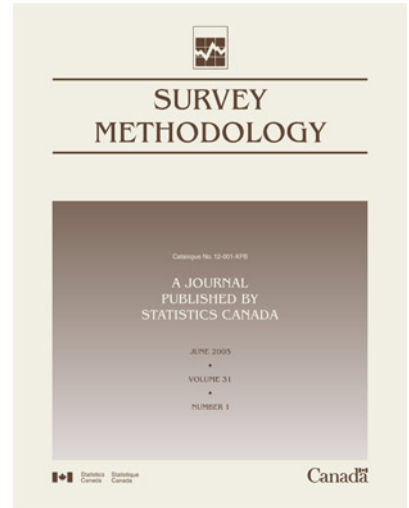




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# Understanding the Question-Answer Process

Norman M. Bradburn<sup>1</sup>

## Abstract

Survey statisticians have long known that the question-answer process is a source of response effects that contribute to non-random measurement error. In the past two decades there has been substantial progress toward understanding these sources of error by applying concepts from social and cognitive psychology to the study of the question-answer process. This essay reviews the development of these approaches, discusses the present state of our knowledge, and suggests some research priorities for the future.

Key Words: Measurement errors; Response effects; Cognitive psychology; Questionnaire design.

## 1. Introduction

When I was in graduate school, I was deeply impressed by Gordon Allport's comment to the effect that the best way to find out something was to ask a direct question. Later, as I began to study and do research on methodological problems in sample surveys of human populations, I became more convinced of the wisdom on this remark. I have even formulated it into Bradburn's Law for Questionnaires: "Ask what you want to know, not something else."

The trouble with this law is that it is extremely difficult to put into practice for several reasons. First, it presumes that we know what we want to know. Often when we start out to construct a questionnaire, we are not sure what we want to know and use the questionnaire construction process in an iterative fashion to refine our ideas about what we want to know. Until we have a clear understanding of what we are trying to ask about, there is little hope that we will be able to ask meaningful questions.

Second, even if we know what we want to know, we need to understand how people answer questions. The complexities of human communication make it difficult to construct of single, standardized instrument that will enable us to ask our questions so that respondents will understand them in the way that we intend and that we will understand their answers in the way they intend. Belson (1968), who has done extensive studies on the comprehension of questions by respondents, estimates that even with the best-constructed questionnaires, less than half of the sample will understand the questions the way the researcher intended. He does not present any data on how well the researchers understand the responses.

Even if this estimate is too pessimistic, we are faced with a difficult problem of measurement error that comes from the question-answer process itself, rather than from sample

design or survey execution. The existence of this source of measurement error has been recognized since the beginning of scientific surveys, that is, since the development of sampling theory and its application to human populations. Unlike sampling theory, which rests on firm mathematical principles, the understanding of measurement error due to the question-answering process has not, until recently, been based on the theoretical understanding of human communication and cognition. This situation is beginning to change.

In the past two decades there has been substantial progress in the conceptualization of the survey interview applying concepts from social and cognitive psychology (Jabine, Straf, Tanur and Tourangeau 1984, Sudman and Bradburn 1974, Sudman, Bradburn and Schwarz 1996, Tourangeau, Rips and Rasinski 2000). In this essay I will review briefly the development of these approaches, discuss the present state of our knowledge regarding the question-answer process, and suggest some research priorities for the future.

## Some History

The collaboration between cognitively oriented psychologists and survey researchers began about 25 years ago. Like many innovations it had many progenitors and seemed to spring up from several independent sources. One of the earliest, if not the earliest instance, was a seminar held in 1978 by the British Social Science Research Council and the Royal Statistical Society on problems in the collection and interpretation of recall data in social surveys. Particularly noteworthy was the participation of the Cambridge cognitive psychologist Alan Baddeley whose paper, "The Limitations of Human Memory: Implications for the Design of Retrospective Surveys," is perhaps the first paper by a psychologist interested in memory directly related to survey design (Baddeley 1979).

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Two important events occurred in the United States in 1980. The first was a workshop convened by the Bureau of Social Science Research in connection with its work in the redesign of the National Crime Victimization Survey. This workshop brought together cognitive scientists and survey statisticians and methodologists to discuss what contributions cognitive scientists could make to understanding response errors in behavioral reports (Biderman 1980). One of the results of this conference was to stimulate some of the cognitive psychologists who participated to begin to study problems in survey questions in a laboratory setting. One of the earliest of such papers was "Since the eruption of Mt. St. Helens has anyone beaten you up? Improving the accuracy of retrospective reports with landmark events," (Loftus and Marburger 1985) which demonstrated experimentally the value of using landmark events to improve the quality of dating events in survey reports.

