Project brief

PB1
Aim: To find out if recall of words is better when recalled in the environmental context of which the words were learned

PB2
A directional alternative hypothesis will be used because there is previous research to suggest what the results will be, (higher recall rates when tested in the same context).

PB3
An experimental method and independent groups design will be used, as it lowers bias.

PB4
The advantage of using an experimental method is that it produces quantitative data making it easier to analyse. It also allows for high levels of control and the ability to establish causal relationship between the independent and the dependant variable.
The disadvantages of this method are that the quantitative data produced is limited, as it does not tell you the cause in much detail. High levels of control result in low ecological validity of experiment.

PB5
Potential sources of bias and possible confounding variables are …

- Demand characteristics - participants may figure out what is expected of them, so change their behaviour to give the experimenter better data.
- Experimenter effects – the behaviour of the experimenter may affect the participants and thus the D.V. for example, the way in which the experimenter behaves may encourage certain responses, such as a subconscious smile from experimenter may suggest the correct answer to participant.
- Possible extraneous variables – how familiar words are to individual participants
- Mood/ bodily arousal – the emotional state of a participant when learning words may affect the recall of word and not the environment in which the word are learned. Studies have shown that material is better remembered if the individual's mood is similar at the time of learning and testing

PB6

To prevent demand characteristics non psychology students will be used as participants and single blind technique will be used so participants will not be told that context is the dependant variable.
To prevent experimenter effects standardised procedures will be used.

PB7
P =0.5 level of significance is to be reached before the experimental hypothesis can be retained as then the likelihood the results are down to chance alone are less than 5%.

PB8
Potential ethical issues include
Deception – this can be dealt with by debriefing participants at the end of the study. At the start of the investigation participants are debriefed about the task at hand and told of their right to withdraw from the study once it has been started. Debriefing allows participants to be assured that the experimental results will not be used to suggest their level of intelligence ect. It also allows researches to thank participants for their involvement.

Consent – informed consent from parents of participants under 16 will be sought

Confidentiality – will be dealt with by not taking names of participants and stating that they do not have to write their names on the answer sheet.

Abstract

This experiment examined the effects context-dependent memory on a test of memory recall. Studies have found that memory is better when the learning context matches the testing context. If the words were recalled in the same room in which the participant learned them, performance was hypothesized to be better than if the room was changed between learning and testing phases. No significant main effects were found between same room and words recalled. For the recall questions, a significant interaction was found between the type of chair the participant sat in and whether the condition was matched or mismatched, which fits the Yerkes-Dodson Law (Mendl, 1999). Participants were given a short story to read during the learning phase, a demographic survey and a game of Boggle comprised the interim phase, and a test of twenty questions comprised the testing phase.

Introduction

Context-dependent memory is the idea that the recall of information is improved if the information is retrieve in the same or similar context to the context in which it was encoded. Recall is not as accurate when the retrieval context is not the same as or similar to the encoding context (Matlin, 2002). Similar to the concept of context-dependent memory is environmental context, which is defined as the environmental setting in which events are experienced and remembered. The environment can provide cues that help individuals remember material learned within the setting (Rutherford, 2000). Similar to how the environment provides clues to memory, a person's state of mind at the time they learn something is also important. State-dependent memory refers to enhanced memory for information that is retrieved in the same state as when it was learned (Lang, Craske, Brown, & Ghaneian, 2001). According to Smith (1995), the environment has some effect on the direction of mood, and manipulations to the environment affect memory only when the two environments suggest different moods to the person. Cognitive function, which

includes the formation and manipulation of memories, is affected by stressors. Stressors may be internal or acquired from the environment (Mendl, 1999). Contextual changes in a person's environment can cause added stress to the testing situation. Stressors cause a person's attention to shift, lapse, or narrow. The person's decision speed can be influenced as well (Mendl, 1999). In this situation, the person not only has to deal with memory failures due to the lack of contextual cues, but also with stress, which affects the person's ability to remember what s/he has learned. However, some stress is necessary in certain contexts to allow the person to perform at there optimal level. The Yerks-Dodson law states that cognitive performance is greatest when a person is in a favourable stress or arousal state. If the level of stress rises above or falls below the favourable level, performance suffers (Mendl, 1999). In other words, in order for a person to perform well, they needs some amount of stress; anything above this amount will overwhelm her/him, but anything under the amount will not allow her/him to fully perform.

