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Respondent Strategies for Recall of Crime Victimization Incidents

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Abstract: This research addresses whether accuracy of reporting is affected by length of reference period, the use of anchors to mark the start of the reference period, or the pattern survey respondents use in searching their memories. Victims of robbery, burglary, and assault were asked to report victimizations and victimization dates in a reverse record check survey. Neither length of reference period nor anchoring the reference period significantly affected the rates of reporting victimizations, however, both factors influenced reports of victimization dates. The manner in which respondents searched their memories affected reporting rates but not accuracy of reported dates. Many respondents appeared to use a common recall strategy and we present suggestions for improving questionnaire design based on these results. We also discuss the relationship between method of memory search and the procedure used to anchor the reference period. Finally, suggestions for overcoming the gross underreporting of assault are presented.

Key words: Recall errors; memory search; anchor points; length of reference period; response errors; questionnaire design.

1. Introduction

Survey respondents are often required to report about behaviors or events that occurred within a specified time period. The accuracy of such reports is important because major policy decisions are often based on these types of data, yet little is known about how respondents perform this task.

Several problems may occur when individuals are asked to recall events that occurred during a specific reference period. Some respondents forget events that should be reported while others report events that occurred prior to the reference period, a phenomenon called forward telescoping (Neter and Waksberg 1964; Loftus and Marburger 1983; Brown, Rips, and Shevell 1985; Loftus, Klinger, Smith, and Fiedler 1990). Although usually less frequent than forward telescoping, respondents also backward telescope, or erroneously assign an earlier date to an event (Sudman and Bradburn 1973; Means, Nigram, Zarrow, Loftus, and Donaldson

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1989). Even if errors of omission and backward telescoping are offset by forward telescoping in a given survey, it is possible that differences in the types of events reported would significantly affect the accuracy of the data. In addition, there may be important differences when analyses are conducted at an individual level.

Various questionnaire design strategies, such as bounding techniques, have been used in attempts to reduce these types of response effects (Neter and Waksberg 1964; Sudman and Bradburn 1974). Telescoping can be reduced substantially using bounded recall procedures. Bounding is usually accomplished by means of a panel design, although Sudman, Finn, and Lannom (1984) have attempted bounding procedures within a single interview. In most cases, implementing a panel study solely for the purpose of bounding would be too costly and time consuming. A more common approach is to help the respondent fix the reference period in mind and then ask him or her to search that period for the particular event or behavior. There is a paucity of data, however, regarding whether respondents actually follow this mental sequence or, when they do, what methods are most effective for fixing the reference period in mind and searching that period.

The ability to recall an event and information about it varies from person to person. Some respondents telescope events into or out of a specified reference period while others do not. This raises the question of whether the accuracy of reporting can be explained by different cognitive strategies respondents use to define and search a specified reference period. Survey researchers have only recently begun to investigate the cognitive processes that occur when respondents attempt to recall information about events or behaviors (Bradburn et al. 1987; Blair and Burton 1987; Loftus, Fienberg, and Tanur 1985).

This paper addresses the question of whether recall and reporting accuracy is linked to the ways in which respondents mentally delineate the reference period and the ways in which they search that reference period. We report results from a reverse record check survey in which respondents were asked whether they had been victims of a robbery, assault, or burglary within the preceding six or nine months. We examine the influence of three factors – length of reference period, the use of anchors to mark the start of the reference period, and the manner in which respondents search their memories on:

a. Whether crime events are reported; and
b. The accuracy of reported dates of crime events.

The underlying premise of this research is that a better understanding of the cognitive processes involved in answering survey questions will allow researchers to design survey procedures and questionnaires that will elicit more accurate reports of events. Specifically, we evaluate procedures to reduce telescoping, attempt to increase our understanding of sources of measurement error for different lengths of reference periods, and examine cognitive strategies respondents use to recall events.

2. Related Research

Assuming that crime victimizations are relatively rare and salient events for most people, there are two different processes one might use to answer victimization questions. First, the respondent could set off or delimit the reference period and then search that period for a crime event. Alternatively, the respondent could retrieve the

event first and then try to determine whether it occurred within the reference period. In either case, the respondent must recall the event and its date to complete the task successfully.

Previous research indicates that a number of factors affect the accuracy of recalling and dating events or behaviors. These factors include the length of the reference period, the use of landmark events or anchors to mark the beginning of the reference period, and the direction or manner in which respondents search their memories.