The second event was the establishment of a panel on the measurement of subjective phenomena by the Committee on National Statistics. This panel produced two large volumes that reviewed a considerable amount of research on response effects involved in the measurement of subjective phenomena. It complemented the work that had been done by the earlier seminars on measuring behavior or more "objective" phenomena. (Turner and Martin 1982)

A big stimulus came in 1983 when the Committee on National Statistics with funding from NSF organized a 6-day seminar in St. Michaels, Maryland on Cognitive Aspects of Survey Methodology. Two papers, "Potential contributions of cognitive research to survey questionnaire design" (Bradburn and Danis 1984) and "Cognitive science and survey methods," (Tourangeau 1984) reviewed how new developments in cognitive psychology could contribute to survey methodology and how developments in survey methodology could contribute to the further development of cognitive psychology. The conference was extraordinarily fruitful and led to a whole new field of research in survey methodology both as applied to objective and subjective phenomena. The results of this conference were published in Jabine *et al.* (1984).

The final instance of independent work that may be thought of a progenitor of this field was a conference organized by Norbert Schwarz and his associates in Germany. Perhaps the most influential paper from this conference was the model proposed by Strack and Martin (1987) "Thinking, judging and communicating: A process account of context effects in attitude surveys." The results of the conference are published in Hippler, Schwarz and Sudman, *Social Information processing and survey methodology* (1987).

In the ensuing years, there has been a stream of research that has refined and elaborated the research agenda that

came from these early seminars. Some of the work sponsored by the Social Science Research Council is published in "Questions about questions: Inquiries into the cognitive bases of surveys" (Tanur 1992). Subsequent research has been updated in a series of volumes edited by Schwarz and Sudman (1992, 1994, 1996).

### **A Conceptual Approach to the Survey Interview**

A survey interview is a structured social interaction between two people who play distinctive roles—the interviewer and the respondent. It has been described as a "conversation with a purpose" (Bingham and Moore 1934). The purpose, to put it succinctly, is to get a series of questions answered. In scientific surveys, these questions are usually embodied in a structured questionnaire designed by a third party, the researcher. It is this type of survey activity that I will consider, although the analysis could be extended to other, less structured interviews.

Like all social interactions among people from the same culture, there are implicit rules that influence the way the participants behave. Some of these are general and apply to all social interactions between social equals; some are general to the peculiar type of interaction we call the survey interview; some are general to this survey; and some are idiosyncratic and apply to only this particular interview. Thus we think of these rules as hierarchically organized from the most general, which apply to all survey interviews, to the particular rules involved in a particular interview.

At the most general level the interaction is governed by the rules for voluntary interactions between strangers. The interaction is initiated by one party, the interviewer, who must establish the nature of the encounter. The important elements that must be established are: 1) that it is non-threatening, that is the interviewer is not going to do any harm to the respondents; 2) the purpose of the encounter, and 3) what are the costs and benefits to the respondents if they agree to participate in the interview. The interaction is thus viewed as neutral, purposive, and worthwhile. As with any structured social interaction, it is governed by the norms related to such interactions.

What are the norms that are important for the interview? The first is mutual respect for individuals, particularly the privacy of the respondents. This principle has become an important issue regarding the protection of research participants because of a number of instances in bio-medical research where the voluntary nature of participation was not made clear. For high-risk research written consent to participate is now required. In the survey interview, however, the context of the request for an interview makes it easy for respondents to refuse if they do not wish to participate and written consent is superfluous. Asking for written consent may actually raise suspicion that the

interviewer has not been truthful about the purpose of the interview because written consent is not normally part of a conversation between strangers who have established that the interaction is non-threatening.

A second important norm is truthfulness. It is part of the role obligation of both parties to be truthful. For the interviewer, this means telling the respondent pertinent facts about the purpose of the interview, what is required of the respondents, *e.g.*, how much time it will take, whether they will need to consult records, whether the questions may be sensitive, *etc.* and to answer any questions the respondents might ask. If providing some information at the beginning of the interview might bias responses, such as who the sponsor of the research is, the information can be given at the end of the interview.

The purpose of the interview is to obtain the information required by the research. The interviewer's role is to get the desired information and the questionnaire is the principal instrument for accomplishing this task. A well-designed questionnaire makes the interviewer's job easier and minimizes the need for the interviewer to have to answer questions about the meaning of questions in the questionnaire. While interviewers need to be trained about the purpose of questions and their meaning, interviewers may become a source of uncontrolled variance if they have to interpret questions for many respondents. Interviewers need to be alert to cues that respondents are misunderstanding questions and to act to correct them. The need for many interventions by interviewers indicates a bad questionnaire.

If respondents accept the role and agree to participate in the interview, they have the obligation, under the norm of truthfulness, to answer the questions as accurately and completely as possible. This norm, however, may conflict with the general desire of individuals to be well thought of and to present themselves in a favorable light. In many surveys, we ask questions about potentially embarrassing, sensitive or even illegal behavior or unpopular attitudes. The interviewer and the questionnaire both play an important role in minimizing this conflict and reinforce the norm of truthfulness. The empirical evidence, however, suggests that even with the best trained interviewers and the best techniques of questionnaire design, it is rarely possible to prevent some overreporting of socially desirable behavior and attitudes or underreporting of undesirable attitudes and behavior (See Bradburn, Sudman and Associates 1979; Wentland and Smith 1993).

