Cognitive Psychology Meets the National Survey

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ABSTRACT: Because of their mutual interests, cognitive psychologists and survey researchers might have been expected to have a long history of collaboration. In fact, only recently have attempts been made to foster a dialogue between the two disciplines. This article describes some of the collaborative efforts that have been initiated and shows how mutually beneficial work might be conducted in this fascinating interdisciplinary area.

In many national surveys, respondents are asked to recall events from their lives. For example, in the National Health Interview Survey, a major government-sponsored sample survey designed to obtain information on the health of Americans, respondents are asked, "During the past 12 months, about how many times did you see or talk to a medical doctor?" or "During the past 12 months, did anyone in the family have an ulcer?" In this and other surveys conducted by the National Center for Health Statistics, people have been asked to recall the occurrence of health-related conditions and their consequences, such as days lost from work and/or school. The resulting survey estimates of health problems and the associated utilization of health care services were used in the formulation of the legislation for both the Medicare and Medicaid programs.

In the National Crime Survey, a major statistical series designed to obtain information on the incidence of crime and its impact on society, respondents are asked about victimizations that may have occurred in the last 6 months. Questions such as these are asked: "In the last 6 months, did anyone try to rob you by using force or threatening to harm you?" and "In the last 6 months, did anyone beat you up, attack you, or hit you with something, such as a rock or bottle?" This effort told us that, in 1981, 41 million crime victimizations occurred and almost a third of all households were victimized by violence or theft (U.S. Department of Justice, 1983).

In election day "exit polls," voters are asked to report the timing of an internal event—deciding for whom to vote. For example, during the 1984 primary season NBC News asked voters in primaries, "Voters choose their candidates at different times during an election campaign. When did you finally decide for whom you would vote in this Democratic presidential primary?" Typically, about a quarter of the voters say they made up their minds during the last few days before the election, slightly over a third say they decided during the previous month, and slightly over a third say they decided more than a month before the election. Knowing at least the perceived timing of these decisions allows poll analysts to gauge roughly the effects of last-minute campaign events.

A major concern of survey designers is the extent to which survey respondents accurately remember, and accurately report to interviewers, incidents that have happened to them (e.g., see Sudman & Bradburn, 1973, and Fienberg & Tanur, 1983). One problem for interviewers is that people forget incidents that have occurred or "recall" incidents that never occurred. Another problem is "forward telescoping," a memory distortion wherein incidents that occurred prior to the beginning of a reference period are "telescoped" forward into the reference period. For example, in response to one of the questions from the National Crime Survey given above, someone interviewed in April 1984 might include a robbery incident that occurred in August 1983, some two months before the appropriate 6-month reference period began. Because telescoping can lead to serious overestimation of incidence rates, whether for crime or for health conditions, it can distort policymakers' perceptions. For example, the relative frequencies of various types of crimes may not be accurately reflected in survey responses. Thus our ability to fight crime might be hampered by a maldistribution of resources to do so.

In addition to forgetting, confabulation, and misplacement of memory, a further problem is that people deliberately fail to mention incidents. In other words, they lie. Sometimes they lie to the interviewer, and sometimes they lie to themselves. This is especially likely to happen when respondents are asked extremely threatening, sensitive questions such as whether they have ever abused their spouses or whether they have cheated on their income taxes (Fox & Tracy, 1980). Such response distortions have received widespread attention in the survey literature.
and innovative survey techniques have been proposed to combat them. For example, Warner (1965) suggested the use of a probability mechanism, such as rolling a die or drawing a colored ball from an urn, to determine whether the individual is to respond to a sensitive question (e.g., "I have used marijuana or some other illegal drug") or its reverse form ("I have never used marijuana or any other illegal drug"). By knowing the probabilities of the respondent's being asked the direct or reversed questions, one is able to estimate the proportion of respondents reporting having carried out the behavior in question without revealing who actually answered the direct or the reversed questions, and thus without knowing who actually reported carrying out the behavior. Randomized response techniques have been found to reduce distorted responses to socially undesirable questions (that one would expect to be underreported) but to be ineffective in reducing distortion to questions dealing with socially desirable behavior (that one would expect to be overreported). The use of such new techniques, however, raises questions about other forms of response distortion (Fienberg & Tanur, 1983), and the evidence regarding their efficacy is inconclusive. Nonetheless, the various randomized response techniques appear to be useful in gathering embarrassing or stigmatizing information (Bourke, 1984).

