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Leading Questions and the Eyewitness Report

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A total of 490 subjects, in four experiments, saw films of complex, fast-moving events, such as automobile accidents or classroom disruptions. The purpose of these experiments was to investigate how the wording of questions asked immediately after an event may influence responses to questions asked considerably later. It is shown that when the initial question contains either true presuppositions (e.g., it postulates the existence of an object that did exist in the scene) or false presuppositions (e.g., postulates the existence of an object that did not exist), the likelihood is increased that subjects will later report having seen the presupposed object. The results suggest that questions asked immediately after an event can introduce new—not necessarily correct—information, which is then added to the memorial representation of the event, thereby causing its reconstruction or alteration.

Although current theories of memory are derived largely from experiments involving lists of words or sentences, many memories occurring in everyday life involve complex, largely visual, and often fast-moving events. Of course, we are rarely required to provide precise recall of such experiences—though as we age, we often volunteer them—but on occasion such recall is demanded, as when we have witnessed a crime or an accident. Our theories should be able to encompass such socially important forms of memory. It is clearly of concern to the law, to police and insurance investigators, and to others to know something about the completeness, accuracy, and malleability of such memories.

When one has witnessed an important event, one is sometimes asked a series of questions about it. Do these questions, if asked immediately after the event, influence the memory of it that then develops? This paper first summarizes research suggesting that the wording of such initial questions can have a substantial effect on the answers given, and then reports four new studies showing that the wording of these initial questions can also influence the answers to different questions asked at

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some later time. The discussion of these findings develops the thesis that questions asked about an event shortly after it occurs may distort the witness' memory for that event.

ANSWERS DEPEND ON THE WORDING OF QUESTIONS

An example of how the wording of a question can affect a person's answer to it has been reported by Harris (1973). His subjects were told that "the experiment was a study in the accuracy of guessing measurements, and that they should make as intelligent a numerical guess as possible to each question" (p. 399). They were then asked either of two questions such as, "How tall was the basketball player?", or, "How short was the basketball player?" Presumably the former form of the question presupposes nothing about the height of the player, whereas the latter form involves a presupposition that the player is short. On the average, subjects guessed about 79 and 69 in. (190 and 175 mm), respectively. Similar results appeared with other pairs of questions. For example, "How long was the movie?", led to an average estimate of 130 min, whereas, "How short was the movie?" led to 100 min. While it was not Harris' central concern, his study clearly demonstrates that the wording of a question may affect the answer.

The phenomenon has also been demonstrated in two other contexts: past personal experiences and recently-witnessed events.

Past Personal Experiences

In one study (Loftus, unpublished), 40 people were interviewed about their headaches and about headache products under the belief that they were participating in market research on these products. Two of the questions were crucial to the experiment. One asked about products other than that currently being used, in one of two wordings:

(1a) In terms of the total number of products, how many other products have you tried? 1? 2? 3?

(1b) In terms of the total number of products, how many other products have you tried? 1? 5? 10?

The 1/2/3 subjects claimed to have tried an average of 3.3 other products, whereas the 1/5/10 subjects claimed an average of 5.2; $t(38) = 3.14, \sigma = .61, p < .01$.

The second key question asked about frequency of headaches in one of two ways:

(2a) Do you get headaches frequently, and, if so, how often?

(2b) Do you get headaches occasionally, and, if so, how often?

The "frequently" subjects reported an average of 2.2 headaches/wk, whereas the "occasionally" group reported only 0.7/wk; $t(38) = 3.19$, $\sigma = .47, p < .01$.

Recently Witnessed Events

Two examples from the published literature also indicate that the wording of a question put to a person about a recently-witnessed event can affect a person's answer to that question. In one study (Loftus, 1974; Loftus & Zanni, 1975), 100 students viewed a short film segment depicting a multiple-car accident. Immediately afterward, they filled out a 22-item questionnaire which contained six critical questions. Three of these asked about items that had appeared in the film whereas the other three asked about items not present in the film. For half the subjects, all the critical questions began with the words, "Did you see a . . . " as in, "Did you see a broken headlight?" For the remaining half, the critical questions began with the words, "Did you see the . . . " as in, "Did you see the broken headlight?"