2.1. Length of reference period

The ability to recall an event is related to the time elapsed since the event and its saliency (Sudman and Bradburn 1974; Mathiowetz 1988). Saliency is determined by the rarity of the event, its economic or social costs or benefits, and the continuing consequences of the event (Sudman and Bradburn 1982). Cash and Moss (1972) concluded that memory of highly salient events is satisfactory for periods of a year or more. Thus, we expected that respondents would be able to recall most crime events for periods of up to 12 months, however, we were less certain about their ability to correctly date the events.

Several studies have investigated memory decay in the National Crime Survey (Gottfredson and Hindelang 1977; Skogan 1981; Bushery 1981; Kobilarcik, Alexander, Singh, and Shapiro 1983; Hubble 1990). The National Crime Survey uses a six-month reference period, and experiments have been conducted to evaluate the effectiveness of three-month, six-month, and twelve-month reference periods. Bushery (1981) found strong evidence that the rates of reported victimization decrease seriously as the length of the reference period increases. He concluded that the reduction in reporting was due to memory decay (forgetting) and "reporting load." Reporting load effects occur when respondents attempt to shorten the interview by omitting incidents that should be reported. Research in other areas, however, suggests that forward telescoping increases with the length of the reference period (Rubin and Baddeley 1989; Thompson, Skowronski, and Lee 1988). Increases in forward telescoping with longer reference periods may be due to the increased uncertainty about the memory of more distant events and the way in which the reference period is bounded (Huttenlocher, Hedges, and Bradburn 1990; Rubin and Baddeley 1989; cf. Thompson et al. 1988).

2.2. Anchoring the reference period

Recent research suggests that determining the dates of events tends to be a reconstructive process, in which respondents use general information about time patterns and the relative ordering of events to determine the time of a specific event (Friedman 1993). In fact, the actual dates of most autobiographical events are not stored in memory and are very difficult to recall (Linton 1975; Brown et al. 1985; Wagenaar 1986). It appears that people know the dates of a few important or landmark events such as holidays, birthdays, and weddings and that they use these dates to estimate the dates of other events (Brown et al. 1985; Means et al. 1989). One method of assisting respondents with the difficult task of dating events is the use of anchors or landmarks (Linton 1975; Loftus and Marburger 1983; Brown, Shevell, and Rips 1986; Means et al. 1989).

Baddeley (1979) found that the spontaneous use of personal landmarks increased recall accuracy. Loftus and Marburger (1983)

found that providing landmark events significantly reduced the number of crime incidents reported by respondents for a given reference period. They attribute this to a reduction in forward telescoping. In addition, Brown et al. (1986) reported that respondents who were asked to date important public and cultural events typically related the event to autobiographical information or to other, more easily dated public events, to narrow the possible range of dates. Most recently, Means et al. (1989) reported the results of research investigating people's ability to recall and date health-related events such as doctor visits, hospitalizations, and emergency room treatments. In their study, the interviewer and respondent constructed a personal time line for the 18 months preceding the interview. The time line was intended to stimulate autobiographical memory of landmark events which could then be used as cues for remembering and dating health events. Use of the time line increased the number of events for which subjects reported a date and increased the number of events dated accurately. These researchers also found that forward telescoping was more common than backward telescoping for serious health-related events, whereas, backward telescoping was more common for minor events. They noted, however, that these effects were small in magnitude and not robust.

The effectiveness of anchors appears to vary by the type of landmark used. Loftus and Marburger (1983) examined the relative effectiveness of three kinds of landmarks: a highly salient public event, a more usual public event (New Year's Day), and personal events provided by respondents. All three types of landmarks were equally effective in reducing forward telescoping. On the other hand, Brown et al. (1986) found that nonpolitical events were more closely tied to autobiographical information (e.g., birthdays), while political events were more highly associated with public markers such as news events. Because crime victimization is a personal event, one might therefore expect more accurate recall when personal, rather than public, anchor points are provided to respondents.

2.3. *Searching reference periods*

Several experiments have examined the relative speed and efficiency of forward search, backward search, and random search for retrieving information from autobiographical memory (Whitten and Leonard 1981; Fathi, Schooler, and Loftus 1984; Loftus and Fathi 1985). With forward search, the respondent thinks of events in chronological order. Alternatively, respondents may start from the most recent event and move backward in time. A third alternative is a random search in which respondents retrieve in an order that has no systematic direction. Though even in this last case, there may be a search pattern but there has been little research on this issue.

