PSYCHOLOGY IA

An investigation into the theory of reconstructive memory

Submitted by: hxp707

Other group members: hxp677 and hxp726

Date of submission: March 2020

Examination Session: May 2020

Word count: 2196

TABLE OF CONTENTS

INTRODUCTION

Cognitive psychologists believe that memory is a crucial cognitive process. It refers to how we encode, store and retrieve information. However, are these memories accurate records of the past, or can they become contaminated? Bartlett (1932) uses the theory of Reconstructive Memory to argue that memory is influenced by external, or post-event information, such that it is reconstructed i.e. it is recreated through past events as opposed to simply being retrieved when needed. In other words, remembering is considered to be an active process in which we try to make sense of our surroundings through the use of pre-existing information, perhaps leading to distorted memories. This pre-existing information could be stored in 'schemas': stable, deeply rooted mental representations that influence our beliefs and expectations (Popov, 2018). We rely on schemas in order to simplify the world and create heuristics (mental shortcuts) which aid our thinking.

Loftus and Palmer (1974) conducted a lab experiment to investigate the extent to which such post-event information could affect participants' memory, and whether these memories had been reconstructed or not. 45 students from the University of Washington were asked to watch videos of traffic accidents followed by a questionnaire about the events. The post-event information was disguised as a change of wording in a "leading" question which asked the participants "About how fast were the cars going when they hit each other?". Four other conditions were used where the verb "hit" was replaced with either "smashed", "collided", "bumped" or "contacted". The sample followed an independent measures design such that each of the five groups contained only 9 participants. The findings showed that participants provided higher speed estimates when more 'emotionally intense' verbs were used. For instance, those who read the verb "smashed" reported a mean estimate of 40.5 mph, whereas those who read the verb "hit" reported a lower mean estimate of 34.0 mph. This is due to the belief that the

impact perceived of an accident is gentler for 'hit' than for 'smashed'. As such, we could see that participants' memory (measured through speed estimates) of the car crash had been reconstructed as a result of a set of pre-existing schemas that certain verbs infer greater emotional intensities than others. This allows us to conclude that reconstructed memories lack accuracy, thus raising concerns regarding the reliability of memory.

This present investigation seeks to investigate the theory of reconstructive memory by partially replicating Loftus and Palmer's experiment. Instead of five conditions, two independent groups of participants will be used and given the leading question using the verbs 'hit' and 'smashed'. Our experiment aims to investigate how post-event information affects memory recall of a car crash. This aim is relevant because it sheds light upon current, topical psychological and legal issues such as the reliability of eyewitness testimonies. In Loftus and Palmer's experiment, the results indicated that participants in an eyewitness situation provided inaccurate and contradictory speed estimates, thus suggesting the possibility of unreliable reconstructed memories. As such, by conducting this experiment, we are hoping to gain a better understanding regarding the reliability of memory in such situations. Our prediction is that post-event information will indeed influence the memories of a car crash, causing them to be reconstructed, possibly through the reliance upon schemas.

IV: The emotional intensity of the verb ('hit' or 'smashed') used in the leading question.

DV: Speed estimates (km/h) provided by participants.

Research Hypothesis (one-tailed): Participants who are asked the leading question with the verb 'smashed' will report higher speed estimates than participants who are asked the question with the verb 'hit'.

Null Hypothesis: There will be no significant difference between the speed estimates in both groups.

EXPLORATION

Design

The experiment used an independent measures design, such that different participants were in each condition, preventing their responses from being susceptible to order effects. This means that since each group only answered one questionnaire, the participants did not get tired and were not able to practice answering the questions, preventing demand characteristics i.e. it was unlikely to guess the aim of the experiment and provide speed estimates which the researchers were expecting. Furthermore, the participants were randomly allocated into each condition; upon entering the classroom, they were asked to sit anywhere they want. The different questionnaires were randomly placed on the desks such that neither the researchers nor participants knew which table had which questionnaire, hence random allocation.

