Influence of question-phrasing and response-scale in speed estimation of witnessed accidents

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Influence of Question-Phrasing and Response-Scale in Speed Estimation of Witnessed Accidents

The effect of question phrasing on speed estimation is assessed by means of two rating systems, a verbal rating scale (VRS) and a visual analogue scale (VAS). Subjects were asked to watch a short video depicting the scene of a car accident and then answer a short memory test concerning the video. The test contained the question, “About how fast was the car going when the crash occurred?” Other subjects received the word “fender-bender” or “impact” in place of the word “crash”. Subjects were asked to estimate speed using either a verbal rating or a visual analogue scale. Results indicated that using a visual analogue scale elicited a higher speed estimate than using a verbal rating measure. The highest speed estimate was given with the word crash and the visual analogue scale, p<.05. No significant difference was found due to the phrasing of the question alone.

Can our memories be altered when new information is presented after the memory has already been formed? For years, research has been conducted on the formation of memories and the reporting of subjective experiences to answer this question. For example, in 1974, Loftus and Palmer had subjects view films of traffic accidents followed by a memory test to identify if the phrasing of the question affects the numerical estimate of speed. The test contained one critical leading question. They defined a leading question as one which by its form or content, suggests or leads the witness to the desired answer. They incorporated the question, “About how fast were the cars going when they smashed into each other?” Other verbs including collided, bumped, contacted, and hit were also substituted for the word smashed. Loftus and Palmer found that the question wording affected the numerical estimation of speed that people remembered. Specifically, the word smashed resulted in the highest speed estimation and the word hit resulted in the lowest speed estimation. They suggested that the question form caused a change in the memory for the event. However, one may ask, would changing different parts of the leading question (i.e. nouns vs. verbs) produce the same results? An important goal of this study was to answer this question.

Loftus (1975), also performed an additional study to identify if information presented immediately after the event would affect the formation of the memory and influence how subjects responded to questions later. Again, subjects watched films of fast moving events. Loftus then presented questions containing information that either was or was not present in the video. Later subjects were asked about the video again. Loftus (1975), concluded that the information presented immediately after the event did alter the memory for that event.
However, Berkerian and Bowers (1983), refuted Loftus’ conclusions. They performed a similar study to Loftus’ and found that the new information presented actually created a new memory and that the memory for the original event remained unchanged. Therefore, they suggested that forgetting was caused by a lack of cues for retrieval that were present at the time that the original information was encoded.

More recently, Cassel and Bjorklund (1995) performed a study to simulate the experience of an eyewitness in an effort to evaluate the accuracy and reliability of eyewitness testimony as a function of the way the questions were asked and age. Adults, 8-, and 6-year-olds viewed a video of two children fighting over a bike and were asked free- and cued-recall as well as positive (correct) and negative (incorrect) leading questions in multiple interviews. All age groups showed higher accuracy in cued-recall than in the free-recall. Furthermore, subjects in the positive leading question condition had more correct responses than those in the negative leading condition, with children having more correct responses than adults. In the negative leading condition, adults had more correct responses than children. Overall, 6-year-old children were found to be the most suggestible.

In sum, these studies suggest that the particular words used to ask questions about an eyewitnessed event influence observers report about it.

Ellis and Daniel (1971) identified the importance of using verbal labels to create strong, stable associations for the recognition of a stimulus. Subjects were initially trained using either verbal representations of the stimuli or directly observing the stimuli. Following the pretraining session, subjects were given recognition tests at different time intervals. Subjects showed better recall when the response terms had some conceptual relationship to the stimulus terms.

Not only is recognition memory affected by verbal labels, but verbal labels also affect reproductive memory (Daniel, 1972). Reproductive memory might be measured by collecting all of the drawings of a form or object a subject is asked to make and examining the differences and changes between each drawing. In a study conducted by Daniel (1972), subjects were shown objects and told that they resembled a cat, a duck, etc. Following this pretraining, subjects were shown distortions of each image and asked to identify how much it resembled the original image. Memory for these objects was affected by the verbal label placed on each object.

Harris (1973), has also presented evidence of the importance of presupposing information and leading questions in numerical estimations. Subjects were told that the accuracy of their estimation was being measured, therefore, numerical guesses were very important. Subjects were then asked questions such as, "How short was the basketball player?" This question containing information that presupposes that the basketball player was short often resulted in lower height estimations than if the question were asked, "How tall was the basketball player." Therefore, numerical estimations are directly affected by the wording of the question.