As we have tried to indicate, survey researchers have long recognized the existence of these nonsampling problems associated with questionnaire design and implementation, and they have produced ingenious approaches to combat them. Yet it is widely recognized that response and other nonsampling errors present a major problem in the interpretation and use of survey results. To further improve the quality of information obtained from respondents, we believe that the designers of surveys would benefit from detailed knowledge of basic findings in cognitive and social psychology. Psychologists in these fields have long studied remembering and forgetting, perception, judgment, and language. More specifically, they have been concerned about the strategies that people use when they retrieve personal information and the psychological factors that influence personal memory retrieval. It makes sense that such knowledge should be used to develop better questions, better sequencing of questions, better interview formats, and more generally, better survey instruments.

Conversely, the knowledge derived from national surveys can provide new sources of data for learning about human cognition. Data from large-scale surveys designed to measure people's recollections of automobile accidents, hospitalizations, and crime victimizations can reveal useful information about how people generally process their perceptions and memories of these important events. Use of such data circumvents the criticism of most laboratory experiments in psychology—that they lack external validity. The great majority of psychology experiments study college students in a university laboratory while they work on tasks that bear little resemblance to their everyday activities (Berkowitz & Donnerstein, 1982). Such studies may not be good predictors of the processes of everyday life. Sample surveys, although themselves using the artificial context of the interview, are closer to real life in that they are conducted in the field, ask about real-life events, and typically involve samples drawn at random (subject to constraints) from a broad population, often the adult civilian population of the country. In some cases, these survey data may provide instances of behavior that looks markedly different from the behavior of subjects in traditional laboratory studies.

To see how survey data can appear to be different from laboratory data, picture the typical forgetting curve produced by Ebbinghaus (1885/1913) a century ago. The curve drops rapidly at first and then levels off. Does this same curve result when Americans, as survey respondents, retrieve important events such as hospitalizations and auto accidents? In fact, although the probability of accurate reporting of these events declines monotonically with the passage of time, the shapes of the curve are rather different from the forgetting curves produced in many laboratory experiments. People appear to "lose" memories for hospitalizations and other important events more slowly and gradually (Loftus, 1982).

In a survey context, Sudman and Bradburn (1973) have attempted to model memory decay with a scaled exponential of the form

\[ ae^{-b_1 t}, \quad a > 0, \quad b_1 > 0, \]

for the probability of remembering an event \( t \) units of time after it has occurred. They combined this model with a time-related component for overreporting due to telescoping based on Weber's law in order to get a combined relative error of the form

\[ \text{net relative error} = ae^{-b_1 t} \left( 1 + \frac{\log b_2 t}{t} \right) - 1. \]

Then, using survey data on purchase behavior and outside validating information, they estimated the model parameters, \( \{a, b_1, b_2\} \), and commented on how the parameter estimates varied for different types of purchases. They also compared the estimate of net relative error from the model above with the actual observed values. Because of the difficulty in

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designing a survey study involving many time periods where validation is possible, this study was unable to shed much light on whether or not memory decay actually follows an exponential curve and how this curve varies from person to person. Nonetheless, the link of a survey problem to psychological theory provided an important first step in a collaborative enterprise.

Because of the mutual interests of cognitive scientists and survey researchers, a substantial history of collaboration between the two groups might have been expected. Oddly, a dialogue between the two disciplines has been fostered only recently. In the summer of 1983, the Committee on National Statistics (based at the National Academy of Sciences), with support from the National Science Foundation, brought together a number of cognitive scientists, survey specialists, and statistical methodologists to discuss Cognitive Aspects of Survey Methodology (CASM; see Jabine, Straf, Tanur, & Tourangeau, 1984). During the CASM meeting, the participants reviewed recent work in the cognitive sciences that might be potentially applicable to survey research, outlined specific research that could improve questionnaire and interviewing procedures used in current surveys, and generated ideas for basic research using surveys as vehicles for experimentation and collection of relevant data in cognitive psychology. In short, they took the first steps toward building a two-way bridge between the disciplines.1 Our hope is to show how mutually beneficial work might be conducted in this fascinating field—and to encourage others to help shore up the foundations of the bridge and perhaps venture to cross it.

