Internal Assessment
Replication of Loftus and Palmer (1974)

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Abstract

This paper investigates the influence of leading questions on memory by replicating the famous study conducted by Loftus and Palmer in 1974. After watching a video of a car crash, participants are asked a leading question wherein the verb describing the collision is controlled ("smashed", "hit"). The question asks the participants to estimate the speed of the collision (and hence recall it from memory). The results indicate that the schemata associates with the verb in the leading question influence the recall of the event, and result in an inaccurate reconstruction of the memory. More specifically, mild verbs such as "hit" resulted in lower speed estimates, while more intense verbs such as "smashed" elicited higher speed estimates. As in the original study, these results support the conclusion that leading question do indeed have a significant influence on memory, specifically recall, as they introduce new information which may trigger certain schemata and hence interfere with memory retrieval.

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1 Introduction

Memory is the cognitive process which deals with storing and retrieving information. Unlike a computer's hard drive, it is well known that human memory does not store information exactly. In fact, we have all experienced the failure of our memory at some time or another; we have all endured the experience of being unable to remember the details of significant events or experiences. In this sense, memory (particularly the retrieval of information in our memory) is inherently unreliable; it suffers from inaccuracy and is subject to change over time.

The unreliable nature of memory was first rigorously investigate by Bartlett in 1932 [1]. He suggested that instead of recording information exactly, memory encodes information by processing it using mental structures called schemes. He conjectured that schemes provide a framework for organizing incoming information based on prior cultural and experiential knowledge. Thus the memory process was not based on recording information verbatim, but rather processing information using prior information as a "guide". Bartlett further hypothesized that the unreliability of memory stemmed from the its reliance on schemes to process information; particularly, he suggested that when information was retrieved from memory, it is distorted after having been processed using personal and cultural schemes.

To test his theory of memory, Bartlett conducted a study wherein British participants were asked to serially reproduce a traditional Aboriginal story containing many elements specific to Aboriginal culture and storytelling. He found that the participants' retelling of the story changed significantly the more it was told. More interestingly, he found that the participants' recollection of the story changed to suit their personal and cultural schemes: the story became shorter and details deemed insignificant to the Englishmen were removed and replaced with details from their own cultures. These results supported Bartlett's hypothesis. Indeed, the results suggest that memory was distorted by processing via cultural and personal schemes. Bartlett's theory of memory is called the reconstructive theory of memory, because it is based on the idea that memory is a consequence of processing information using prior knowledge (in the form of schemes). Bartlett's theory of reconstructive memory spurred significant interest and was subsequently supported by multiple empirical studies. Today, it is a widely accepted theory of memory.

Based on the theory of reconstructive memory, Loftus and Palmer wanted to know whether the use of leading questions influenced the reliability of information recall; particularly in the context of courtroom examinations. Leading questions are questions which suggest a particular answer, for example, the question "Did you see the broken sign?" suggests that a broken sign exists. A non-leading version of this question could be "Did you see a broken sign?". Loftus and Palmer conjectured that the information embedded in leading questions could evoke processing by particular schemes during

recall, and thus interfere with recall.

In 1974, the duo conducted a study to investigate this hypothesis [2]. In their study, participants were shown video footage of two cars colliding, and were asked a leading question regarding the speed at which the cars collided. The leading question contained a control verb which gave information about the incident ("contacted", "hit", "smashed"). The researchers found that the control verb had a significant influence on speed estimates. Specifically, more dramatic verbs such as "smashed" elicited high speed estimates, while milder verbs such as "contacted" elicited low speed estimates. These results support the researchers' hypothesis. The results suggest that the speed information embedded in the control verb evoked particular schemes associated with words such as "smashed" and "contacted", and subsequently interfered with recall to increase or decrease speed estimates, respectively. In the context of courtroom examination, this meant leading question had a significant impact on the reliability of witnesses' answers.

In this paper, we attempt to replicate the study conducted by Loftus and Palmer. The aim of this study is to investigate how the use of specific control verbs in leading questions (IV) influences the reliability of recall, using the influence of leading questions on speed estimates as a proxy (DV). We hypothesize that the information embedded in the control verb will interfere with the recall of information in accordance with the scheme evoked by the verb in the leading question, and thus reduce reliability. More specifically, we hypothesize that the use of dramatic control verbs, such as "smashed", will elicit overly high speed estimates, while mild control verbs, such as "contacted", will elicit overly low speed estimates. Otherwise, our null hypothesis is that information embedded in leading questions will not interfere whatsoever with the reliability of recall, more specifically, that the control verb will have no influence on the magnitude of the speed estimates. These hypotheses are clearly justified by the prior literature; they follow directly from the results of Loftus and Palmer and the ideas of Bartlett.

2 Method

2.1 Apparatus

- Consent and briefing form
- Debriefing form
- Video of car crash
- Questionnaire with the "contacted" control verb
- Questionnaire with the "smashed" control verb
- Laptop computer

- Pencils
- Eraser

See the appendix for a detailed overview of the various forms.