Whitten and Leonard (1981) found that backward search was the most efficient and fastest method for subjects asked to recall the names of their elementary and secondary school teachers. Loftus and Fathi (1985) found that college students, asked to recall dates of exams, also preferred backward search over forward search and that backward search led to more accurate recall than forward search. In another experiment, however, Fathi et al. (1984) found that people who were asked about health care events tended to recall in a forward direction. They concluded that the direction people use to retrieve may vary for different classes of retrieval tasks and that further research is needed to clarify

retrieval order effects and the extent to which these effects are task specific.

3. Study Design

This research was conducted as part of a reverse record check survey designed to evaluate the efficiency of using network sampling for local victimization surveys (Czaja and Blair 1990). Crime victims were selected from police department records in a small Illinois Metropolitan Statistical Area. Selections were made from victims' reports to police of burglary, robbery, and assault for the period February through September 1986. Although respondents or other members of their households may have been victims of multiple crimes, this research focuses on only the reporting of the sampled crime. The survey was conducted primarily by telephone; only seven respondents who were not reachable by telephone were interviewed face-to-face. Interviews were conducted from October 1986 through January 1987 from the University of Illinois Survey Research Laboratory's Urbana Telephone Center. The sample of crime victims included 462 households; 374 interviews were completed for a response rate of 81%.

Burglary was defined as an actual or attempted illegal entry of the respondent's home, garage, or other building on the respondent's residential property. Robbery included any incidents in which something was taken or stolen from the respondent while away from home. Assault was defined as having been "beaten up", "attacked," "hit with something," "knifed," or "shot at."

Within crime type, victims were randomly allocated to two groups for purposes of assessing the effects of the length of the reference period on reporting victimization. The initial design was to use reference periods of 6, 9, and 12 months. During sample selection, the 9 and 12-month reference period groups were collapsed into a single 9-month group because the sampling frame did not contain a sufficient number of cases eligible for the 12-month group. As a result, a disproportionate number of cases, approximately two-thirds, were assigned a 9-month recall period.

A split ballot experiment was conducted to assess the utility of using landmarks or anchor points to assist respondents in recalling victimizations and remembering the dates. One-half of the respondents were asked to recall any special events which happened to them to bound the beginning of their recall period. If they were unable to do so, a national or international news event (the explosion of the Challenger space shuttle or the Chernobyl nuclear power plant accident) was given to them (Figure 1). The remaining half of the respondents were not asked to anchor the reference period.

The number of completed interviews within each cell of the experimental design is shown in Table 1. Within each recall period, a random half of the sample for a crime type was assigned to an anchor or no anchor treatment. In all cases, the target crime occurred within the respondent's assigned recall period. Differential response rates and victim verification account for the somewhat unequal final cell sizes.

The data collection instruments consisted of seven sections. The first section was a screener in which all household members age 18 or older were enumerated. A respondent selection procedure was used to select the target crime victim as the respondent, however, the procedure was designed so that interviewers did not know in which households we expected to find victims. Following respondent selection, the interview began with a series of general ques-

I am going to ask you a few questions about how often you have been the victim of a crime or your household was burglarized. We are working on a project investigating how people answer such questions, with the overall goal of making surveys about crime more accurate. We are interested in your answers to these questions, and would like you to try to please make them as accurate as possible.

The following questions refer to crimes that occurred only in the period from February 1, 1986 to September 30, 1986.

Sometimes it can help people to remember what happened if they have a good way to remember the date. Is there anything special that happened to you on or around February 1, 1986, maybe a birthday, anniversary, new job, vacation, or whatever? What was it?

No 0

(*If R comes up with something:*) Okay, since (event) . . . . . (Q.15a)

(*If R does not come up with something:*) Well, okay, February 1, 1986 was around the time the space shuttle Challenger exploded killing the seven crew members. Since then and until September 30, 1986 . . .

15a. Did anyone break into or somehow illegally get into your home, garage or another building on your property?

Yes (Blue Booklet) 1

No (Skip to Q.16a) 2

Fig. 1. Sample questions used to provide respondents with anchor points to bound the beginning of their reference periods

tions about the respondent's satisfaction with his or her neighborhood and city. The next section of the questionnaire elicited the first names of specified relatives (network members). Then the questions about victimizations of the respondent were asked. These questions, adapted from the National Crime Survey, included four questions concerning burglary, five questions on robbery, three on assault, and a general catch-all question on crime victimization. After the questions about each type of crime were asked, the details of any victimization event that was mentioned were elicited. In the next section, the same set of victimization questions was asked for network members. A set of standard demographic questions about the respondent was then asked. The interview concluded with the random selection of two network members and telephone contact information about each.