**Existing Surveys as Sources of Information on Cognitive Processes**

Surveys can provide a context for experimental cognitive research. For example, consider the issue of whether memory declines with advancing age. Laboratory studies fairly routinely have shown that once the amount of material to be remembered exceeds the span of primary memory, older people are unable to recall as much of the material as their younger counterparts (Perlmutter, 1983). This occurs when people try to recall recently presented lists of words (Schonfield & Robertson, 1966) and when other procedures such as recognition (Botwinick & Storandt, 1974) and cued recall (Smith, 1977) are used. Based upon these laboratory studies, the universal conclusion could be reached that older people have somewhat more difficulty storing and retrieving information from long-term memory. Yet an examination of data from survey respondents paints a different picture. Age effects did not occur in a survey of drivers of automobiles involved in accidents who were later interviewed about the accident, the time it occurred, the damage to the vehicles, and so forth (Henson, Cannell, & Lawson, 1973). Elderly drivers were just as likely to answer accurately as younger drivers.

In another survey, people had to recall questions that they were asked 4 months earlier, and strong age effects did emerge. On the earlier occasion, some respondents were asked, “The Arab nations are trying to work for real peace with Israel. Do you agree or disagree?” Four months later, they were asked the “Arab–Israel” question again and whether they recalled being asked it before. In addition, other respondents, who had not been asked the Arab–Israel question earlier, were asked whether they recalled the question. Elderly respondents who had been asked the item were significantly less likely to recall it than their younger counterparts. Moreover, elderly respondents who had not been asked the question before were somewhat more likely than younger ones to incorrectly recall having heard it (Schuman, 1980, cited in Loftus, 1982). Why the elderly have relatively more difficulty recalling one type of item, but no greater difficulty recalling another type of item, is a puzzle that remains to be solved, though we might speculate that real-life salience is an important explanatory variable.

Whatever the eventual resolution of that particular puzzle, these survey results allow us to see various phenomena at work outside the laboratory, and they nicely supplement controlled laboratory findings. It is important to know that a particular variable operates differently in the field than it does in the laboratory; this tells us something about the boundary conditions for that variable. When such differences occur, the survey results should force us to modify our theoretical interpretations of psychological processes.

**New Surveys to Develop Norms for Cognitive Abilities**

Cognitive psychology could profit from new data collected on probability samples that represent broad population groups. For example, although through surveys we know a great deal about the health of Americans, their crime victimization, their political leanings, and their sex life (e.g., Blumstein & Schwartz, 1983), we know very little about the

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1 Actually, an effort in 1980 brought together a number of cognitive scientists and survey statisticians. This was done in connection with ongoing work on the redesign of the National Crime Survey. At that time, Albert Biderman of the Bureau of Social Science Research, with support from the Bureau of the Census and the Bureau of Justice Statistics, convened a 2-day workshop for the purpose of discussing how knowledge of cognitive processes could be applied to survey work. This effort can be regarded as the actual first step toward the building of an interdisciplinary bridge.
Improving Survey Methods

Not only does survey research have much to offer the cognitive sciences, but the cognitive sciences can contribute to survey methods. A good deal of survey research methodology originated in public opinion polling, where, as in a legal context, the interviewer goes to great lengths not to "lead the witness." Thus questions are written in the most neutral fashion possible, and when respondents ask for clarification, interviewers merely repeat the troublesome question. Perhaps this model—sensible though it may be for the elicitation of opinions and attitudes—may be far from optimal for the elicitation of more factual information. Can knowledge of how memory is organized be harnessed to help respondents remember occurrences in their everyday lives? If the task required is one of estimation, can we use our knowledge of the effects of anchoring and other heuristics (Kahneman, Slovic, & Tversky, 1982; Tversky & Kahneman, 1974) to guide the respondents' judgments? One cognitive topic that is particularly relevant to survey methodology is that of protocols and schemata (Abelson, 1981). By scripts, we mean the higher level knowledge structures that govern information processing. We have scripts, for example, about going to the doctor that contain general assumptions about why people go to the doctor and the sequence of events that a visit to the doctor usually comprises. A better understanding of the scripts that are evoked in the survey interview situation could lead to better design and sequencing of questions. For example, when probing for events that fit the stereotypical pattern of the script (e.g., a routine checkup), we might use one questioning strategy, whereas probing for events that depart from the script (e.g., a trip to a hospital emergency room) might call for a different strategy.