Sampling

Participants were selected using opportunity sampling, as this was easy and convenient to do in a school setting, however there was an exclusion criterion of psychology students as this could have resulted in demand characteristics; it is more likely that psychology students have learned about Loftus and Palmer's experiment, in which case they would have provided biased speed estimates. The sampling resulted in 24 (13 males, 11 females) 16-year old non-psychology IGCSE students. Our school is international therefore the participants were ethnically mixed from different cultural backgrounds and had a high level of proficiency in English. Their age allowed them to sign their informed consent while their English proficiency prevented language from being an extraneous variable.

Procedure and Materials

The participants were asked to be at a specified classroom during afternoon registration. The classroom was chosen such that it was large enough to accommodate 24 participants. The desks were arranged in exam conditions with each having a questionnaire and a pen. After the participants were seated, the standardized instructions were read (Appendix A), asking them to read and sign their informed consent (Appendix B). As the instructions were being read, the other researchers collected the consent forms. Participants were asked not to write their names on the questionnaires, reserving their confidentiality and ensuring ethical considerations were met. After the car crash video was played (Appendix D), the participants turned over the questionnaires (Appendices E and F) and started answering in silence. This particular video was chosen as it was short (10 seconds) and the crash displayed an appropriate level of violence such that the emotional intensity of the verbs ‘smashed’ and ‘hit’ would have (potentially) had a contextually appropriate effect on the speed estimates provided. Upon completion of their questionnaires, participants were debriefed (Appendix C) and then they left.