Survey data are collected under a strong norm of confidentiality. The norm is so strong that even if it is not made explicit, respondents expect that information from interviews that have the form of scientific surveys, such as public opinion polls or employee attitude surveys, will not be identified with them. Violations of this norm such as

occur with "sugging" (selling under the guise of a survey) or "frugging" (fund raising under the guise of a survey) threaten to erode public confidence in surveys and contribute to the increase in rates of refusal to participate. Unless the data are collected under "shield laws" or certificates of confidentiality that have the force of law, confidentiality promises, however, can be compromised by law enforcement activities.

Linguists have also noted that there are basic shared assumptions underlying conversations that facilitate the interactions. These have been systematically described by Grice and are referred to as Grician rules (Grice 1975, see also Sudman *et al.* 1996 for their application in surveys). According to Grice, conversations are based on a principle of "cooperativeness" which is embodied in four maxims. The maxim of quality enjoins speakers to be truthful and not to say things that they lack evidence for. The maxim of relation indicates that the utterances are relevant to the topic of the ongoing conversation. The maxim of quantity requires that speakers not repeat themselves and make the contributions to the conversation as informative as possible. The maxim of manner requires that the speakers be as clear as possible in their meaning. Thus, according to Grice, speakers are expected to be truthful, relevant, informative and clear.

These maxims apply equally to informal conversations and to interviews that have the form of a special type of conversation. Thus the questions asked by the interviewer are interpreted within the same framework, that is both questions and introductory material to questions are relevant to the topic, are supposed to be informative and clear. Violations of these maxims can lead to confusion on the part of respondents and produce response effects that are well documented. For example, violations of the maxim of relevance when questions are obscure (see for example, Schuman and Presser 1981) or deliberately about fictitious issues (Bishop, Oldendick and Tuchfarber 1986) lead to respondents trying to make sense of the question by looking to contextual cues about the meaning of the question. This produces what appears to be an erroneous response when viewed from the perspective of the researcher who does not understand the conversational assumptions of the respondents.

One of the most well documented order effects in surveys occurs when questions of differing levels of specificity occur together. When one question is general, *e.g.*, "Taking all things together, how happy are you these days?" and the other is specific, *e.g.*, "How happy is your marriage?", responses to the general question are affected by the order of the questions, while responses to the more specific question are not. The effect appears to be the result of the workings of the maxim of relevance. When the

general question comes first it is interpreted as intended, that is, respondents should include all aspects of their lives in making the judgment about their happiness. When the general question comes second after the specific question about marriage happiness, the maxim of relevance suggests that respondents should exclude from consideration their marriages because they have already reported on them. Thus, even though the question literally asks about “all things together”, it is interpreted to mean “all things except those we have already asked about.” It is only those things that have not been asked about that are still relevant.

What happens if the norms outlined above are not accepted in the interview either because the respondent rejects or redefines the role of respondent or does not observe the maxims of conversation? Of course the easiest form of rejection of the role of respondent is to refuse the interview altogether. Sometimes, however, a person sampled becomes a “reluctant respondent”, that is, they are may feel pressured to participate in the study because of follow-up procedures, because they do not like to refuse a strong request from another person or for some other reason. In such cases they may care less about being a good respondent than just getting the interview finished. Thus they may take less time to think about questions, make less effort to recall information requested, or be less interested in a truthful answer than a “don’t know” or even a false answer. Interviewers have told me that they often feel that the responses given by those that they have convinced to participate in an interview after many attempts at refusal conversion are less valid than those who participate more willingly. Extra efforts to obtain high completion rates may in fact produce less good data.

Respondents also may misunderstand the nature of the survey interview, simply want to convert it into a social conversation, or not be very skilled conversationalists, that is not abide by the Gricean maxims and thus engage in an “inefficient” conversation. Such conversations are characterized by frequent asides or changes of topic, comments on topics of little or no relevance to the question at hand, relating personal anecdotes that may be triggered by some aspect of the question, or simple repetition of comments. In such cases the interviewer must politely but firmly teach the respondent the rules for the conversation and guide the respondent to keep focused on the questions in the interview. Skilled interviewers become experts in steering the conversation and, by selective reinforcement, shaping the respondents’ behavior to follow the Gricean maxims.

In summary, interviews take place in social contexts that have a structure governed by socially shared expectations and norms. These norms may differ from society to society and perhaps even within subcultures in the same society, but they have powerful effects on the way interviews are

conducted and the way questions are interpreted. Violations of the expectations or norms may lead to “effects” that may be interpreted as error from the perspective of the researcher. If these norms and expectations are understood, they can be used to avoid problems or to mitigate the effects.