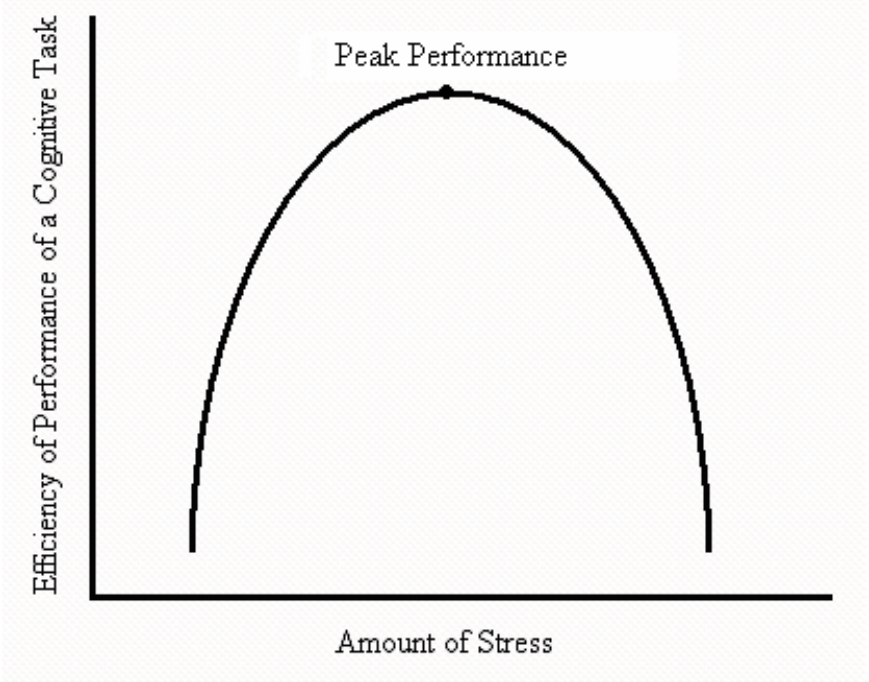


Figure 1. An inverted U shaped curve showing the relationship between a measure of stress/ arousal (horizontal axis) and effectiveness of performance of a cognitive task (vertical axis). This is the Yerkes – Dodson law.

The same stressors that affect performance can also affect reaction time and cause fatigue, inducing a lowered state of alertness. These factors each play a role in how memories are created and retrieved. Contextual elements may become stressors if there are too many of them present. People can only handle so many stimuli at a time, and exposure to too many stimuli at once can send the individual's stress level over her/his personal threshold level, affecting her/his memory. This is referred to as stimulus overload. However, certain outside stimuli can cause a narrowing or focusing of attention, which actually aids in recall and recognition (Mendl, 1999).

These stimuli, such as loud noises, background music, and visual cues can actually be favourable contextual cues when retrieving memories.
The mental reinstatement principle is a way in to avoid the problems associated with differing environmental contexts and stressors. According to the mental reinstatement principle, the effect of changing the environment from the learning to testing stages decreases the extent to which the subjects are encouraged to mentally reinstate the context that was present at learning while they are testing (Smith & Vela, 2001). The environmental context is different enough that it does not trigger memory cues to aid in the retrieval of the material. The state or mood of the individual may also have an effect on memory recall and retrieval (Mendl, 1999). Results from several research studies have shown that material is better remembered if the individual's mood is similar at the time of learning and testing (Grant, Bredhal, Clay, Ferrie, Groves, McDorman, & Dark, 1999; Smith & Vela, 2001).

Mood congruency and similar environmental surroundings are not the only variables that affect memory; physiological factors, including body arousal, may be additional factors. Hardman and Miles (1998) conducted a study that examined the differences between memory recall for participants who learned word lists while riding stationary bicycles in comparison to those sitting on the bicycle without pedaling. There was a significant increase in the number of words remembered when then learning and retrieval contexts matched (Hardman & Miles, 1998). This confirmed previous research.