Thus, the questions differed only in the form of the article, *the* or *a*. One uses "the" when one assumes the object referred to exists and may be familiar to the listener. An investigator who asks, "Did you see the broken headlight?" essentially says, "There was a broken headlight. Did you happen to see it?" His assumption may influence a witness' report. By contrast, the article "a" does not necessarily convey the implication of existence.

The results showed that witnesses who were asked "the" questions were more likely to report having seen something, whether or not it had really appeared in the film, than those who were asked "a" questions. Even this very subtle change in wording influences a witness' report.

In another study (Loftus & Palmer, 1974), subjects saw films of automobile accidents and then answered questions about the accidents. The wording of a question was shown to affect a numerical estimate. In particular, the question, "About how fast were the cars going when they smashed into each other?" consistently elicited a higher estimate of speed than when "smashed" was replaced by "collided," "bumped," "contacted," or "hit."

We may conclude that in a variety of situations the wording of a question about an event can influence the answer that is given. This effect has been observed when a person reports about his own experiences, about events he has recently witnessed, and when answering a general question (e.g., "How short was the movie?") not based on any specific witnessed incident.

QUESTION WORDING AND ANSWERS TO SUBSEQUENT QUESTIONS

Our concern in this paper is not on the effect of the wording of a question on its answer, but rather on the answers to other questions asked some time afterward. We will interpret the evidence to be presented as suggesting a memorial phenomenon of some importance.

In the present experiments, a key initial questions contains a *presupposition,* which is simply a condition that must hold in order for the question to be contextually appropriate. For example, the question, "How fast was the car going when it ran the stop sign?" presupposes that there was a stop sign. If a stop sign actually did exist, then in answering this question a subject might review, strengthen, or make more available certain memory representations corresponding to the stop sign. This being the case, the initial question might be expected to influence the answer to a subsequent question about the stop sign, such as the question, "Did you see the stop sign?" A simple extension of the argument of Clark and Haviland (in press) can be made here: When confronted with the intial question, "How fast was the car going when it ran the stop sign?", the subject might treat the presupposed information as if it were an address, a pointer, or an instruction specifying where information related to that presupposition may be found (as well as where new information is to be integrated into the previous knowledge). In the process the presupposed information may be strengthened.

What if the presupposition is false? In that case it will not correspond to any existing representation, and the subject may treat it as new information and enter it into his memory. Subsequently, the new "false" information may appear in verbal reports solicited from the subject.

To explore these ideas, subjects viewed films of complex, fast-moving events. Viewing of the film was followed by initial questions which contained presuppositions that were either true (Experiment 1) or false (Experiments 2–4). In Experiment 1, the initial questions either did or did not mention an object that was in fact present in the film. A subsequent question, asked a few minutes later, inquired as to whether the subject has seen the existing object. In Experiments 2–4, the initial questions were again asked immediately after the film, whereas the subsequent questions were asked after a lapse of 1 wk.

EXPERIMENT 1

Method

One hundred and fifty University of Washington students, in groups of various sizes, were shown a film of a multiple-car accident in which one car, after failing to stop at a stop sign, makes a right-hand turn into the main stream of traffic. In an attempt to avoid a collision, the cars in the oncoming traffic stop suddenly and a five-car, bumper-to-bumper collision results. The film lasts less than 1 min, and the accident occurs within a 4-sec period.

At the end of the film, a 10-item questionnaire was administered. A diagram of the situation labeled the car that ran the stop sign as "A," and the cars involved in the collision as "B" through "F." The first

question asked about the speed of Car A in one of two ways:

(1) How fast was Car A going when it ran the stop sign?

