of Control Group.	4
30/01/2012	Testing participants.	4
30/01/2012	Applied for ethical consent - Fixing up application.	1
1/02/2012	Testing participants.	5
1/02/2012	Testing participants.	5
1/02/2012	Analysing data.	2
4/02/2012	Analysing Data - Calculating Scores and Times of Experimental Group.	7
9/02/2012	Final Report.	9

Total hours spent on project: 204.5