Data could also be obtained from interviewers about how much the interview deviated from the model outlined above. Although little research has been done assessing the quality of interviews from this point of view, a fruitful area for future research could be to investigate the decline in validity of data as the conditions of the interview increasingly deviate from the ideal model.

### **Cognitive Processes in Survey Response**

Answering questions in a survey involves considerable cognitive work on the part of respondents. Much of what underlies recent advances in understanding survey response processes derives from the application of models of information processing to the question-answering process. While there is still much work to be done before we have complete and detailed understanding of how the brain processes information, there is sufficient agreement about the general approach to serve as the basis for a better understanding of the response process.

The mind is conceptualized as a large information processing system composed of a series of component systems. The physical sensations of sound and sight enter the system in the sensory register. The sensory register has capacity limitations so that only a portion of the information is transferred to short-term memory. Attention plays a large role in determining what is brought into short-term memory. Attention is a function of an executive monitor that enables and controls the information processing system much the way that programs enable what computers do. The executive system controls the entire system through goals and plans that are organized into priorities for action.

The storehouse of the system is the long-term memory system that has a very large capacity. Working memory refers to the system in which active thinking takes place. The activity here draws on short-term memory and retrievals from long-term memory. Short-term memory has limited capacity but rapid access, while long-term memory has large capacity but is relatively slow in access. Long-term memory appears to have two rather distinct subsystems, semantic memory and episodic memory, although this distinction is not universally agreed upon. Semantic memory refers to memory associated with vocabulary, language structure, rules and abstract knowledge, while episodic memory refers to memory for events that took place in time and space.

Information is represented as a list of features or concepts that are linked together in networks. Information is stored in memory in structures that are hierarchically organized with more general concepts being higher in the structure than more discrete instances of the concept or distinct features. The term “schema” is sometimes used to refer to larger, more complex shared and/or overlearned structures that organize our thoughts on familiar topics and may be retrieved as a whole rather than as individual parts.

Language is the medium through which information is primarily communicated and thus information, to be available for communication, must be associated with a linguistic code. The exact relationship between language and thought and whether or not all thoughts have verbal representation are still subjects of debate. It is clear, however, that meaning is encoded somehow in language and these codes play an important role in the acquisition, storage and retrieval of information. Emotion may also be part of the code, although its role is not well understood.

Knowledge structures facilitate and constrain patterns of activation in the mind. What comes to mind, that is, into consciousness, is limited and is the result of the activation of the networks. Activation is rapid but goes along pathways determined by the ways information is encoded. Encoding puts information into particular categories and structures the pathways by which the information will be retrieved. Cues are stimuli that are related to the codes and stimulate the activation of the networks. Activation is rapid but does take time. The amount of time it takes for someone to respond to a stimulus (reaction time) is often used in research as a clue to the way information is coded.

There are number of models of the question-answering process (Cannell, Miller and Oksenberg 1981; Strack and Martin 1987; Tourangeau and Rasinski 1988; Sudman *et al.* 1996;) that, while differing in details, generally agree on a series of processes respondents go through in answering questions. These processes are: 1) comprehending the meaning of the question; 2) retrieving relevant information; 3) formulating an answer; 4) formatting and editing the answer to meet the requirements of the interviewer and respondents self-presentation. While conceptually viewed as a linear sequence, it is recognized that in reality the processes occur in the flow of a conversation and that the different processes may go on in parallel or in rapid cycling back and forth. For purposes of considering the question-answer process, it is useful to consider them as if they were separate and proceeded in an orderly sequence.

### Comprehension

In order to answer a question, respondents must first understand what they are being asked. The goal for the researcher is for respondents to understand the question in

the same way that the researcher does. This goal is very difficult to reach because of the many subtleties and ambiguities of language. Indeed Belson (1981), who has studied extensively respondents’ understanding of common terms such as “weekday”, “children,” “regularly” and “proportion,” found widespread misunderstanding even in questions using such common terms.

Comprehension begins with a perceptual process of interpreting a string of sounds or written symbols as words in a language that respondents understand. The string of words is “parsed” into syntactical units that are understood, that is, the meaning that is encoded in the linguistic units is extracted by a process that is still poorly understood. Many comprehension problems occur because of ambiguities arising from words that have different meanings (lexical ambiguity) or are used in different ways (structural ambiguity). For example, the question “Where is the table?” is lexically ambiguous because the word “table” can refer to an object on which things can be placed or a set of numbers arranged in a sheet of paper. The sentence “Flying planes can be dangerous” is structurally ambiguous. The interpretation depends on whether “flying” is understood as a verb or as an adjective. Structural ambiguities can be resolved by careful wording of questions. Lexical ambiguities, on the other hand, are inherent in language and are usually resolved by the context within which the sentences appear.

