MOVING SURVEY PROBLEMS INTO THE COGNITIVE PSYCHOLOGY LABORATORY

David Fathi, Jonathan Schooler, and Elizabeth Loftus
University of Washington, Seattle

Several years ago, Loftus (1982) argued that cognitive researchers could benefit by availing themselves of some new sources of data for learning about human cognition, sources of data that could supplement those obtained in experimental laboratories. Specifically, these new data come from large-scale surveys designed to measure people's recollections of automobile accidents, hospitalizations, and other important events in their lives. When the data can be compared to actual records, it can often be seen that the data confirm the discoveries of cognitive researchers. Moreover, the survey data permit us to see the operation of many psychological factors in real-world, interesting situations.

But the survey data serve another purpose: They provide cases showing that the cognitive processes of survey respondents can look very different from the cognitive processes revealed by subjects in experimental laboratory studies. As an example, consider the well known forgetting curve discovered by Hermann Ebbinghaus (1885). The classic curve of forgetting, which plots amount of material retained against the time elapsed since learning, shows that forgetting is rapid at first and then levels off. When forgetting curves are plotted using data from real-world surveys, they often look somewhat different. So, for example, a forgetting curve can be constructed from data collected by the National Center for Health Statistics from persons known to have been in a motor vehicle accident during the 12-month period preceding the interview. Of primary interest is the relationship between the respondent's ability to report the accident and the length of time between the occurrence of the accident and the date of the interview. Although the curve obtained is monotonically decreasing, as was that of Ebbinghaus, it is different in an important way. For Ebbinghaus severe losses developed quickly; but for accident recollection, losses were more gradual and linear. From this example, one learns that it is important to remember that not all forgetting curves look exactly like the one obtained by Ebbinghaus; their precise shape will depend upon the type of material to be remembered as well as upon many other factors.

Borrowing from Cognitive Psychology

Surveys can aid Cognitive Psychology, but is the converse true? Can Cognitive Psychology aid the survey? As Cognitive Psychologists, we decided to try. We here report a series of attempts to use common laboratory procedures to tell us something about how a survey might better be designed so as to maximize the accuracy and completion of information obtained.

Our first step was to more precisely define what we wanted to learn, that is to ask a more specific question. In many national surveys, respondents are asked to recall several events from their lives. For example, in the National Health Interview Survey, respondents are asked

"During the past 12 months, about how many times did (you) see or talk to a medical doctor?" If multiple visits were made, there are different orders in which one can retrieve these events from memory. Respondents could for example recall in a forward direction, that is starting with the most temporally distant memories and proceeding toward the more recent. Or, they could start from the most recent event and move backward. Or they could retrieve in an order that had no systematic direction. Many reasonable predictions can be made. The forward order might be best since it reflects the natural order in which the events happened. On the other hand, the backward order permits one to begin with a presumably highly available recent event which can serve as a retrieval cue for earlier events. Which order of retrieval is preferred; which is the most efficient?

One method for learning about cognitive strategies is through the use of protocols (Ericsson & Simon, 1980). In the protocol technique, people are asked to think aloud as they answer specific questions. The verbalizations produced are called protocols, and they can subsequently be transcribed and analyzed. This method has an advantage over the similar technique of asking people after the fact to describe how they arrived at a particular answer or estimate. The "after the fact" technique has the disadvantage that people often provide reasons or rationalizations for their behavior that are not the true reasons but rather are strategies that subjects believe should have been appropriate (Nisbett & Ross, 1980).

To explore the feasibility of a protocol analysis approach to the problem of how people retrieve personal experiences of the type required on a national survey, we asked laboratory subjects to think aloud while answering specific questions. For example, we asked: "In the last 12 months, how many times have you gone to a doctor, or a dentist, or a hospital, or utilized any health care specialist or facility?" This general question was followed by more specific questions inquiring about certain medical specialists.

We discovered some interesting things about retrieval from analyzing the protocols. For example, we found that subjects often produced new information in response to later queries that had not been produced earlier. For example, one female who was asked the general health question said "Let's see...six...six months ago I went to the dentist. Last month I went to the doctor. I think that's it." Later, when asked specifically about visits to dentists, she answered "Let's see...I had my teeth cleaned six months ago, and so...and then I had them checked three months ago, and I had a tooth...yeah, I had a toothache about March...yeah."

Another observation from the protocols is the large number of instances in which people change their answer as they are in the midst of

speaking. It is common to hear subjects utter something like "No, not that I can think of, unless...oh, yes....." or "No, I haven't, that I can remember....Yes, I was...I was thinking about...." and then recall some events of interest.

As for retrieval order, the protocols revealed that recall tended to be in a forward direction - subjects would typically start with the most temporally distant event and then the second most distant and so on. "Six months ago I went to the dentist. Last month I went to the doctor," is a perfect example.