2.2 Procedure

Participants were greeted and asked to read and sign a consent form which also briefed them on the general outline of the experiment. The specific aim of the experiment was not mentioned; rather participants were simply told that they would witness a car crash and answer a questionnaire. See appendix section XX for an overview of the form given. After consenting and reading the briefing, participants were verbally reminded their rights as participants.

The participants were then led into a quiet classroom (or hallway), and seated in front of a table. On the table was a laptop, open to the first frame of the car crash video (appendix YY), an overturned questionnaire, and a pencil. The questionnaire was selected randomly from a shuffled set of questionnaires. The participants were asked to play the video once and complete the questionnaire when the examiner left the premise, and then inform the examiner when they had finished. See appendix section YY for an overview of the questionnaire.

After they indicated they were finished filling out the questionnaire, participants were verbally de-briefed and given a debrief form which explained the objective of the experiment in greater detail. The video on the laptop was then reset in preparation for the next participant. See appendix section ZZ for an overview of the debriefing form.

2.3 Design

The experiment was designed as an independent measures laboratory experiment. This enabled us to establish a controlled environment and establish a clear cause and effect relationship between the IV (the control verb in the question) and the DV (the speed estimate). There were two experimental groups comprised of 10 students each: the group which received the "smashed" control verb in their questionnaire, and the group which received the "contacted" control verb in their questionnaire. We will call these groups the "smashed" and "contacted" groups respectively.

The experimental variables were highly controlled. In an attempt to avoid demand characteristics, 4 additional questions were added to the questionnaire in an attempt to shift the focus away from the critical question regarding the speed estimate. Furthermore, this experiment attempts to reduce experimenter's bias by ensuring that the examiner leaves the premise before the participants begin the experiment, and by designing the experiment

using a double blind design. Because the questionnaires were shuffled and a random questionnaire was placed face-down on the desk, neither the participant, nor the experiment knew which experimental group ("smashed" or "contacted") the participant was part of before the experiment was over.

The study was designed to respect ethical guidelines. Before the experiment, participants were briefed, and made aware of their rights as participants both verbally and in writing. They were told their data would be kept confidential, that no personal data or information would be taken and that they have the right to withdraw themselves and their data from the study at any time. After the experiment concluded, participants were fully debriefed, again both verbally and in writing.

2.4 Participants

In order to quickly and easily gather data, an opportunity sample was used. Participants were chosen from the population of grade 11 and 12 student at the International School of Helsinki who do not take any psychology classes. This prevented students who were familiar with the study from participating. Twenty participants were chosen in total, all of whom agreed to participate in the study. As mentioned earlier, the participants were randomly split into two experimental groups ("smashed" or "contacted") based on the questionnaires they received.

3 Results

The responses to the questionnaire were tabulated and the central tendency and dispersion of the results were calculated. Of the 10 questionnaires returned, 6 responded to the "smashed" condition and 4 responded to the "hit" condition. The mean speed estimated in the "hit" condition was 40 km/hr, with estimates ranging from 30-50 km/hr (a range of 20 km/hr). In contrast, the mean speed estimated in the "smashed" condition was significantly higher at 60 km/hr, with a much wider dispersion ranging from 40-90 km/hr (a range of 50 km/hr).

The mean estimated speeds describe the average speed estimates of the participants and the ranges describe how spread apart (or how close) the various data points were.

This same information has been graphed and tabulated below.

The results clearly show a difference between the speed estimates in the two experimental conditions. The mean speed estimates in the "smashed" condition are 50% higher than the mean speed estimates in the "hit" condition.

See the Appendix, subsection 2 for the raw data and calculations.

Condition	Mean (km/hr)	Range (km/hr)
“hit”	40	20
“smashed”	60	50

Figure 1: Mean and range results for “hit” and “smashed” conditions.

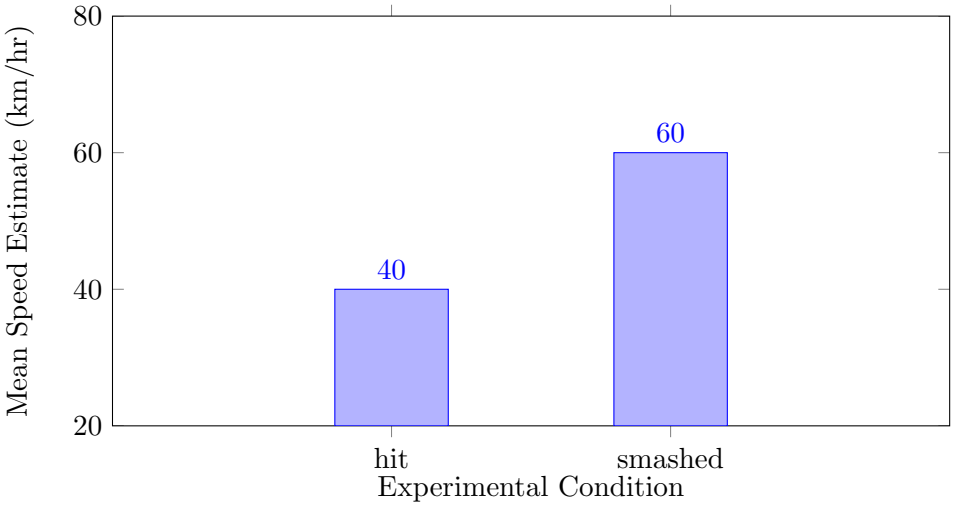

Figure 2: Comparison of mean speed estimates.