Context plays an important role not only in resolving ambiguities but also aids in interpreting the meaning of words that are unfamiliar. For example, a study by Schuman and Presser (1981) found that a question about the Monetary Control Bill, an obscure piece of proposed legislation, was interpreted as referring to an anti-inflationary measure when it occurred after a series of questions about inflation, but was interpreted as referring to controls of the international transfer of money when it occurred after questions dealing with the balance of payments.

The underlying psychological mechanism for these types of context effects is priming. In order to interpret the stream of sounds or written symbols, we have to draw on our semantic memory that contains the store of linguistic information that enables us to understand the languages we know. Since this is a large store of knowledge, it takes time to retrieve information, and some things will be more easily accessible than others. Those bits of information that have been recently activated are more easily accessible and will be used first to interpret what is being said or read. Priming activates thoughts or “schemata”, that is, organized thoughts about objects or concepts, so that they are more accessible to consciousness and thus more easily come into play in interpreting the questions. In the example above, previous questions have primed either thoughts about inflation or about international flows of money, so that when the



unfamiliar concept of the Monetary Control Bill is asked about, the thoughts that have been primed come more rapidly to the fore and affect the interpretation of the words.

Different meanings may be differentially accessible to different respondents because of the frequency with which they employ them in daily life. For example, Billiet (cited in Bradburn 1992, page 317) observed that, in response to the question "How many children do you have?" some respondents offered numbers between twenty and thirty. Further inspection of the data revealed that these respondents were teachers who interpreted the question to refer to the children in their classes, the meaning that was most accessible in their memories.

### Information Retrieval

Once a question has been comprehended, respondents must retrieve from memory the information necessary to answer the question. In almost all cases this means retrieving the information from long-term memory. If the question is about behavior, the relevant information is likely to be stored in episodic memory. If the question is about attitudes, the relevant information is likely to be stored in semantic memory, but may require some retrieval from episodic memory.

Remembering is a process by which the memory storehouse is searched to retrieve a particular item that is being sought. If we think of memory as a big storehouse, it is clear that it must be organized in some way in order for us to be able to retrieve things from it. Just as we must label files when we put them in file drawers, so we must attach some kind of labels to information in the memory storehouse. The labeling process, often called "encoding," refers to various aspects of the information or the experience, including emotional tone, attached to the item when we stored it in memory so that we can retrieve it. (For a more complete discussion of memory models see Tourangeau *et al.* 2000, Chapter 3).

Barsalou (1988) has proposed a theory that provides a good framework for understanding how information about personal events is stored in memory. He notes that information about activities or event types in episodic memory includes not only specific events but also extensive idiosyncratic, generic knowledge about the events, that is, having a generic mental image of some types of activity, *e.g.*, visiting a pediatrician, rather than an image of a particular event, *e.g.*, going to Dr. Jones about your daughter's rash (Brewer 1986, 1994). For activities to be stored in memory, they must be comprehended. In other words they must be understood within some meaning system, usually linguistic, that brings to bear knowledge of past activities and generic knowledge about similar event types as well as specifics of the event itself and the context

within which it occurred. This complex set of information that goes into the comprehension of the event becomes integrated into the memory of the event. The comprehension process determines how the memories are encoded.

Information, such as the wording of the question and any explanatory material available to respondents at the time they are asked to recall an event, acts as retrieval cues. Retrieval cues are any words, images, emotions, *etc.* that activate or direct the memory search process. If retrieval cues do not specify the event type, *e.g.*, pediatrician visits, then the event types must be inferred before the search can begin. This inference can come from the wording of the question or from the larger context in which the question is asked, including the preceding questions or the introductory material to the survey.

Retrieval is an active process that is facilitated by cues in the question that activate the pathways of association leading to the desired information. Because information, both in episodic and semantic memory, is encoded in many different ways, the cues in the question or in the context surrounding the question including previous questions, may facilitate or constrain the activation and produce better or less good retrieval.

Retrieval takes time. One clear empirical finding is that giving respondents more time to answer questions produces more accurate reports, particularly for behavioral questions. But time is not all there is to it. Memories for events in one's life appear to be organized in event sequences (Barsalou 1988), for example, a summer vacation or a hospitalization, which are hierarchically organized. Giving respondents cues to remind them about the sequence is more effective than trying to get them to retrieve information about a specific event. For example, in questions about alcohol consumption, giving examples of the kinds of situations in which one might drink increases consumption reports.

Examples are an important aid to recall, but they are not a panacea. Giving respondents of list of magazines that they might have read improves reports of reading; a list of organizational types helps respondents remember all the organizations they belong to. While examples may help reduce omissions, they have the effect also of being direct cues for memory and result in greater reports for the types of items on the list. If an important type of activity or event is omitted from a list, the lack of a cue for that type of activity may result in underreporting. The cuing effect of question wording can scarcely be overestimated.