(2) How fast was Car A going when it turned right? Seventy-five subjects received the "stop sign" question and 75 received the "turned right" question. The last question was identical for all subjects: "Did you see a stop sign for Car A?" Subjects responded by circling "yes" or "no" on their questionnaires.

Results and Discussion

Fifty-three percent of the subjects in the "stop sign" group responded "yes" to the question, "Did you see a stop sign for Car A?", whereas only 35% in the "turn right" group claimed to have seen the stop sign; χ^2 (1) = 4.98, $p < .05$. The wording of a presupposition into a question about an event, asked immediately after that event has taken place, can influence the answer to a subsequent question concerning the presupposition itself, asked a very short time later, in the direction of conforming with the supplied information.

There are at least two possible explanations of this effect. The first is that when a subject answers the initial stop sign question, he somehow reviews, or strengthens, or in some sense makes more available certain memory representations corresponding to the stop sign. Later, when asked, "Did you see a stop sign . . . ?", he responds on the basis of the strengthened memorial representation.

A second possibility may be called the "construction hypothesis." In answering the initial stop sign question, the subject may "visualize" or "reconstruct" in his mind that portion of the incident needed to answer the question, and so, if he accepts the presupposition, he introduces a stop sign into his visualization whether or not it was in memory. When interrogated later about the existence of the stop sign, he responds on the basis of his earlier supplementation of the actual incident. In other words, the subject may "see" the stop sign that he has himself constructed. This would not tend to happen when the initial question refers only to the right turn.

The construction hypothesis has an important consequence. If a piece of true information supplied to the subject after the accident augments his memory, then, in a similar way, it should be possible to introduce into memory something that was not in fact in the scene, by supplying a piece of false information. For example, Loftus and Palmer (1974, Expt. 2) showed subjects a film of an automobile accident and followed it by questions about events that occurred in the film. Some subjects were asked "About how fast were the cars going when they smashed into each other?", whereas others were asked the same question with "hit" substituted for "smashed." On a retest 1 wk later, those questioned with "smashed" were more likely than those questioned with "hit" to agree

that they had seen broken glass in the scene, even though none was present in the film. In the present framework, we assume that the initial representation of the accident the subject has witnessed is modified toward greater severity when the experimenter uses the term "smashed" because the question supplies a piece of new information, namely, that the cars did indeed *smash* into each other. On hearing the "smashed" question, some subjects may reconstruct the accident, integrating the new information into the existing representation. If so, the result is a representation of an accident in memory that is more severe than, in fact, it actually was. In particular, the more severe accident is more likely to include broken glass.

The presupposition that the cars smashed into each other may be additional information, but it can hardly be said to be false information. It is important to determine whether it is also true that false presuppositions can affect a witness' answer to a later question about that presupposition. Such a finding would imply that a false presupposition can be accepted by a witness, that the hypothesis of a strengthening of an existing memorial representation is untenable (since there should be no representation corresponding to nonexistent objects), and that the construction hypothesis discussed above is supported. Experiment 2 was designed to check this idea.

EXPERIMENT 2

Method

Forty undergraduate students at the University of Washington, again in groups of various sizes, were shown a 3-min videotape taken from the film *Diary of a Student Revolution*. The sequence depicted the disruption of a class by eight demonstrators; the confrontation, which was relatively noisy, resulted in the demonstrators leaving the classroom.

At the end of the videotape, the subjects received one of two questionnaires containing one key and nineteen filler questions. Half of the subjects were asked, "Was the leader of the four demonstrators who entered the classroom a male?", whereas the other half were asked, "Was the leader of the twelve demonstrators who entered the classroom a male?" The subjects responded by circling "yes" or "no."

One week later, all subjects returned and, without reviewing the videotape, answered a series of 20 new questions about the disruption. The subjects were urged to answer the questions from memory and not to make inferences. The critical question here was, "How many demonstrators did you see entering the classroom?"