4 Discussion

The result of our experiment clearly suggest that the use of leading questions does indeed influence memory. As in the original study conducted by Loftus and Palmer, the mean speed estimate was significantly higher in the “smashed” condition than in the “hit” condition. Based on the reconstructive theory of memory proposed by Bartlett, these results could be explained due to the triggering of the schemata associated with the respective verbs “smashed” and “hit”. The intense, dramatic schema associated with the word “smashed” elicited higher speed estimates, while the milder, less intense schema associate with the word “hit” elicited lower speed estimates.

In conclusion, extra information obtained from the schemata associated with the verb in the leading question interfered with the retrieval of memory, causing differing mean speed estimates in the two experimental conditions. This conclusion closely resembles that of Loftus and Palmer, who also showed that the schema associated with the verb used in the leading question interfered with memory retrieval.

Despite the solid conclusions we were able to draw, this experiment suffers

from several limitation both in it's design and it's procedure. Firstly, the extremely small sample size and the use of opportunity sampling introduced significant bias to the results, as not every stratum of the population was represented. Furthermore, although a double blind design was used, the experimenter (due to the sampling method used) may have inadvertently chosen participants who were more likely to give answers he expected or wanted. As in the original study, the experiment lacked ecological validity, as participants were shown a video of a car crash rather than the real thing. In the real life event, they might have been able to assimilate more information about the crash, perhaps even enough information to disregard the extra information communicated in the leading question. Furthermore, the quality of the video of the car crash was far less than ideal; unlike our eyes and ears, the image wasn't very high resolution and the sound was fair. Therefore, the net information communicated in the video was far less than what would have been communicated in real life. Lastly, the experiment does not directly address the fact that these verbs have interfered with the recall of the memory of the car crash, rather, it only shows that these verbs interfered with the recall of the speed at which the crash occurred. To ascertain whether the real memory of the crash were affected, I would have to test whether other elements likely to be associated with the verb's schema were present in the participants' memories. Otherwise, it could be argued that the extra information communicated in the leading question helped the participant choose a more accurate speed, and no memory was really altered. In the original study conducted by Loftus and Palmer, a second experiment was used to establish the fact that the memory was truly modified.

Conducting this experiment over, I would definitely expand the sample population and use a less biased sampling method, such as random sampling. This would reduce the bias introduced by the small population and allow the findings of the study to easily generalize. The ecological validity of the experiment could also be improved by attempting to use real life car accidents and accident witnesses, however, this remains difficult and dangerous.

5 References

[1] F.C. Bartlett. *Remembering: A Study in Experimental and Social Psychology.* Cambridge University Press, 1932.

[2] E.F Loftus and J.C. Palmer. Reconstruction of automobile destruction; An example of the interaction between language and memory. *Journal of Verbal Learning and Verbal Behaviour*, 1974.

6 Appendix

6.1 Materials and Apparatus

Item	URL
Consent form	`http://bit.ly/VKofDc`
Debriefing form	`http://bit.ly/YHO7gc`
Video of car crash	`http://bit.ly/11Rrb2O`
Questionnaires	`http://bit.ly/Xrwn5T`

Figure 3: URL locations of the materials used in this study.

6.2 Raw Data and Calculations

Participant	Speed Estimate	Condition
1	50	hit
2	40	hit
3	30	hit
4	40	hit
5	70	smashed
6	90	smashed
7	40	smashed
8	50	smashed
9	60	smashed
10	50	smashed

Figure 4: Raw data of both experimental conditions.

The mean for both experimental conditions was calculated using the following formula,

$$\mu = \frac{1}{n} \sum x.$$

Therefore,

$$\begin{aligned} \mu_{\text{hit}} &= \frac{1}{4} \sum x \\ &= \frac{1}{4} \cdot 160 \\ &= 40. \end{aligned}$$

And,

$$\begin{aligned}\mu_{\text{smashed}} &= \frac{1}{6}\sum x \\ &= \frac{1}{6}\cdot 360 \\ &= 60.\end{aligned}$$

The range for both experimental conditions was calculated using the following formula,

$$\text{range} = \max x - \min x.$$

Therefore,

$$\begin{aligned}\text{range}_{\text{hit}} &= \max x - \min x \\ &= 50 - 30 \\ &= 20.\end{aligned}$$

And,

$$\begin{aligned}\text{range}_{\text{smashed}} &= \max x - \min x \\ &= 90 - 40 \\ &= 50.\end{aligned}$$