

# Forward Telescoping: The Question Matters

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Forward telescoping, the reporting or dating of events as being more recent than they actually were, is often observed in surveys and produces inaccurate data. We believe that some forward telescoping occurs when the question format allows people to respond without extensive retrieval of temporal information concerning the target events. We collected two types of data. The first, the type usually collected by survey researchers, involved visits to medical doctors. As is common in survey research, the actual dates of the events were not verifiable. The second type involved students' participation in laboratory research studies. Here, the actual dates were verifiable. We demonstrate that modifying the questions asked produced differences in the amount of forward telescoping in participants' responses.

## INTRODUCTION

“Have you been treated by a medical doctor during the last six months?” “On what date did you buy your home computer?” “Since the beginning of this year, have you been the victim of a crime?” “When did you last try to stop smoking?”

Questions such as these are commonly asked on a variety of surveys to ascertain the prevalence and frequencies of such events, and to make decisions about the allocation of needed resources. Such questions are also of interest to memory researchers, especially those concerned with how temporal information is represented and retrieved. Prior investigators have found that people's

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responses to these questions often contain a particular form of error called "forward telescoping". Forward telescoping is the reporting of events as having occurred more recently than they actually occurred. For example, if a respondent says "Yes" to visiting a doctor during the last six months, when actually the last visit was eight months ago, or reports completing a major home repair during May, when the repair was actually completed during April, the report has been forward telescoped. Forward telescoping errors are common whenever people answer questions about when autobiographical events occurred (e.g. Cohen & Java, 1995; Huttenlocher, Hedges, & Prohaska, 1988; Loftus & Marburger, 1983; Means & Loftus, 1991; Neter & Waksberg, 1964; Rubin & Baddeley, 1989; Thompson, Skowronski, & Lee, 1988). Our hypothesis is that the degree of forward telescoping is associated with the form of the question that respondents are asked. We more fully develop this hypothesis later, after considering the evidence of forward telescoping and the role of reconstruction in answering questions about the time of events.

The common evidence of forward telescoping consists of differences in the number of reports between groups. For example, Loftus and Marburger (1983) asked people whether they had been the victims of crimes during a six-month reference period. One group was given an explicit landmark on which the reference period began (the eruption of Mt. St. Helens or New Years Day) while the other was not (i.e. "during the last six months"). The group without the landmark reported more instances of crime victimisation. Loftus and Marburger concluded that without the presence of a landmark, events that actually occurred before the reference period were forward telescoped into it.

Neter and Waksberg (1964) compared people's reports of major household repairs and purchases using either unbounded or bounded reference periods. The same respondents were interviewed in separate waves of data collection that occurred six months apart. In the unbounded condition, they were simply told to indicate events since their last interview. In the bounded condition, the interviewer first read the items reported at the last interview, and then asked for new items. Neter and Waksberg found that more items were reported in the unbounded interviews. They concluded that in the unbounded interviews, previously reported items were being forward telescoped into the current reference period.

Finally, Bachman and O'Malley (1981) asked high school students about their drug use over reference periods of different lengths (e.g. the past year, the past month). Bachman and O'Malley found that shorter reference periods produced relatively higher usage rates. Although they concluded that longer reference periods led to underestimation of drug usage, they also noted that forward telescoping of earlier events of drug usage could be inflating the estimates in the shorter periods.

The interpretation of evidence of forward telescoping is problematic, however. Observed differences in the number of reports across different

reference periods may or may not indicate the presence of forward telescoping. As Sudman and Bradburn (1973) noted, it is possible that people are forgetting earlier events and being more accurate in the shorter and more recent reference periods (the explanation favoured by Bachman & O'Malley, 1981). In order to determine the presence of forward telescoping, verification of people's reports is necessary. Fortunately, some recent studies have been able to examine forward telescoping using events whose dates can be verified.

In a verification study, Huttenlocher et al. (1988) provided evidence for greater accuracy in shorter reference periods. Huttenlocher et al. asked university students to list films they had attended at their university's film societies. Two reference periods were used, the entire academic year and the most recent academic quarter. Results showed that students asked only about the most recent quarter reported attending more films during that quarter than did students asked about the entire year. Without verification data, this finding could be interpreted as evidence of forward telescoping in the shorter reference period. However, Huttenlocher et al. found when comparing reports to actual film dates that the difference in the number of reports between the groups was not due to telescoping. That is, forward telescoping was present in both groups, but participants in the shorter reference period condition reported more events that actually occurred during that reference period. Huttenlocher et al. concluded that the shorter reference period led people to conduct a more thorough search of memory for the target events.

In a similar vein, Rubin and Baddeley (1989) collected reports of people's attendance at a seminar series and compared reports to the attendance records for the seminars. Again forward telescoping was observed. Another type of verifiable evidence of forward telescoping was collected by Thompson et al. (1988) who asked people to keep diaries. At a later time when people reported the dates of the events from memory, the diaries were consulted to ascertain the actual dates of those events. Thompson et al. also observed forward telescoping of event dates.