When thinking about retrieval, we mostly think about forgetting or failure to retrieve relevant information. Some times, however, incorrect information may be retrieved that results in overreporting behavior. The best-known example is the phenomenon observed by Neter and Waksberg (1964)

called “telescoping”, that is, recalling events that took place at a time other than the time period asked about. Telescoping occurs in response to questions about behavior in a defined time period such as: “How many times have you been to the doctor in the past 6 months?” Neter and Waksberg found in analyzing data from the Consumer Expenditure Survey that when respondents reported on purchases in different reference periods, there was a systematic overreporting of purchases that came from reporting purchases made in a previous period as if they had been purchased in the period being asked about. While the phenomenon has been observed in a number of studies, there had been no cognitive explanation for it until recently.

Memory for the time of events becomes more uncertain the further back in time the event happened, even though there is no systematic bias in the reports. Telescoping results from the conjunction of two processes—rounding and bounding. Rounding refers to the fact that respondents round their estimates for when things took place in successively larger periods the further back in time an event occurred. For example, events are remembered as having occurred in “days ago” discretely up to about 7 days ago, then they are rounded to periods such as 10 days, two weeks, 4 weeks, 3 months, and 6 months ago. Bounding refers to the aspect of the question that limits the time of reports, *e.g.*, the last 6 months. The effect of this bounding is to truncate reports of events that are remembered as having occurred longer ago than 6 months. Since the variance in the memory for the dates of events becomes larger the further back the event occurred, a larger number of events will be incorrectly remembered as falling into the period the further back the events occurred. This overreporting of events from outside the period will not be offset by an underreporting of events in the near term because events cannot be reported that have not yet happened. Since there are no offsetting events remembered as occurring outside the period at the other end of the time boundary, *i.e.*, the future, the result is a net overreport. (For a full explication of the model see Huttenlocher, Hedges and Bradburn 1990).

### Formulating an Answer

Taking into account the information activated by the cues provided by the questions and the context in which they are asked and retrieved from memory, respondents must formulate an answer to the question. Some information is easily accessible. For example, if the questions are about well-rehearsed topics, such as birthdates or marital status, or about topics for which the respondents have an already well-articulated position, respondents may retrieve the answers directly. They spring, as it were, fully formed from memory and can be reported directly. This kind of information we call chronically accessible.

On the other hand, if the questions are about behavior that has not been thought about recently and is not well-remembered or about attitudes that have not been well thought out or discussed, respondents must construct answers on the spot using all the information from whatever source available to them in working memory. This construction process utilizes not only chronically available information but also, importantly, information that is temporarily accessible because it has been activated by the question itself, contextual cues, previous questions, or any other aspects of the interview situation.

There are several general cognitive processes that are pervasive strategies used to process information efficiently. Assimilation and contrast are two such fundamental processes that affect communications. In the study of perception, assimilation refers to the tendency to perceive stimuli as more alike than they actually are. Contrast refers to the tendency to perceive stimuli as more different than they actually are. Applying these principles to survey answering leads to what has been called the inclusion/exclusion model (Schwarz and Bless 1992; Sudman *et al.* 1996). Information that is included in the temporary representation that respondents form of the target of the question will result in assimilation effects because the judgment required to answer the question is based on information included in the representation used. If the information is positive, the judgment will be more positive. If the information is negative, the judgment will be more negative. The size of the effect depends on the amount and extremity of the temporarily accessible information.

Previous questions may activate thoughts that are then included in the representation of topics of later questions. The impact of a given question decreases as the number of other context questions increases. For example, answering a question about marital happiness had a pronounced effect on answers to subsequent questions about general life satisfaction when respondents’ marriages were the only specific life domain asked about. When respondents were asked about their leisure time and their jobs in addition to questions about their marriages before reporting on life satisfaction, the effect was significantly reduced. (Schwarz, Strack and Mai 1991).

Information that is excluded rather than included in the temporary representation of the target will lead to a contrast effect. In this case, if the information excluded is positive, the judgment will become more negative; if the information is negative, the judgment will become more positive. Similarly the size of the effect depends on the amount and extremity of the temporarily accessible information. In effect, the excluded information is subtracted from the representation of the attitude object.

Excluded information, however, may play an additional role in formulating judgments. In addition to being excluded from the representation of the target, the information may be used in constructing a standard or scale anchor. In this case we speak of comparison-based contrast effects. The effect here is not caused so much by the subtraction of the excluded information from the evaluation of the attitude target, but by the comparison of the target with some standard or evaluated on some scale.

Which of these processes drives the emergence of a contrast effect determines whether the contrast effect is limited to the single object or generalizes across related objects. If the contrast effect is based on simple subtraction, the effect is limited to that particular target. If the contrast effect is based on a comparison, the effects are apt to appear in each judgment where that standard of comparison is relevant.