The next question to be asked then is, how can we best measure these numerical estimates of subjective experiences? It has been demonstrated in the medical literature, that currently two scales are most commonly used for subjective experience, the verbal rating scale and the visual analogue scale. A verbal rating scale is a measuring device used to translate a subjective measure such as pain, speed, time, and distance into a qualitative value. On the other hand, the visual analogue scale is comprised of a 10 cm line, which represents a range of values used to express a subjective measure into a numerical form (Ohnhaus & Adler, 1975). In a study performed by Ohnhaus & Adler (1975), subjects were given a specified analgesic and then asked to rate the level of pain, using the visual analogue scale and the verbal rating scale. Results showed that for high levels of pain the visual analogue scale tended to elicit lower pain estimates than the verbal rating scale. The visual analogue scale has also been shown to be more consistent than the verbal rating scale at higher levels of the stimulus, however, the opposite is also true, the verbal rating scale tends to be more consistent at lower levels (Ohnhaus & Adler, 1975).

Therefore, the purpose of this study was to investigate whether the phrasing of a question, specifically nouns as opposed to verbs, affects speed estimation of a previously eyewitnessed event when a verbal rating scale is used versus
the visual analogue scale. Although these two scales have frequently been used in the medical field in studies of pain, however they have been not been used specifically for research on eyewitness testimony. From previous research, we predicted that after viewing the scene of a motor vehicle accident, subjects would respond with higher speed estimates when a higher severity noun like "crash" was used than when lower severity nouns like "impact" or "fender-bender" were used. We also predicted that subjects would have different and perhaps more consistent speed estimates when a visual analogue scale was used than when a verbal rating scale was used. However, we did not know whether one scale would be more sensitive to the nouns used than others.

METHOD

Subjects
The 70 participants for this experiment included males and females ages 13 years and older in the Rochester, MN area. The only requirements were to have normal or corrected to normal vision and hearing. Subjects were all volunteers and no remuneration was offered for their participation. Ten subjects participated in a preliminary study and sixty different subjects participated in the actual experiment.

Procedure and Materials
A preliminary study was conducted to identify the level of severity that individuals associate with different words, having a similar meaning to the word accident. The results were used to select three words of maximum, medium, and minimum degrees of severity as a measure of phrasing effects on speed estimation. Ten words were chosen as synonyms for the word accident. These words included: collision, crash, accident, mishap, impact, wreck, casualty, contact, incident, and fender-bender. Next, ten individuals were asked to rate these words on severity using a 1-5 scale (1= very light, 5= very severe). As a result, three words were selected to be included in the memory test: crash (rated most severe), fender-bender (rated least severe), and impact (rated as average severity).

Subjects in the actual experiment were asked to view a short video. Clip 6 of a German multiple car accident film was then shown for approximately 23 seconds. Following the film, each subject was given 7 minutes to complete a crossword puzzle as a filler activity. After completing this task, subjects were asked to answer a short memory test about the video. This consisted of a mixture of multiple choice and open-ended questions, one critical question and 13 fillers. The critical question instructed subjects to estimate the speed of the vehicle. Ten subjects were asked, "About how fast was the car going when the crash occurred?" An equal number of subjects were asked the same question with the words "fender-bender" and "impact" in the place of the word "crash". Each subject recorded their speed estimate on one of two measuring scales. Thirty subjects were asked to provide a verbal rating by simply writing in a numerical estimate of speed. The remaining 30 subjects were given a visual analogue scale, which consisted of a 10 cm line with 0 mph at one end and 100 mph at the other end. These subjects were asked to mark an "x" on the line where they estimated the speed to be. In all, each session lasted approximately 20 minutes.

For this study a 2 x 3 between subjects design was used. The first independent variable, the noun, had three levels: fender-bender, impact, and crash. The second independent variable, measuring scale used, included two levels: the visual analogue scale, and the verbal rating scale. Subjects were randomly assigned to one of the six different conditions. The dependent variable of concern was speed estimation, measured in miles per hour.