Two areas of coding were crucial to the interpretation of the study results: whether the victim was interviewed, and whether the target crime was reported in the inter-

Table 1. Number of completed interviews by recall period, anchor treatment and crime type

Crime type	Six-month recall		Nine-month recall		Total interviews
	Anchor	No anchor	Anchor	No anchor	
Burglary	30	27	80	63	200
Robbery	13	6	22	26	67
Assault	17	11	39	40	107
Total	60	44	141	129	374

view. First, it was necessary to determine whether the interviewer reached the correct household; second, whether the crime victim was enumerated in the household chart; and third, whether that victim was the interview respondent. In order to determine whether the correct household was contacted, coders compared the following items from the questionnaire with the police report: telephone number, age and sex of someone listed in the household chart matching the victim listed in the police report, and number of years of residence at the present address. To determine whether the correct respondent was interviewed, the coders compared the respondent's first name, age [within one year] and race, as reported in the interview, to the same set of information in the police report. Respondents who did not match on these criteria were excluded from the analysis.

After determining whether or not the respondent to the interview was the crime victim noted in the police report, the next step was to determine whether a reported crime event was, in fact, the event of the police report. Because of memory error and other factors, we did not expect that a target crime reported in the questionnaire would exactly match, in every detail, the same crime reported to the police. A series of criteria was developed for each type of crime for purposes of comparison and classification. Whether or not the target crime was reported was classified into four categories: yes, probably yes, probably no, and definitely no. The criteria used to code robbery, for example, into the above categories were as follows. A "yes" was a match on three of the following four items and a reported date within six months of the police report date: articles taken, offender known or not, weapon used or not, value of the items within 33% of the value on the police report. A "probably yes" was a match on two of the four items and the date; "probably no" was a match on one of the four items and the date; and a "definitely no" was no matches.

Two dependent variables are examined in this paper. The first concerns the reporting of the victimization. The report variable is treated as a dichotomy: victimization was or was not reported. To create this variable, reported crimes that definitely or probably matched the police records (as described above) are classified as "reported" and coded as 1, while those that were definite or probable nonmatches are classed as "not reported" and coded as 0.

The second dependent variable is date of victimization. For each reported victimization, respondents were asked the month, day, and year it occurred. The magnitude of the reporting error was computed for each respondent who reported the victimization by subtracting the respondent reported date from the record date. We report two forms of this variable. One form is the deviation in days. The scores

Please take a moment to consider how you thought about the period from February 1, 1986 to September 30, 1986 when you were thinking about your answers to the questions on crime.

Some people try to "think about" the whole time period at once.

Some start from the present and think back to February 1, 1986 month-by-month.

Others start from the beginning and think forward, to the present September 30, 1986.

While still others skip around within the period in no particular order.

Please take a moment to consider how you "thought about" the period from February 1, 1986 to September 30, 1986 that you've just told me about.

Did you . . .

Think about the entire period at once, ... 1

Start from the present and think back, ... 2

Start from the beginning and think forward, ... 3

Skip around, or 4

Use some other method? 5

(*If "some other method"*:)

What method did you use?

_____

_____

_____

_____

Fig. 2. Memory search question

for this variable range from 114 days earlier than the record date to 219 days after the record date. This variable allows us to identify and investigate forward or backward telescoping. The second form is simply the absolute value of the first form. The scores for this variable range from 0 days to 219 days. This variable allows us to investigate the magnitude of the reporting error in days disregarding the direction of the error.