Results and Discussion

Subjects who had previously been asked the "12" question reported having seen an average of 8.85 people 1 wk earlier, whereas those asked

the "4" question recalled 6.40 people, t (38) = 2.50, σ = .98, $p < .01$. The actual number was, it will be recalled, eight. One possibility is that some fraction of the subjects remembered the number 12 or the number 4 from the prior questionnaire and were responding to the later question with that number, whereas the remainder had the correct number. An analysis of the actual responses given reveals that 10% of the people who had been interrogated with "12" actually responded "12," and that 10% of those interrogated with "4" actually responded with "4." A recalculation of the means, excluding those subjects in the "12" condition who responded "12" and those in the "4" condition who responded "4," still resulted in a significant difference between the two conditions (8.50 versus 6.67), $t(34) = 1.70, p < .05$. This analysis demonstrates that recall of the specific number given in the initial questionnaire is not an adequate alternative explanation of the present results.

The result shows that a question containing a false numerical presupposition can, on the average, affect a witness' answer to a subsequent question about that quantitative fact. The next experiment was designed to test whether the same is true for the existence of objects when the false presupposition concerns one that did not actually exist.

EXPERIMENT 3

Method

One hundred and fifty students at the University of Washington, in groups of various sizes, viewed a brief videotape of an automobile accident and then answered ten questions about the accident. The critical one concerned the speed of a white sports car. Half of the subjects were asked, "How fast was the white sports car going when it passed the barn while traveling along the country road?", and half were asked, "How fast was the white sports car going while traveling along the country road?" In fact, no barn appeared in the scene.

All of the subjects returned 1 wk later and, without reviewing the videotape, answered ten new questions about the accident. The final one was, "Did you see a barn?" The subjects responded by circling "yes" or "no" on their questionnaires.

Results and Discussion

Of the subjects earlier exposed to the question containing the false presupposition of a barn, 17.3% responded "yes" when later asked, "Did you see a barn?", whereas only 2.7% of the remaining subjects claimed to have seen it; χ^2 (1) = 8.96, $p < .01$. An initial question containing a false pressuposition can, it appears, influence a witness' later tendency to report the presence of the nonexistent object corresponding to that presupposition.

The last experiment not only extends this finding beyond the single example, but asks whether or not the effect is wholly due to the word "barn" having occurred or not occurred in the earlier session. Suppose an initial question merely asks about, instead of presupposing, a nonexistent object; for example, "Did you see a barn?," when no barn existed. Presumably subjects will mostly respond negatively to such questions. But, what if that same question is asked again some time later? It is possible that a subject will reflect to himself, "I remember something about a barn, so I guess I must have seen one." If this were the case, then merely asking about a nonexistent object could increase the tendency to report the existence of that object at some later time, thereby accounting for the results of Expt III.

EXPERIMENT 4

Method

One hundred and fifty subjects from the University of Washington, run in groups of various sizes, viewed a 3-min 8 mm film clip taken from inside of an automobile which eventually collides with a baby carriage being pushed by a man. Following presentation of the film, each subject received one of three types of booklets corresponding to the experimental conditions. One hundred subjects received booklets containing five key and 40 filler questions. In the "direct" version, the key questions asked, in a fairly direct manner, about items that were not present in the film. One example was, "Did you see a school bus in the film?" All of these questions are listed in Table 1, under the column labeled "Direct questions." In the "False presupposition" version, the key questions contained false presuppositions referring to an item that did not occur in the film. The corresponding example was, "Did you see the children getting on the school bus?" All of these questions are listed in Table 1 under the column labeled "False presupposition questions." The third group of 50 subjects received only the 40 filler questions and no key questions. The goal of using so many filler items was to minimize the possibility that subjects would notice the false presuppositions.