Results
Subject's estimates of speed are shown in Figure 1. They were submitted to a 2x3, between subjects factorial ANOVA. The results indicated that the estimation of speed was not significantly affected by the wording of the question, comparing the nouns: fender-bender (M=49.95 mph, SD=14.44), impact (M=49.68 mph, SD=13.28), and crash (M=52.75 mph, SD=15.45), E (2,54) = .325, p>.05. However, the estimation of speed was significantly influenced by the type of response measuring scale used, F (2,54) = 6.44, p<.05. More specifically, the visual analog scale resulted in a higher speed estimate (M=55.17 mph, SD=14.43) than the verbal rating scale (M=46.42 mph, SD=12.82). A marginally significant interaction occurred between the noun used in the wording of the question and the type of measuring scale used. F (2,54) = 2.98, p=.05
A Tukey test showed that the word "crash" in combination with the visual analogue scale (M=60.0 mph, SD=13.38) produced a slightly higher speed estimate than the word "fender-bender" combined with the verbal rating scale (M=42.5 mph, SD=14.44), HSD=17.57, p=.05. Lastly, an independent measures t-test demonstrated no significant difference in the consistency of the visual analogue scale (M=13.95, SD=.55) and the verbal rating scale (M=12.61, SD=2.08), t(4)=1.08, p>.05.

**DISCUSSION**

The main finding of this study was that the type of measuring scale used did significantly affect the estimation of speed. These findings support our hypothesis that subjects would have different speed estimates when a verbal rating scale versus a visual analogue scale was used. More specifically, those subjects given a visual analogue scale elicited a higher speed estimate than those subjects using the verbal rating scale. The idea behind using different scales is that the verbal rating scale attempts to force a subjective measure, such as: pain, speed, time, or distance into a quantitative form by placing it into categories (i.e. severe, moderate, etc., or concrete numerical values) (Ohnhaus & Adler, 1975). On the other hand, the visual analogue scale provides a continuum, which represents the "least value" on one end and the most "extreme value" on the other end (Ohnhaus & Adler, 1975). This allows the subject a range of values to make estimation easier. Patients have also been shown to prefer this type of scale to rate pain (Ohnhaus & Adler, 1975).

Thus, in combination with previous findings, the results of this study demonstrate the importance of measuring devices for subjective experiences. This can be important in the area of law enforcement, not only for the police officers themselves, but also for eyewitness testimonies. It can also be applied whenever there is a need for subjective reporting. For example, when an event takes place (such as a car accident), eyewitnesses are often interviewed by law enforcement officials, who in turn, file this information, as well as their own subjective interpretation in a hand written report. However,
because we did not have access to the actual car speed in the original accident video, this experiment cannot answer whether the visual analogue scale or the verbal rating scale yielded more accurate estimations. Therefore further research is needed to investigate under which circumstances each scale would be more appropriate to use.

Our second hypothesis was that speed estimation would be higher when the noun "crash" was used than when the nouns "fender-bender" and "impact" were used. However, our results did not support this hypothesis, but instead showed that the phrasing of the question, taken by itself did not significantly affect the speed estimation. This is contrary to previous research performed by Loftus & Palmer (1974). Loftus (1975) demonstrated that accident representation is significantly modified by the verb used in the question because this then supplies a new piece of information to the already encoded memory. Questions with this type of presupposing information, if used with the previous information have also been shown to improve the memory of that event (Pirolli & Mitterer, 1983). There are two main reasons that may help to explain why our results do not support previous findings. One explanation may have been our word selection. Loftus and Palmer (1974) used different verbs, whereas, we used nouns. Nouns may be encoded differently and have a weaker impact than verbs when used in leading questions, thus producing no noticeable change in the observers report. Further research is needed to test this idea. Another possibility is that our sample size may have been too small to accurately discern a pattern in the speed estimates between the three nouns used. However, a third explanation exists when we consider the noun used in the leading question and in conjunction with the response scale used in the response. The word "crash" elicited higher speed estimates using the visual analogue scale, than the word "fender-bender" using the verbal rating scale. Additional research is needed in this area to clarify this dilemma and to expand its scope which may include: looking at the effects of previous experience in motor vehicle accidents on the estimation of speed or what effect the use of different types of vehicles represented in the video (i.e. van vs. sports car) would have on the estimation of speed.

REFERENCES