Huttenlocher et al. (1988) provided an explanation of forward telescoping based on two factors. The first was increasing inaccuracy of information in memory with elapsed time. Baddeley, Lewis, and Nimmo-Smith (1978) had previously demonstrated that the accuracy of people's memory (absolute error) for when events occurred decreased with elapsed time. The second was reference period boundaries. In the Huttenlocher et al. model, information about older events is less precise than information about more recent events. Thus, there is a greater probability that older events will be telescoped. Because events that occurred outside the early boundary of the reference period (those that can be forward telescoped into it) are older than events inside the early boundary (those that can be backward telescoped out of it) the result is net forward telescoping over any reference period. Net forward telescoping will increase over periods in which the most recent boundary is the present (because there can

never be backward telescoping of future events). Rubin and Baddeley (1989) provided a similar explanation. In both the Huttenlocher et al. and Rubin and Baddeley models, net forward telescoping is always going to occur, despite the fact that some degree of backward telescoping also occurs. Backward telescoping is a weaker effect than forward telescoping because of the greater imprecision in dating older events than more recent events, which leads to a greater tendency to forward telescope older events into the reference period than to backward telescope more recent events outside of the reference period.

Why is forward telescoping a problem? On a practical level, the presence of forward telescoping calls into question the accuracy of the survey data on which many decisions about resource allocations are made. Public perceptions and governmental policy may be based on inflated data because of forward telescoping errors. On a theoretical level of more concern to memory researchers, the presence of forward telescoping errors raises questions about the representation of temporal information in memory and the processes that people use to reconstruct temporal information.

Our starting premise is that when asked any temporal question about autobiographical memory, people engage in reconstruction to form an answer (Friedman, 1993; Thompson, Skowronski, Larsen, & Betz, 1996). However, the representation of the temporal information on which reconstruction is based is hierarchically organised (Huttenlocher et al., 1988). We maintain that the specific question asked will be an important factor in the amount of reconstruction in which respondents engage, because people only reconstruct to a level of detail sufficient to form an appropriate response. Thus, when people are asked: "Have you been treated by a medical doctor in the last six months?" they retrieve characteristics of the event and match them against characteristics of the reference period. For example, people might consider how cold it was on their last doctor visit, or what they were wearing, or whether it was during an academic semester. If these characteristics match the reference period (cold over the last six months, being in school, etc.), they can respond "Yes" and stop reconstructing at that point. There is no need to reconstruct an exact calendar date. In contrast, a question such as: "On what date were you last treated by a medical doctor?" compels respondents to think carefully about when the target event happened and reconstruct an exact date. When faced with the date question, respondents may be more likely to execute a more extensive retrieval attempt to estimate the date. Thus, more contextual information associated with remembering the last event is likely to come to mind. We believe that when people spend less effort in reconstructing the temporal information about events, they will be more inaccurate in their reports and, thus, they will have a greater tendency to forward telescope those reports, consistent with the boundary model of telescoping first advanced by Huttenlocher et al.

One study by Loftus, Klinger, Smith, and Fiedler (1990), sought to reduce the amount of observed forward telescoping in people's reports. In an extension of

Neter and Waksberg's (1964) procedure, they found that forward telescoping of reports of health procedures over a two-month reference period were reduced when participants were first asked about the same health procedures over a six-month reference period. We suggest that their procedure may have encouraged people who received the six-month period first to engage in a more extensive retrieval of information in the two-month period in comparison to those who only answered for the two-month period. Answering about the six-month period first may have indicated to respondents the importance of precisely estimating for the two-month period, leading to a more complete reconstruction to determine whether an event had indeed occurred within the past two months. It should be remembered, however, that forward telescoping is still quite likely to occur, as prior investigators have demonstrated, even when people engage in extensive reconstruction, but our hypothesis is that it will occur less often than when people's responses can be based on less extensive retrieval.

To test our hypothesis we conducted two experiments. The major difference between them is that Experiment 1 asked about an event (a visit to a medical doctor) for which the true dates could not be verified. However, Experiment 2 asked about events (students' participation in research studies) for which the true dates could be verified. Other differences between the experiments are discussed later.

## EXPERIMENT 1

In Experiment 1, we explored forward telescoping using a methodology common to survey research. Participants were asked either a "Yes/No" or exact date question about being treated by a medical doctor. Two different reference periods, two months and four months were used. Our prediction was that less telescoping would be observed when participants reconstructed an exact date as a response.

### Method

*Participants.* Participants were 205 undergraduate students at the University of Alberta, who were enrolled in Introductory Psychology during the spring 1995 semester.