An example of a contrast effect based on using information from previous questions is provided in a study by Schwarz, Muenkel and Hippler (1990). Respondents were asked to rate a number of beverages according to how "typically German" they were. When this question was preceded by a question about the frequency with which Germans drink beer or vodka, contrast effects appear in the typicality ratings. Respondents who had estimated the consumption of beer first (a high frequency item), rated wine, milk and coffee as less typical German drinks than did respondents who had estimated the consumption of vodka first (a low frequency item), thus showing a contrast effect that extended across the three target drinks. This contrast effect, however, did not appear when the preceding question was about the caloric context of beer or vodka because the information activated by this question was not relevant to a judgment about typicality.

### **Formatting and Editing Responses**

After respondents have formulated their responses, there remains the task of fitting these answers into the response formats that the interviewer offers. Rarely in surveys does the researcher allow respondents to answer questions in a free format. Open-ended questions have a multitude of problems not least of which is the cost and difficulty of transforming free-form answers in a format that can be treated quantitatively. Today almost all questionnaires depend on closed or pre-coded questions.

Research on response alternatives is less well developed theoretically than the study of question wording and context effects. In general, the empirically observed effects are thought to stem from two sources—memory limitations and cognitive elaboration stimulated by the response alternatives.

Memory limitations create some order effects among response alternatives. Primacy and recency are two well-known effects in the memory literature. When a series of stimuli are present visually, those that come early in the series are remembered better than those later in the series (primacy). When a series of stimuli are present in an auditory mode, those that come late in the series are remembered better (recency). Thus there is an interaction between the order in which stimuli are presented and the mode by which they are presented.

The research literature has shown that there are persistent, although in general samples fairly small, primacy and recency effects in the serial position of response alternatives depending on the mode presentation. Primacy effects appear when the response alternatives are presented visually, as in show cards in personal interviewing, and recency effects appear in telephone interviewing when the respondents have to depend entirely on auditory memory for the response alternatives. More recent research (Knaeuper 1999; Schwarz and Knaeuper 2000), however, reveals that the effect is very much a function of memory capacity and is sharply increased among older respondents whose memory is poorer and who depend more on the primacy or recency of the stimuli as supported by mode of presentation. Among older respondents, the primacy/recency effects can be quite large, on the order to 20 percentage points (Schwarz and Knaeuper 2000). Among younger respondents the effects are small.

An intriguing theory to account for some observed response order effects within a question is that of cognitive elaboration. This theory draws on early work by Krosnick and Alwin (1987) and cognitive research on persuasion (Eagly and Chaiken 1993; Petty and Cacioppo 1986). This theory hypothesizes that the order and mode in which response alternatives are presented affects respondents' opportunity to elaborate on their content. Such elaboration, in turn, activates thoughts in response to the question and provides retrieval cues in response to behavioral questions. The response alternatives provide supplementary cues that activate a range of thoughts that become temporarily accessible and may become part of the answer formulation process. In effect, the response alternatives are an essential part of the question but may be processed later in time after the question itself has been processed.

The cognitive elaboration hypothesis suggests a number of complex predictions, few of which have yet been tested. One example for which there is considerable evidence, is an interaction between serial position and mode of administration in long lists. The primacy effect evident in visually presented material gives respondents time and stimulus to think more about alternatives early in the list before giving an answer. The crowding out of early alternatives by the

reading of later alternatives and recency effects evident in lists presented in an auditory mode suggest that the later alternatives can be more deeply processed cognitively. These effects are more robust than the primacy and recency effects that appear to depend more on simple memory limitations.

Once a response alternative has been chosen in the respondents' mind, the respondent may still edit the response. As mentioned earlier, the interview is a social situation and respondents may be concerned with self-presentation. There is ample evidence that social desirability is an important aspect of the response process and responses to sensitive questions may be seriously distorted by unwillingness to admit to behavior or attitudes that would put the respondent in a bad light in the interviewer's eyes or by the desire to over claim socially desirable behavior (Bradburn, Sudman and Associates 1979; Sudman and Bradburn 1974). There are several techniques for reducing social desirability bias, although there is no technique that totally and reliably eliminates it. The general strategy is to increase social distance between respondents and interviewers. This can be done by changing the mode of administration by eliminating or reducing the presence of the interviewer. Computer Assisted Personal Interviews (CAPI) which allow respondents to directly enter responses to sensitive questions into the computer as part of a face-to-face interview enable researchers to combine the benefits of a personal interview with a self-administered questionnaire. The use of audio enhanced CAPI (Audio-CAPI) which enables respondents to listen to a recorded voice reading the questions, although somewhat more expensive, overcomes literacy and language problems that might arise when respondents have to read questions from a computer screen.