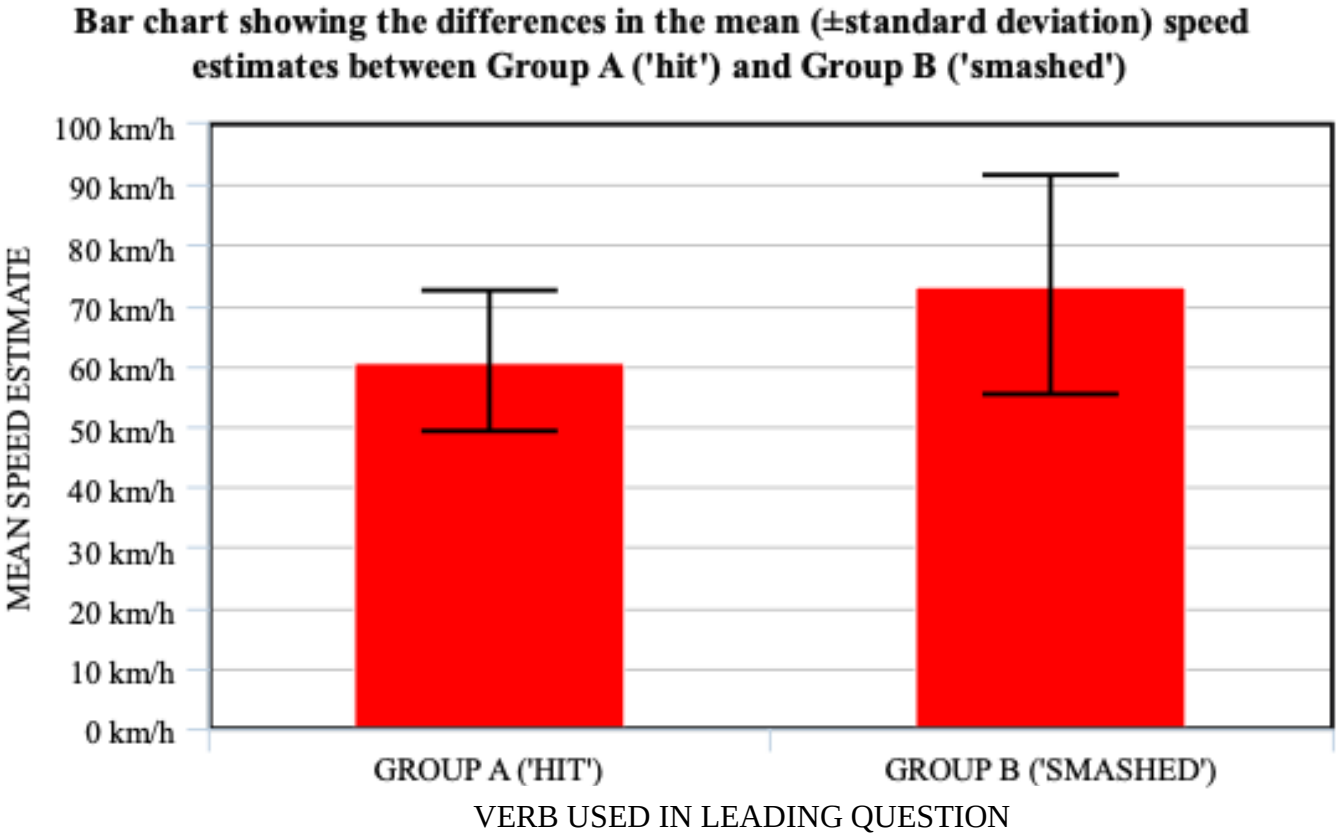
Control Variables

Both questionnaires used the same font (Times New Roman pt.12), had an identical format and asked the same questions (except the change in the verb), thus negating the impact of these extraneous variables and making the two conditions controlled. The standardised instructions and debrief were read by the same person, therefore clarity of speech was not affected, and the video was displayed on a large board such that all participants could clearly see the car crash with ease. Furthermore, the participants were the same age and presumably had no driving experience, mitigating the effects of individual differences that could have potentially affected the speed estimates.

ANALYSIS

Descriptive Statistics

The data obtained was at least ordinal. As such, the means and standard deviations (SD) were calculated from the raw data (Appendix G), since they are appropriate measures for the analysis of interval data. Group A ('hit') estimated a mean speed of 60.7 km/h, with a SD of 11.7 km/h; whereas group B ('smashed') estimated a mean speed of 73.2 km/h, with a SD of 18.1 km/h. This data is summarised in the figure below. It is important to note that in calculating these statistics, two values have been identified as outliers and excluded from the calculations, since they did not fit within the general trend and were contextually inappropriate, and thus could have impacted the interpretation of the statistics. These values are '5' from group A and '6' from group B. Therefore, only 11 participants from each condition have been analysed.



Created using: https://www.meta-chart.com/bar

The mean speed of Group B was 12.5 km/h higher than that of group A. The SDs showed moderate spread around the mean for both groups, although the SD for group B was 55% higher than group A, suggesting that there was greater variability in the data and greater disagreement amongst participants about the car speed. In the original experiment, the difference in speed estimates between 'hit' and 'smashed' was 10.5 km/h (Loftus and Palmer, 1974), which is similar to our difference of 12.5 km/h. As such, our results agree quantitatively. At first glance, this descriptive data seems to support the research hypothesis that there is causality between the emotional intensity of the verb and the mean speed estimates; however, inferential statistics are required to confirm this.

Inferential Statistics

The Mann-Whitney U-test of statistical significance was applied for the inferential analysis, as our experiment employed an independent measures design. Furthermore, the data acquired deviated from normality and the sample size was quite small, therefore a parametric test would have not been appropriate. The test indicated that the speed estimates in group B (mean rank = 13.95) were significantly higher than the speed estimates in group A (mean rank = 9.05); $U(11, 11) = 33.5$, $p < 0.05$, one-tailed (see Appendix H). The calculated U-value was less than the critical value of 34, thus making the results statistically significant. That is to say that post-event information, through the use of different emotional intensity verbs in the leading questions, did indeed affect memory recall. In other words, the null hypothesis is rejected, and the research hypothesis is accepted, due to the results being of statistical significance, i.e. the probability of this being a coincidence is less than 5%.