*Procedure.* During class on 31 March, 1995, each participant was randomly given a folded and stapled sheet of paper. Each sheet contained one of three questions about visits to medical doctors. The 2-Month group's question was: "In the last TWO months have you been treated or examined by a physician?" The 4-Month group's question was the same but with "FOUR months" replacing "TWO months". The Date group's question was: "On what date were you last examined by a physician. Please be as exact as possible, but estimate the day (or the month) if necessary". Because participants were tested

on the last day of March, we were able to use partial responses and approximations, such as “February” or “January 15 or 16”. To keep the total number of reference and date groups similar there were twice as many sheets with the date question.

## Results

The percentages of “Yes” responses in the 2- and 4-Month groups and the percentages of dates that fell within each reference period are presented in Table 1. A chi-square analysis revealed that the 2-Month group gave more “Yes” responses (57%) than the Date group gave reports that fell within the two-month reference period (35%),  $\chi^2(1, N = 155) = 7.45, P < .01$ . However, the difference between the 4-Month (62%) and Date (49%) was not significant,  $\chi^2(1, N = 150) = 2.26$ .

It is interesting to note that the percentage of people who answered “Yes” did not change with the change in the length of the reference period. That is, 57% answered “Yes” in the two-month reference period and 62% answered “Yes” in the four-month reference period, an increase of only 5% despite a 50% increase in the reference period. In contrast, in the Date group the percentage of participants who reported being treated rose from 35% during the last two months to 49% during the last four months, an increase of 14%.

## Discussion

Our hypothesis, that the date question would result in less forward telescoping than the yes/no question, was supported in the two-month reference period. There are several possible reasons why the same pattern of results was not observed in the four-month reference period. One reason may be due to the use of students as participants. The end of the four-month period coincided with the end of the prior semester, thus providing a firm boundary that may have attenuated the 4-Month group’s tendency to forward telescope. Another possibility, consistent with our hypothesis, is that the Date group’s more

TABLE 1  
Experiment 1

<i>Condition</i>	<i>Reference Period</i>	
	<i>Two months</i>	<i>Four months</i>
2-Month, <i>n</i> = 54	57%	
4-Month, <i>n</i> = 50		62%
Date, <i>n</i> = 101	35%	49%

Percentage of participants indicating they had been examined by a medical doctor within the respective reference period.

extensive retrieval led to their remembering more events in the longer reference period. Finally, a third possibility, also consistent with our hypothesis, is that the two- and four-month reference periods were not sufficiently different to allow participants to distinguish the familiarity or availability of the event. That is, participants may have simply judged whether a medical treatment was recent and thus within range (whether the range was two- or four-months), or not recent and thus out of range.

Interpretations of Experiment 1 suffer from all of the problems inherent in data that cannot be verified that were discussed earlier. For example, there could have been differences in doctor visits between the groups of which we had no knowledge. Because we did not have access to participants' actual medical records, no attempt could be made to collect direct evidence of differential telescoping between the reference periods. Experiment 2 was designed to circumvent this limitation.

## EXPERIMENT 2

In Experiment 2, the events we used were students' participation in research studies during an academic semester. Participants reported either the number of times they had participated in research studies (they could have participated once, twice, or not at all) or the exact dates on which they had participated. The data were collected three months after the semester began and a two-month reference period was used so that forward telescoping errors would be possible. As we were able to ascertain when students participated from attendance sheets, we were able to verify participant's reports.

### Method

*Participants.* Participants were 143 undergraduate students at Lehman College, The City University of New York, who were enrolled in two sections of General Psychology during the autumn 1995 semester. This course contains a research requirement and one of the ways that students can (and most often do) fulfil this requirement is to participate in two research studies.

*Procedure.* Research studies were available for student participation throughout the semester, from 11 September to 12 December, on various dates and times, and students selected the studies, dates, and times they preferred. At the end of their classes, on 6 December, exactly three calendar months after classes began, students were given one of two questions about their participation in research studies. The format was the same as in Experiment 1; each participant was given a folded sheet on which one of the two possible questions was printed. The Reference Period group were simply asked to indicate the number of studies in which they participated during the last two months. The Date group was asked for the exact date(s) on which they participated. Because

we were interested in forward telescoping, we arranged that many studies were available for participation in September (i.e. earlier than the reference period) and that the two instructors reminded students about this requirement throughout the early part of the semester.

## Results

First, we compared the percentage of "Yes" responses by the Reference Period group to the percentage of dates reported by the Date group that fell into the two-month reference period. These data are presented in Table 2. A chi-square analysis found no significant difference between the groups,  $\chi^2(2, N=143)=2.6$ . However, evidence of forward telescoping was observed within the Reference Period group. Specifically, although the Date group was evenly divided between those who reported one (40%) and those who reported two (4%) dates, in the Reference Period group more participants (53%) reported completing two studies than reported completing only one (29%),  $\chi^2(2, N=83)=16.3, P<.005$ .