Retrieval and judgment heuristics constitute a second topic with broad applicability to survey methods. When asked "How many glasses of wine have you had in the last 2 weeks?" (as respondents were indeed asked in a supplement to the National Health Interview Survey) or "In the last 6 months, how many times have you gone to a doctor?" people use different retrieval strategies to estimate frequencies. Survey researchers would benefit from an investigation of what strategies or heuristics people use when they answer questions of this type and what errors result from the procedures employed. One method for learning about such strategies is through the use of protocols (Ericsson & Simon, 1980), in which people are asked to think aloud as they answer specific questions. The verbalizations produced—the protocols—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 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 many national surveys, several researchers asked subjects...
to think aloud while answering specific questions (Fathi, Schooler, & Loftus, 1984). Subjects were asked health- and crime-related questions such as “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?” and “In the last 12 months, have you been the victim of a crime?”

Many interesting issues can be explored by examining the overt protocols. For example, do people answer the health question by starting from the beginning of the 12-month period and moving toward the present (the past-to-present approach), or do they start from the most recent event and move backward (the present-to-past approach)? One might predict that respondents would begin with the most recent events, because these might be more “available” in memory (Kahneman & Tversky, 1973). Although the data of Fathi et al. (1984) must be considered preliminary, they indicate that, to the contrary, the past-to-present approach is favored. For example, one female respondent answered the health question by saying, “Let’s see... six... six months ago I went to the dentist. Last month I went to the doctor. I think that’s it.” If, besides being more “typical,” the past-to-present retrieval sequence was also shown to be the more accurate sequence, it would suggest that people might be most efficient at retrieving information if prompted to do so by cues that allowed them to start in the past and work toward the present. This verification of accuracy is an important step, because subsequent work by Fathi et al. showed that people more accurately retrieve exams they have taken using the present-to-past strategy. Thus efficient retrieval strategies may be quite item specific, although we might speculate that customary periodicities in everyday life (dental checkups every 6 months or examinations at middle and end of term) would influence the efficacies of recall strategies.

Another interesting observation from the protocols is the large number of instances in which people change their answers as they are in the midst of speaking. For example, a female subject who was asked the crime question answered: “No, not that I can think of unless... oh, I had two dollars stolen at work, but that’s it.” Another said: “No, I haven’t, that I can remember... Yes, I was— I was thinking about my car, and I had some tapes stolen from my car, in Montlake, about six months ago.” We could speculate that if subjects had been responding using a more formal “checklist” technique in which they simply had to say “yes” or “no” that these two instances might have never been reported, whereas under the more leisurely approach provided in the gathering of protocols, the instances emerged from memory. If this finding holds up in further research, one question that naturally comes to mind is whether we can use it to improve on current interviewing techniques. For example, if respondents in surveys were asked to think silently for a minute before answering the question, would we be able to accomplish the same benefits within the context of the more typical interviewing procedures where thinking aloud would be considered awkward? There is evidence that longer survey questions produce longer and more accurate responses (Cannell, 1977). Perhaps longer questions give respondents more time to think over their answers.

A major innovation in surveys, the use of the computer-assisted telephone interview (CATI), offers the opportunity to utilize different strategies of retrieval through different question sequences. In CATI, the interviewer reads questions from a CRT screen instead of from a questionnaire and records the answers by typing them on the keyboard of the computer terminal. Branching on the basis of answers to successive questions has already been used in a variety of ways in actual surveys. This CATI facility might be used in connection with screening questions designed to elicit respondents’ preferred retrieval strategies, in order to structure alternative sequences for a set of questions that reflect these strategies.

In short, many interesting survey issues can be explored through the use of traditional cognitive paradigms. Specific hypotheses can be tested concerning how personal information is retrieved and how estimates are made in survey-like contexts. Moreover, methods for improving the interview process can be tested in this fashion.

**Final Comment**

Recently, Neisser (1982) registered his dissatisfaction with the orthodox psychology of cognition, and particularly with the study of memory. To him, the field has little to show for a hundred years of effort, perhaps because it always avoided interesting issues. Neisser complained about his fellow psychologists’ selection of research topics: “If X is... interesting or socially significant... then psychologists have hardly ever studied X” (p. 366). The time has come, Neisser believed, to investigate questions of interest in more naturalistic settings. To paraphrase him, just as the naturalistic study of animal behavior has proved to be more rewarding than traditional research on “learning,” so a naturalistic study of cognition may be more productive than its laboratory counterpart. At the very least, naturalistic studies can provide informative complements. The bridge being built between cognitive researchers and survey methodologists appears to be one of the pathways toward Neisser’s goal.
REFERENCES


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