Research on mode effects generally indicates that self-administration of a questionnaire, particularly in an anonymous, group setting, minimizes, but does not entirely eliminate desirability bias. Interviews done on the telephone generally produce results that are intermediate between a face-to-face interview and a totally anonymous self-administration, although the results are not entirely consistent.

In addition to reducing the social distance between interviewer and respondent by altering the mode of administration there are techniques for increasing the real or perceived anonymity of respondents that also reduce social desirability bias. For example, respondents may put their responses in a sealed envelope and mail them back to a central office so that they know that the interviewer cannot see their responses.

Another technique is the so-called random response technique, although it is more properly a random question technique (Greenberg, Abul-Ela, Simmons and Horvitz 1969;

Horvitz, Shah and Simmons 1967; Warner 1965). The interviewer asks two questions, one sensitive and the other non-sensitive. Both questions have the same possible answers, "yes" and "no". Which question the respondent answers is determined by a probability mechanism, such as flipping a coin or using a plastic box containing two colored beads, e.g., red and blue beads, in differing proportions, e.g., 70% red beads and 30% blue beads. The box is designed so that when it is shaken by respondents a red or a blue bead seen only by the respondent will appear in the window of the box. If the bead is red, the sensitive question is answered; if blue, the non-sensitive question is answered. The interviewer does not know which question is answered.

By using this procedure you can estimate the behavior of a group on the sensitive questions, but not that of any single individual. Thus with this method you cannot relate individual characteristics of respondents to individual behavior. If you have a very large sample, group characteristics can be related to the estimates obtained from randomized responses. For example, you could look at all the answers of young women and compare them to all the answers of men or young versus older age groups. On the whole, however much information is lost when randomized response is used.

While, compared with other methods, randomized response greatly reduces the under reporting of undesirable behavior, it does little to reduce the overreporting of desirable behavior. It also does not entirely eliminate under-reporting of undesirable behavior (Bradburn *et al.* 1979).

## Conclusion

In this essay, I have tried to present the outlines of a social psychological approach to the understanding of the question-answer process in the survey interview. This approach draws on theory from sociology, cognitive psychology and linguistics, to present a comprehensive framework for research on response effects. Much, however, remains uncertain or unknown.

While social role theory provides a good starting point for conceptualizing the social relations among researchers, interviewers and respondents, there is much we do not know about how these roles are played by their respective actors and how they may be changing. Contemporary concerns about privacy and confidentiality of data and protection of human participants in research are changing to an unknown degree the way respondents view surveys and social research. Technology is changing respondents' ability to protect their privacy and researchers' ability to protect confidentiality of data. Response rates have been declining and greater efforts are required to convince sampled persons to respond. Interviewing is increasingly mediated by

computer-assistance, which may change the way in which respondents and interviewers interact and the way respondents view the interview situation.

The cognitive processes involved in formulating an answer are complex and not yet fully understood. The application of our understanding of fundamental cognitive processes to the study of question formulation and order goes a long way toward improving our understanding of context effects. Cognitive science is making great strides in understanding how the brain works and how we organize and process information. New knowledge in these areas grows at a rapid pace. As we learn more, many of the conceptualizations outlined in this essay will change and either shown to be wrong or greatly elaborated.

Finally there is a great challenge to linguistics. Many of the effects we have discussed in this essay occur because of ambiguities in language. Understanding how meaning is encoded in language and how we extract that meaning from spoken and written language is a formidable challenge. Perhaps more than anything else, our ability to resolve some of the most fundamental problems in questionnaire construction depends on progress in these areas.

What are the high priority areas for research? In the short run, I would concentrate on better understanding of the biasing effects of declining respondent participation, particularly on possible distortions of responses from reluctant respondents. We must develop response effect models that not only account for missing data, whether at the item level or at the whole person level, but also for response effects introduced by reluctant respondents who give only partial answers or not well-considered answers. Multiple imputation models such as those developed by Little and Rubin (1987) and latent variable approaches such as developed by O'Muircheartaigh and Moustaki (1999) are promising. More empirical work is needed on the effects of pushing people into responding who initially are unwilling to participate in a survey.

In the longer run, further research is needed on the mechanisms by which questions and answer categories stimulate cognitive elaboration and activate thoughts that are then used in answering questions. We need to know what it is about questions that cause respondents to exclude information in making a judgment as contrasted with those that stimulate them to include information when they make judgments. Progress in this area will require a close collaboration between cognitive psychologists and survey methodologists and involve both laboratory and field survey work.

In the end, however, fundamental understanding of the question-answer process will only come when we understand how meaning is communicated between human beings. Questions have meaning that we expect respondents to comprehend. We can only go so far in improving the

process of clear communication without a much deeper understanding of the basic mechanisms of communication. We need a concerted multidisciplinary effort by linguists, psychologists, statisticians, and cognitive scientists and others to crack the meaning code much as natural scientists cracked the genetic code. It is one of the grand scientific challenges of our time.

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