These data also allowed us to examine differences in the accuracy of reports between the two groups by matching participants' reports to attendance sheets. For the Reference Period group, correct responses would be "Yes" responses and recorded participation within the two-month reference period. Similarly, for the Date condition, the reported date simply had to be correct as to whether it was within or outside the two-month reference period. These data are presented in Table 3. The Reference Period group was significantly more likely to be incorrect, either when reporting that they had participated twice,  $\chi^2(1, N=68)=4.4, P<.05$ , or once,  $\chi^2(1, N=48)=4.2, P<.05$ . Specifically, 82% of the participants who said they had participated in two studies during the two-month reference period were incorrect. In contrast only 58% of those who gave two dates within the two-month reference period were incorrect. Similarly 58% of those who said they had participated once during the two-month reference period were incorrect, while only 29% of those who gave one date within the two-month reference period were incorrect. The most common error was forward telescoping; that is, students said

TABLE 2  
Experiment 2

<i>Condition</i>	<i>Response</i>		
	<i>Twice</i>	<i>Once</i>	<i>None</i>
Reference Period, <i>n</i> = 83	53%	29%	18%
Date, <i>n</i> = 60	40%	40%	20%

Percentage of participants indicating they had participated in research studies within the two-month reference period.



TABLE 3  
Experiment 2: Accuracy by Condition and Responses

	<i>Correct</i>	<i>Incorrect</i>
Reference Period—said TWO	8 (18%)	36 (82%)
Date—2 dates in period	10 (42%)	14 (58%)
Reference Period—said ONE	10 (42%)	14 (58%)
Date—2 dates: 1 in, 1 out or 1 date in	17 (71%)	7 (29%)

they had participated within the two-month period (in October or November), when actually they had participated earlier (in September).

## Discussion

Increased forward telescoping based on a comparison of reported and actual information by the group asked the easier question was observed. Indirect evidence of forward telescoping was observed within the Reference Period group (i.e. more “TWO” responses), but not between the groups (i.e. there were not more “Yes” responses from the Reference Period group than dates within the reference period by the Date group). We think this lack of a between-groups difference is due to the fact that there was a high level of participation in the event in question. Unlike the event utilised in Experiment 1, visiting a doctor for a routine check-up, participation in a research study was, in a sense, a course requirement, so our rate of positive responses from both groups was high.

## GENERAL DISCUSSION

Our starting premise, that people use reconstruction when answering questions about the time of autobiographical events, is a widely accepted one. Indeed, this premise is accepted in regard to the dating of public events as well (e.g. Brown, 1990; Burt & Kemp, 1991). Furthermore, the premise that memory is hierarchically organised also is well accepted (e.g. Barsalou, 1988; Belli, this issue; Brown, 1990; Conway, 1996; Huttenlocher et al., 1988). Finally, Baddeley et al. (1978), Huttenlocher et al. (1988), and Rubin and Baddeley (1989) demonstrated that forward telescoping is related to the increasing inaccuracy of memory with elapsed time.

Our specific hypothesis, based on these three starting premises, was that the question format would influence the amount of forward telescoping observed in people’s reports. We believe that the more difficult question (“Report the exact date”) led respondents to engage in a more thorough reconstructive process, resulting in a better location of the events in time and greater relative accuracy. The simpler questions (“Were you treated?” “How many times did you

participate?’’) led respondents to simply infer the events’ recency, rather than attempt to precisely locate each in time.

The focus of the present study was on autobiographical events with relatively low frequencies of occurrence. Asking the more difficult question about higher-frequency events (e.g. ‘‘Report the exact dates during the last two months that you: purchased gasoline for your car; ate beef for dinner; exercised’’) might produce too high a demand on people and lead to less accurate results. Indeed, Means and Loftus (1991) showed that people’s strategies for answering questions changed depending on the frequency of the events. However, their study also demonstrated that the manner in which people are questioned could increase accuracy even with high-frequency events. Finally, forward telescoping also is observed when people are asked to report temporal information about discrete public events and we believe it likely that results similar to those of the present study would be observed in this domain as well.

As the models of Huttenlocher et al. (1988) and Rubin and Baddeley (1989) indicate, some forward telescoping is almost always going to occur in people’s reports, and will continue to be a problem for survey researchers whenever they cannot verify respondents’ reports. Moreover, there are situations for which the dating question might not necessarily lead to more accurate responses. For example, asking people to date frequently occurring mundane events might lead to under-reporting because the relevant event instances are rapidly forgotten. Nonetheless, our data suggest that asking respondents to provide a more precise response regarding the timing of events will encourage a more thorough reconstruction which will reduce forward telescoping. Thus, by making people work a little harder in determining when events had occurred, survey researchers will likely gain more accurate data.

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