Godden and Baddley' study was valuable to the field because the state and context involved changes in the participants surroundings rather than in their bodies or mental state of the participants (such as being under the influence of drugs and alcohol). The experiment done by Godden and Baddley (1975) relates to the proposed study because there will not be a manipulation of the context in the room or administration of any form of drug to alter the person's state of mind, but rather we are going to alter a person's body position and comfort level by using various types o f chairs. The Hardman and Miles study manipulated people's bodies by either using exercise or none exercise and their results were significant by merely manipulating body movement. In the proposed study, similar results will hopefully be obtained by manipulating the type of chairs a person uses. Different chairs may affect the participant's memory because the environmental context will be different and body positioning will also be different. A change in comfort level or stress level caused by a change in seating (or consistency in seating) may also occur. The difference between the two studies involves the particular system of the body that will be activated by the change. Hardman and Miles' study manipulated the sympathetic nervous system by way of peddling the bicycle, as opposed to merely sitting on the bicycle. In the proposed study, the skeletal muscular system will be altered. Sitting on the chair alters the body position, not the physiological aspects of the body. Hardman and Miles measured the heart rate of the person during the learning and testing phases. They used this as the variable they manipulated and found that it supported their hypothesis. However, do not take into account the fact that numerous other changes in the body, not just heart rate, could have affected the memory of the participants. Hardman and Miles based their experimental design off of a well-known experiment done on context-dependent memory by Baddeley and Godden. The Baddeley and Godden experiment tested the memory of participants in two different environments: underwater and on land. The researchers were interested in seeing if

context clues helped the memory of new material that was learned. The participants were experienced scuba divers to control for fear or any other reaction to being under water. Baddeley and Godden had the participants in four conditions: land/land, land/water, water/land and water/water. If the participant was on land s/he sat near the water in their scuba gear after just finishing up with a regularly scheduled dive. This assured that all participants were wet and cold. Baddeley and Godden (1975) found that material was best remembered when the context was the same at the learning and testing condition. This research is important to the proposed experiment because the study is well known, and the proposed research will follow a similar design, modeled after Hardman & Miles (1998) and Baddeley & Godden (1975

A proposed explanation of context-dependency is the ICE Theory (Malmberg, Murnane, & Phelps, 1999). Each letter in the acronym ICE stands for a different type of context-dependent memory. The "I" represents item information, which is the information in a person's surrounding environment that is essential to the cognitive task. Contextual information, represented by "C", is the information in the environment that is not used for the cognitive task at hand. Unlike item information which is important to the actual processing of the cognitive task, context information is not as important; it is merely the information surrounding the person performing the task. The letter "E" in ICE signifies ensemble information. Ensemble information, produced by a combination of item and context information can be created in either the learning or retrieval stage. These three components are important to understanding how context-dependent memory works. When the type of context is the focus of what a person is trying to learn (item), s/he is able to remember the target in both the learning context and the new context. When a person uses context information from the surrounding environment and not just as the target focus, s/he can remember the targets and distractions when in the learning context, but s/he does not remember either in the new context. Ensemble information causes the person to recall only the target in the learning context. The distracters in the learning context and both targets and distracters in the new context are mismatches, which means that the context was not the same in both the learning and testing phases (Malmberg et al., 1999).

Studies have shown that memory generally is better when the learning condition matches the test condition. Grant et al. (1998) found that students who study in the same type of environment in which they are tested perform better. For example, students who study on their bed while listening to music or watching television would perform better on the test it was taken on their bed while listening to music or watching television. Smith and Vela (2001) stated that the more matching features there are between a probe and a memory trace, the more likely it is that the memory trace will be retrieved. In addition, people tend to be aware of their surroundings even when they are attempting to memorize information, and these environmental features are encoded along with the memorized material. Based on this research, the study habits employed by many students could be harmful to their test performance (Grant et al., 1998). For example, if a student studies material while listening to music, laying in her/his bed, or in a warm room, and then takes the test sitting in an uncomfortable desk in a very quiet, structured, cold room, s/he will not be able to recall the material s/he learned as effectively in comparison to testing in a context similar to the learning environment (Grant et al., 1998).