The fact that subjects tend to retrieve memories from past to present may be interesting, but it tells us nothing about the relative efficiency of various retrieval orders. Clearly, the mere fact that a majority of people tend to perform a task in a given way does not mean that is the most efficient way. To cite a trivial example, most people button their shirts or blouses from top to bottom, although it is actually quicker to button them from bottom to top (Gilbreath & Carey, 1948). Thus, direct tests of the relative efficiency of various retrieval orders are needed.

Order of Retrieval

One study of retrieval order examined college students' ability to recall the names of their elementary and secondary school teachers (Whitten & Leonard, 1981). Specifically, students were asked to produce the name of one teacher from each of grades 1 through 12 in either a forward (beginning with grade 1), backward (beginning with grade 12) or random order. The random order did not involve free recall, but rather required recall in a specifically prescribed, randomly determined order. The results were clear: the backward order was the least difficult. More subjects completed the task and they did so in shorter periods of time.

Although this study is a start toward understanding the role of retrieval order, there are several reasons why further research was needed. First, no independent verification of the names of teachers was made. Second, no true free recall condition was included, that is, a condition in which subjects were allowed to retrieve the sought-after memories in any order they chose. Finally, the backward order preference could be due to the peculiarities of retrieving teachers, and might not generalize to retrieval of other kinds of autobiographical memories, such as doctor visits and crime victimizations where there is not a definite and obvious number of events to be produced.

Empirical Tests of Retrieval Order

Our first study examined undergraduate students who were asked, via questionnaire, to recall all of the times in the preceding 12 months that they had made deposits in their A La Carde (cafeteria credit card) accounts. They were also asked to specify the amounts they had deposited. For one third of the subjects, the questionnaire asked them to recall in a forward direction; for another third, it specified backward recall; and the final third were allowed to recall in any order they wished. We recognized the problems of generalizing from memory for monetary deposits to memory for doctor visits, however, we chose to study monetary deposits since we could, with permission, gain access to computer records for verification purposes.

Unfortunately, this study met with little success. Most subjects seemed unable to recall any but their most recent one or two deposits, making examination of order effects difficult. Moreover, subjects often confused A La Carde deposits with rental payments on their dormitory room, since both are made to the same office. Finally, unexpected difficulties were encountered in obtaining permission from the university to examine subjects' records for verification purposes, even with subjects' written consent. Thus, we turned to a new study.

The second study used dates of exams as our to-be-recalled information. Introductory psychology courses at the University of Washington usually have three or four exams over the course of a ten-week term - enough to allow for order of retrieval to be meaningfully varied. Exams have the additional advantage that they are presumably more salient to the subject than are A La Carde deposits, and that verification is considerably simpler, since the correct date is, of course, the same for all subjects.

Nearly 150 undergraduates participated in the study, each receiving a questionnaire that asked them to recall the dates of their exams in either a forward, backward, or random order. Once the data were collected, they were analyzed by computing the error in the subject's estimate of date of each of the exams. Next the absolute values of these errors were averaged to yield a single mean error score in days for each subject. The average mean error for subjects in the forward condition was 2.17 days, for those in the backward condition, it was 1.05 days, and for those in the random condition it was 1.03 days. An analysis of variance and multiple comparisons indicated that the forward condition was significantly different from the other two.

We also conducted a more detailed examination of the free recall condition. We found that 78% of these individual retrieved exam dates in a completely backward direction, and the mean error for this group was .93 days. The remaining subjects recalled in some other order, producing a mean error of 1.41 days.

This study, like that involving the recall of teachers, showed a preference for backward memory search over forward search. Moreover, our study showed the backward order to be more efficient. Many theoretical explanations can account for this result. The finding is particularly interesting, however, in light of the fact that when we asked people about their health care visits, the tendency was to recall in a forward direction. This discrepancy raises the question of whether it is possible to generalize about retrieval-order effects. Is there, in fact, one direction that people always tend to retrieve in, and one direction that always leads to more efficient retrieval? Or is each retrieval task totally idiosyncratic in this respect? We speculate that the truth lies somewhere in between. There may be certain classes of retrieval tasks in which people tend to retrieve in a forward direction, and other classes of

tasks in which the natural order of retrieval is backward. In retrieving exam dates, for example, since exams are fairly independent events, at least in Introductory Psychology classes, people might well be expected to begin by retrieving the most recent and available instances. With health care visits, on the other hand, there is more likely to have been some causal relationship between the various visits (e.g., you broke your ankle, so you went to the orthopedic specialist, who told you to go to the radiologist and get some x-rays and then come back in two weeks) that might lead people to retrieve in a forward direction, following the chain of causality. Since the various studies differ in many ways other than the type of event to be recalled (e.g., period of time over which subject is asked to recall, interview format), it is not possible to say with any degree of certainty what led to the different effects of retrieval order in the different studies. Only further research can clarify the extent to which it is possible to generalize about retrieval-order effects, and the extent to which these effects are task specific.

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