All subjects returned 1 wk later and, without reviewing the film clip, answered 20 new questions about the incident. Five of these questions were critical: They were direct questions, shown in Table 1, that had been asked a wk earlier in identical form, of only one of the three groups of subjects. The subjects responded to all questions by circling "yes" or "no" on their questionnaires.

Results and Discussion

The percentage of subjects responding "yes" to each of the key questions during the final experimental session is shown in Table 1. Overall,

TABLE 1

PERCENTAGE OF "YES" RESPONSES TO DIRECT QUESTIONS ASKED 1 WK AFTER THE FILM, FOR THE CONTROL GROUP (C), THE DIRECT GROUP (D), AND THE FALSE RESUPPOSITION GROUP (F). ALL QUESTIONS REFERRED TO ITEMS THAT WERE NOT PRESENT

Direct questions	False presupposition questions	Percentage of "yes" responses to direct question 1 wk later[a]			Chi-square	p
		C	D	F		
Did you see a school bus in the film?	Did you see the children getting on the school bus?	6	12	26	8.44	.025
Did you see a truck in the beginning of film?	At the beginning of the film, was the truck parked beside the car?	0	8	22	26.01	.01
Did you see a center line on the country road?	Did another car cross the center line on the country road?	8	14	26	6.26	.05
Did you see a woman pushing the carriage?	Did the woman who was pushing the carriage cross into the road?	26	36	54	8.52	.025
Did you see a barn in the film?	Did you see a station wagon parked in front of the barn?	2	8	18	7.66	.05

[a] Means: C, 8.4; D, 15.6; F, 29.2.

of those who had been exposed to questions including a false presupposition, 29.2% said "yes" to the key nonexistent items; of those who had been exposed to the direct questions, 15.6% said "yes'" and of those in the control group, 8.4% said "yes."

For each question individually, the type of prior experience significantly influenced the percentage of "yes" responses, with all chi-square values having $p < .05$. Additional chi-square tests were performed to test for the significance of the differences between the pairs of groups. For each of the five questions, the differences were all significant between the control group and the group exposed to false presuppositions, all chi-square values having $p < .025$. Summing over all five questions, a highly significant chi-square resulted, χ^2 (5) = 40.79, $p < .001$. Similarly, over all five questions, the difference between the group exposed to direct questions and the group exposed to false presuppositions was significant, χ^2 (5) = 14.73, $p < .025$. The difference between the control group and the group exposed to direct questions failed to reach significance, χ^2 (5) = 9.24, $p > .05$.

GENERAL DISCUSSION

We saw that either a strength hypothesis or a construction hypothesis would account for the results of the first experiment in which the presupposition of a true event increased the later assertion that the event had occurred. But only the construction hypothesis explains the comparable results which occur when the presupposition is of false information, as in Experiments 2-4.[1]

We need, therefore, to consider the form of a theory of memory for complex visual experiences in which a constructive mechanism plays an integral role. Figure 1 presents a skeleton of this theory that has three major components. The first two components involve acquisition processes, and the third involves retrieval processes.

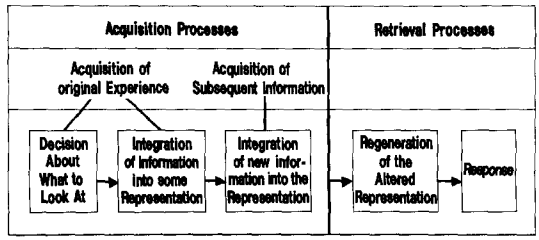

FIG. 1. Schematic diagram of the memorial processes.

[1] It should be emphasized that even though Experiments 2-4 demonstrate support for a construction hypothesis, a strength hypothesis is not necessarily excluded as an explanation for Experimert 1.

Acquisition Processes

Acquisition of the original experience. When a complex event is experienced, we assume that some of the features of that experience are extracted for arriving at action decisions and/or storage. Early on, the observer must decide to which aspects of the visual stimulus he should attend. Our visual environment typically contains a vast amount of information, and the proportion of information that is actually perceieved is very small. The process of deciding to what we attend must consist of a series of decisions, each corresponding to where the next eye fixation should be.