While there is a great body of research supporting the theories of contextual dependency with regard to memory, researchers often find that it is difficult to demonstrate the effects of context-dependent memory and encoding specificity in a laboratory setting (Matlin, 2002). Matlin (2002) proposes three possible explanations

for this phenomenon. The first possible explanation involves the type of memory task. Encoding specificity is often quite strong in real-life situations, in which people are recalling events that have happened to them. In contrast, encoding specificity is usually low in recognition tasks, which is what most laboratory research focuses on. The second explanation involves the outshining hypothesis, which proposes that context can trigger memory in the absence of better memory cues, but context can be completely outshone when other, better cues are present (Matlin, 2002). Following this logic, context is typically important when the material has not yet been mastered. The third explanation for inconsistency in the research regarding context-dependent memory centers on the concept of physical context versus mental context. Often, mental context is more crucial to memory than physical context, which fits with the line of reasoning suggested by the Yerkes-Dodson Law.

The proposed experiment has universal practical implications for students. Most current information emphasizes the importance of learning and testing in the same context, however this study will examine the importance of studying in a context similar to the testing environment. If we find that studying and testing in the same contextual environment does in fact improve test performance, then our study may aid students of all ages and educational levels. If students can get themselves into the habit of studying in a similar context to their testing environment while they are young, they may greatly enhance their academic performance and also their educational experiences in the future.

The proposed experiment is different from other experiments because it involves only changing the context of body positioning and therefore possibly the level of stress a person feels based on the chair in which s/he is seated. If the contexts are not similar, vital information about what they have previously learned may be lost, as stated by the theories behind context dependent memory that if the context of the learning and retrieval stage is not the same or similar, information may not be remembered completely.

Additionally, stress can be induced by such a change in context. In order to perform at peak level, a person must learn the material in a context, state of mind, and amount of stress similar to that of the testing situation.

<u>A study to investigate the affects of context on memory recall in the long term memory</u>

Hypothesis: If words are recalled in the same context in which the participants learned, the performance will be better than if the context the participant recalls words is changed. Performance in the learned context should be better than in a different context because there are certain context cues that could help recall.

Experiment

In this experiment young and old subjects learnt a list of unrelated words in one location and were later tested for free recall either in the same or in a different room. It was expected that, in these conditions recall would be better when words were learned in the same context as recalled and older subjects would benefit, to a larger extent than young subjects, from being tested in the same environment in which they previously learnt.

Method

A total of 24 participants both male and female were used, they participated voluntarily in the experiment. The participants used are all members a Methodist church in which the experiment took place. The twelve subjects in the older group had completed secondary school education and had no problems will reading or writing. They ranged between the ages of 20 and 54 years, with a mean age of.

The twelve participants from the younger group were all students and ranged in age from 16 to 19, with a mean age of 17.

A set of 35 two-syllable words were randomly selected from a sample of 100 words in the oxford dictionary. The list of word were typed in black ink in a linear sequence on a4 sheet of white paper.

Two different rooms were used in the context manipulation. The first
Room A was located in a bible study room on the left hand side near the church entrance. The walls were bare and painted in white, and it contained only a long table with seven chairs around the table and an additional 3 in a corner. There was a window on the right hand side with a view of the garden that remained open during the experiment, allowing for natural light to illuminate the room. Room B was located at the back of the church; its walls were painted in cream and decorated with pictures, and it contained a white sketching board, 6 round tables, 18 chairs and 3 shelves filled with books. A window looked on to a hallway and the lighting was completely artificial. Room A was considerably smaller than Room B. There were two experimenters; one assigned to Room A and the other assigned to Room B.

Design

Both rooms were used as study and test environments with the two age groups. Half the subjects in the same context condition studied the words and went through the memory test in Room A, and the other half studied and was tested in Room B. For subjects in the different context condition, half of them studied the words in Room A and were tested in Room B; the other half studied the words in Room B and were tested in Room A. This experimental situation can be described as a 2 x 2 factorial design, with Environmental Context (same, different) and Group (young, old) as between-subject factors.

Procedure

Subjects in each age group were randomly assigned to either the same or different context condition and individually run in a session that lasted around 8 minutes. The session had three consecutive phases, which were study, retention, and test. At the beginning of the study phase the experimenter met the subject in the foyer, located at the main entrance of the building, and accompanied the subject to the corresponding study room. Once there, the subject was debriefed allowed time to read the instructions of what to do and given a consent form to sign. The subjects were not aware that the dependant variable was the context in which they learned the words. They were then given the word sheet and orally instructed to memorize the list of words on the sheet given to them. The participants were given 10 minutes to memories the 35 words.