EVALUATION

The theory of Reconstructive Memory could be used to explain our findings. According to the theory, the participants initially perceived the car crash similarly; however, upon receiving new information in the questionnaires, their memories of the car crash were reconstructed based on the implications associated with the verbs in the leading question. This misinformation effect is a source of problematic discussion amongst psychologists, as it alludes to the idea that our memories are unreliable, and hence, as aforementioned, raises concerns about events like eyewitness testimonies, where people are unwittingly being deceived by their memories.

A strength of our opportunity sample is that it contained 13 males and 11 females, representative of the gender proportion in our schools' IGCSE students, ensuring high population validity. However, due to the participants' age, they were not eligible for a driving license (legal age is 18), which is problematic because the questionnaires required them to answer a question associated with driving; something which they (probably) did not have much experience with. This means that they would have not been strongly familiar with certain speeds; they could have had a lack of schema regarding what 60km/h would visually look like in a real-life crash. Using 18-year old IB students as part of our sample would be a good modification because they are likely to have had some experience with driving, thus mitigating this limitation.

A strength of our procedure is that many extraneous variables were controlled. The fact that the classroom, questionnaires and video length were kept the same ensured that participants were treated equally. As such, their speed estimates were unlikely to be biased as a result of confounding variables such as environmental setting. However, a limitation of the procedure is that the questionnaires failed to explicitly request a unit to be accompanied with the speed

estimate. Some participants gave their answer in km/h while one gave it in mph, however, the majority did not provide any unit. This meant that their intentions were unknown, and therefore had to be interpreted as km/h, since that is the conventional unit. Originally, we planned not to request a specific unit due to the different backgrounds of the participants and thus did not want to restrict their choice so that they could provide the speed using a unit they're familiar with. Simply adding a note at the end of the question such as "please specify your unit" would be a useful modification as it would ensure that there is no confusion for the participants when answering and for the researchers when analysing.

Finally, a strength of the independent measures design is that it prevented participants from guessing the aim and consequently from displaying demand characteristics. If the design was repeated measures, participants would have been familiar with the questions and could have noticed the change in verbs, thus introducing a confounding variable. As a limitation of the design, randomly allocating participants to groups meant that participants' variability was not accounted for. Although none of the participants had their driving licenses, some could have been more familiar with car speeds than others, perhaps as a result of playing racing video games or watching car races, therefore they could have provided more realistic estimates due to their increased exposure to cars and their (presumably) greater understanding of speeds. A modification would be to allocate participants to groups as matched pairs based on video game experience, ensuring that this potentially confounding variable would be equally distributed amongst the two groups, reducing individual differences between participants.

In conclusion, our experiment was shown to be of statistical significance at the $p<0.05$ level, supporting the theory of reconstructive memory. However, applying the modifications aforementioned may enhance the degree of causation and increase our certainty in the results.

REFERENCES

Bartlett, F. C., & Burt, C. (1933). Remembering: A study in experimental and social psychology. *British Journal of Educational Psychology, 3*(2).

Loftus, E. F., & Palmer, J. C. (1974). Reconstruction of Automobile Destruction: An Example of the Interaction Between Language and Memory. *Journal of Verbal Learning and Verbal Behavior*, *13*, pp. 585–589.

Popov, A. (2018). *Psychology for the IB Diploma*. Oxford, United Kingdom: Oxford University Press.

APPENDICES

Appendix A: Standardised instructions

Welcome and thank you for agreeing to participate in our cognitive psychology experiment.

In front of you is the informed consent, please read over and sign if you agree to participate. This means you understand the terms of the experiment and agree to participate. Although, you have the right to withdraw at any time from the experiment if you no longer want to participate and your results will also be removed from the data collected.

There is a question paper on the desk, please do not turn over the paper until you are asked to do so. You will watch a short video clip and then be asked to answer the questions. Please do this in silence without discussing with the other participants. There is no need to write your name on the answer sheet as your names will not be included in the results in order to maintain anonymity. Your results are confidential.

We will now play the video. After you have watched the video, answer the questions to the best of your ability and then turn the sheet back around when you are finished.

We will then read you the experiment debrief.

Are there any questions?