The form of the representation. Into what form of representation is the newly acquired information integrated? Many views have been suggested. A prominent view is that when a person experiences an event, he organizes and retains knowledge about that event in the form of statements or propositions that can be treated as a labeled graph structure (e.g., Anderson & Bower, 1973; Rumelhart, Lindsay & Norman, 1972). In this view, experience might appear as a collection of points or nodes representing particular concepts or objects, with links between the nodes representing labeled semantic relationships between the particular objects.

Other hypotheses about the representation of knowledge are stated in terms of decision routines (e.g., Winograd, 1972); features (e.g., Selfridge & Neisser, 1963); or "mental images" that are isomorphic to the original event (Shepard, 1966). At present, the issue is clearly unresolved. One appealing resolution, however, is that people may use more than one form of representation they may be sufficiently flexible to store information in whichever form is most appropriate to the situation, and they may transform information from one form to another at will. So, for example, human beings may be able to store information in terms of porpositions which are then transformed into mental images at the time the information is retrieved.

Acquisition of subsequent information. However an event may be represented, there is little reason to believe that the representation is accurate; in fact, it may be quite malleable by occurrences other than the event it is supposed to represent. Events or information occurring subsequent (and probably prior) to the original event may alter the representation of that event. One way this might be accomplished is by simply influencing the process of entering new information into the existing memory structure, thereby enhancing, enriching, or otherwise altering that structure. We will refer to the added information as "external" to distinguish it from the information acquired during the initial experience.

Retrieval Processes

Some time after both the initial visual experience and the first interrogation about it, a witness may be quizzed again. For example, after being questioned by the police, a witness may have to testify in court. At this point he must "re-create" from long-term memory, at least that portion of the experience needed to answer a specific question. Thus, the image may be based both on information acquired during the original experience and external information acquired subsequently. This regenerated image has some internal structure, which may or may not be "visual," but must contain information as to the spatial structure of its referent. Any response which a witness makes is based on this regenerated image.

To reiterate, we suggest that information acquired during a complex experience is apparently integrated into some overall memory representation. Subsequent information about that event—for example, that introduced inadvertently via questions containing true or false presuppositions—is also integrated, and can alter the initial representation. When the person is later queried about the original experience, he forms a regenerated image based on the altered memorial representation, and bases his response on that image.

In thinking about the present work in relation to some of the existing literature on reconstructive memory, Bartlett's (1932) notions come immediately to mind. Bartlett was one of the first to argue that the way we represent experiences in memory is determined by our permanent knowledge about objects, events, and processes of our experiences. In this view, the new experience is somehow assimilated into the framework of prior experiences. Since Bartlett's work, there has been a lasting interest in the interaction of prior knowledge and present input experiences (cf. Bransford & Johnson, 1972; Dooling & Lachman, 1971). The belief that a person's prior knowledge can wield considerable influence over his recollection of a specific experience is expressed in the recent articles of several noted cognitive psychologists. For example, Rumelhart and Norman (1973) make the point that the "retrieval of an experience from memory is usually a reconstruction which is heavily biased by the person's general knowledge of the world" (p. 450), while Tulving and Thomson (1973) regard "remembering" as "a joint product of information stored in the past and information present in the immediate cognitive environment of the rememberer." (p. 352).

The present work extends these notions to include the influence on a to-be-remembered experience of information acquired subsequent to that experience. In the present experiments, the subsequent information was introduced via presuppositions in questions, a technique which is ef-

fective in introducing information without calling attention to it. Obviously, there are many other ways to introduce new information. The experimental manipulation of subsequent information may constitute a useful technique for investigating the interaction of a person's specific experiences and subsequent knowledge related to those experiences.

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