After the learning procedure, there was a five-minute interval in which they were told to chat among themselves. The corresponding experimenter accompanied the subjects to the appropriate test room (same or different) to begin the test phase of the experiment. Once in the room the free recall test was administered subjects were given a sheet of paper and instructed to write down all the words he or she could remember from the list of words presented in the study phase in whatever order they came to mind. The time allowed for the completion of this task was 3 minutes.

Results and discussion

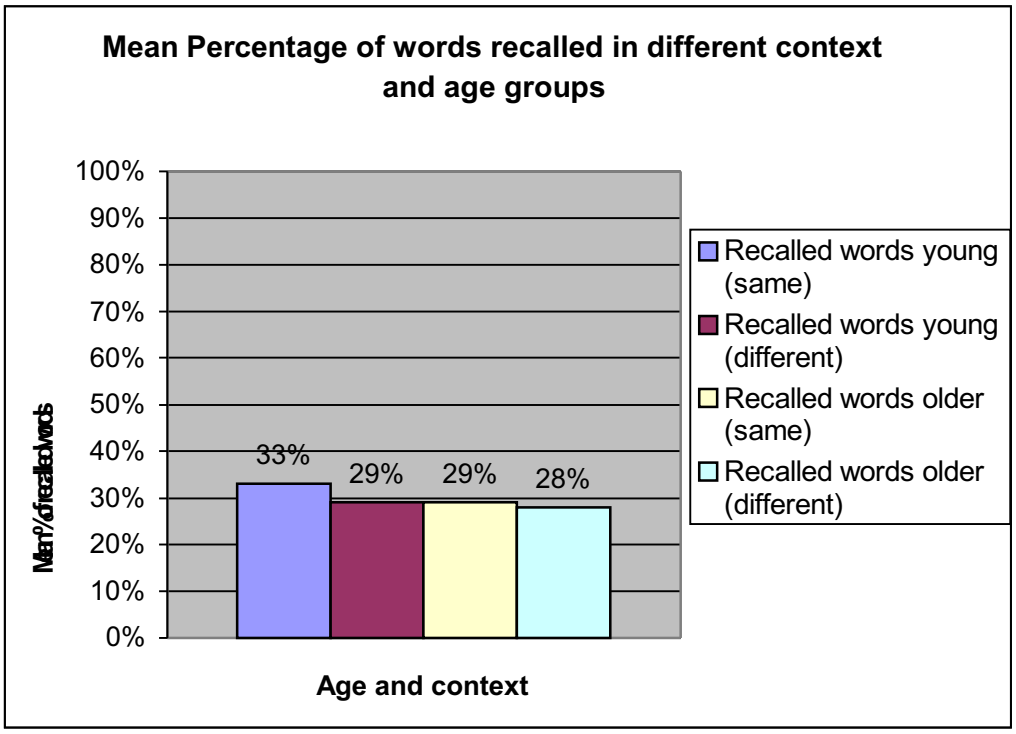
Each subject's score was the percentage of recalled words out of the 35 words in the list. Each column below represents 6 young or older subjects in same of different context from which words were learned. Figure 1 shows the mean recall scores in each of the four experimental conditions.

Figure 1

Recalled words young (same)	Recalled words young (different)	Recalled words older (same)	Recalled words older (different)
25%	31%	26%	20%
31%	37%	17%	22%
22%	40%	35%	31%
34%	17%	20%	22%
40%	28%	35%	40%
45%	20%	43%	31%

Mean recall scores as a function of age group and environmental context condition:

Mean % for recalled words in the same context for younger participants is: 33%
Mean % for recalled words in the different context for younger participants is: 29%
Mean % for recalled words in the same context for older participants is: 29%
Mean % for recalled words in the different context for older participants is: 28%



There was an overall effect of group on free recall scores. The recall of young was significantly higher than the recall of older subjects. The contextual manipulation also had a significant effect on the recall scores. Over all subjects tested in the same environmental context recalled more words than subjects tested in a different environmental context.

In order to examine the variability within data sets and to understnd the extent to which scores in my data are similar or different from one another I will caculate the standard deviation. The standard deviation is a measure of dispertion that will measure the variability the number of words recalled from its mean. The formulae used for calculating the standard deviation is:

$$S = \sqrt{\frac{\sum d_2}{N-1}}$$

Where:
S = standard deviation
√ = sqare root
∑ = sum of
d_2 = the square deviation of each value from the mean
N = number of scores

Mann Whittney test