Thank you again for agreeing to participate.

Appendix B: Informed consent

Dear participant,

Our names are

For our IB psychology IA we are conducting a simple experiment, that is part of cognitive psychology. This consent form is an agreement that gains permission for your participation.

As a participant:

- I have been informed about the nature of the research to an extent.
- I understand that I have the right to withdraw from the research at any time, and that any information/ data about me will remain confidential.
- I understand that my anonymity will be protected as my name will not be identifiable in the IA.
- I understand that I will be debriefed at the end of the research.

I understand and agree to the conditions above and I give my consent to participate in this experiment:

Name: _____

Signature: _____

Date: _____

Age:_____

Appendix C: Debrief

Thank you for taking part in this experiment. Now that you have completed your questionnaires, we will debrief you by sharing further details of the experiment. We had two different conditions, each being given a different set of questions. The questions were identical with the exception of a subtle change in the wording of the question we were interested in, the one which asked you to provide an estimate for the speed of the cars. One half of participants in this class were asked the question using the verb "smashed", whereas the other half were given the question using the verb "hit". This experiment therefore aimed to investigate how post-event information would affect your memory of the car crash. In other words, how different verbs possessing different emotional intensities would affect the speed estimates you provided. This potentially gives us insight into the reliability of our memories.

If you would like, we will share the results of this experiment with you in a few days. Please feel free to contact us if you have any questions or if you do not want your data to be analysed so we can withdraw it.

Appendix D: Car Crash Video

Available at: https://www.youtube.com/watch?v=Rg5bBJQOL74

Appendix E: Questionnaire A

1. What colour was the car in the accident?

2. What was the weather like in the video?

3. How many cars were in the video?

4. What speed do you think the car was traveling at when it hit the other car?

5. Where did the accident take place?

6. When/ what year do you think it took place?

Appendix F: Questionnaire B

1. What colour was the car in the accident?

2. What was the weather like in the video?

3. How many cars were in the video?

4. What speed do you think the car was traveling at when it smashed into the other car?

5. Where did the accident take place?

6. When/ what year do you think it took place?

Appendix G: Raw data and descriptive statistics calculation

Table 1: Speed estimates (km/h) given by participants in two different experimental conditions 'hit' and 'smashed'. Bold values have been identified as outliers. *value was originally given as 50mph, and got converted to km/h.

Group A ('hit')	Group B ('smashed')
55	**6**
40	80*
75	95
63	60
50	40
60	100
80	70
5	80
70	65
65	90
50	55
60	70
$\sum = \mathbf{668}$	$\sum = \mathbf{805}$

$$\mu = \frac{\sum}{n} \qquad SD = \sqrt{\frac{\sum_{i=1}^{n} {x_i}^2}{n} - \mu^2}$$

$$\mu_A = \frac{668}{11} \qquad SD_A = 11.7\ (3\ s.f.)$$

$$\approx 60.7$$

$$SD_B = 18.1\ (3\ s.f.)$$

$$\mu_B = \frac{805}{11}$$

$$\approx 73.2$$

Appendix H: Inferential statistics calculation

Table 2: Speed estimates (km/h) given by participants in two different experimental conditions 'hit' and 'smashed' and their respective ranks according to the Mann-Whitney U-test. '5' and '6' have been excluded.

Group A ('hit')	Rank	Group B ('smashed')	Rank
55	5.5	80	18.0
40	1.5	95	21.0
75	16.0	60	8.0
63	10.0	40	1.5
50	3.5	100	22.0
60	8.0	70	14.0
80	18.0	80	18.0
70	14.0	65	11.5
65	11.5	90	20.0
50	3.5	55	5.5
60	8.0	70	14.0

$$\mathrm{U} = n_A n_B + \frac{n_A(n_A + 1)}{2} - R_B$$

where:

n = number of participants

R = sum of rankings

$$\therefore \mathrm{U} = 11 \times 11 + \frac{11(11 + 1)}{2} - 153.5$$

$$\mathrm{U} = 33.5$$