The independent variables examined are: victim's age, race, gender, education, marital status, years at present address, crime type, use of anchor points, length of

reference period, and how the respondent searched his or her memory. In the regression analyses, age, education, and years at present address are treated as continuous variables and coded in numbers of years. Race, gender, marital status, and length of reference period are dichotomies with nonwhite, female, other than married, and six-month reference period coded as the zero values. Use of anchor points and crime type are each coded as two dummy variables with 0 and 1 values. For the anchor variables, "anchor-event mentioned" and "anchor-no event mentioned" are the 1 values and "no anchor" is the reference category; and for the crime type variables, "burglary" and "robbery" are the 1 values and "assault" is the reference category. Respondents were asked twice to describe how they searched their memories during the interview: once after the first victimization question and again after the victimization questions for the crime type for which they were selected into the sample (Figure 2). This question was asked twice because we anticipated that it might be difficult to understand and wanted to alert respondents to the task. The two variables from the first and second memory search questions are each coded into four categories: (1) "entire period at once" (respondent tried to think of the whole period at once, rather than searching it in any order); (2) "forward search" (started from the beginning of the period and searched forward); (3) "backward search" (started from the present and worked backward); and (4) "other search." The "other search" category includes responses that describe how the respondent remembered the date of a reported victimization (e.g., "Just knew it happened in July when they went to the fair," "While we were on vacation, someone broke in," and "Had to file reports therefore remember date"). For the search variables, "entire period at once," "forward search," and "backward search" are the 1 values and "other search" is the reference category.

4. Results

The bivariate relationships between the independent variables and reporting the victimization are presented in Table 2. Crime type, years at current address, and race of the victim are significantly related to reporting at $p < .05$. Burglary and robbery were well reported, but fewer than one in three assault victims reported their crime events. Victimizations were reported by 71% of the whites, but by only 44% of the "other" racial group. Those who had lived at their current address for 15 or more years were the best reporters (77%). Those who had been at their current address less than two years were the poorest reporters; only 57% of them reported the target event. Reporting is not related to marital status, age, education, gender of the victim, length of the recall period, how respondents searched their memories, or whether the respondent used an anchor point.

All variables were entered into a multivariate logistic regression analysis with the dichotomous report variable as the dependent variable (Table 3). For this analysis, age, education, and years at current address were coded as continuous variables. Crime type and use of anchors were coded as two indicator variables and the second memory search question was coded as three indicator variables. Model 1 shows that crime type and race were the only variables which remained significant at $p < .05$. As the effects on the odds indicate, robbery victims have odds of reporting the crime five times greater than assault victims; and burglary victims have odds of reporting that are almost twelve

Table 2. Reporting by demographic characteristics of the victim, crime type, and recall procedures

Demographic characteristics, crime type and recall procedures	Reporting	
	Percent	*N*
Total	66	374
Age		
18–29	59	119
30–44	67	124
45 and over	72	130
Race**		
White	71	296
Other	44	77
Gender		
Male	69	176
Female	63	198
Marital status		
Married	71	170
Other	61	201
Education		
Less than high school	65	82
High school graduate	64	151
Some college	68	140
Years at address**		
Less than 2	57	84
2–5	61	99
6–14	67	91
15 or more	77	99
Crime type**		
Burglary	84	199
Robbery	72	67
Assault	29	107
Reference period		
6 months	68	104
9 months	65	270
Anchor–no anchor		
Anchor-event mentioned	74	49
Anchor-no mention	62	152
No anchor	67	173
First memory search		
Entire period at once	68	136
Backward	71	45
Forward	75	79
Other	65	63
Second memory search		
Entire period at once	69	158
Backward	66	58
Forward	63	73
Other	67	69

** $p < .05$

Table 3. Logistic regression models for reporting by demographic characteristics of the victims, crime type, recall procedures and interactions

	MODEL 1		MODEL 2	
	Log-odds	Effect on odds	Log-odds	Effect on odds
Age	−.01	.99	−.01	.99
Race (white = 1)	.65**	1.92	.63*	1.87
Gender (male = 1)	.09	1.09	.02	1.02
Marital status (married = 1)	.23	1.26	.30	1.35
Education	−.07	.94	−.06	.94
Years at address	.00	1.00	.01	1.01
Crime type[a]				
Robbery	1.67****	5.33	2.10****	8.20
Burglary	2.48****	11.95	2.84****	17.11
Recall (9 months = 1)	−.08	.92	−.07	.93
Anchor[b]				
Event mentioned	.10	1.11	−.01	.99
No event mentioned	−.21	.81	−.16	.85
Recall procedure[c,d]				
Entire period at once	.18	1.20		
Forward search	−.02	.98		
Backward search	.03	1.03	1.34**	3.81
Interactions				
Backward *Robbery			−2.13**	.12
Backward *Burglary			−2.03***	.13
Constant	−.30		−.51	
χ^2/df	97.35/14****		105.44/14****	
(N)	(365)		(365)	

*$p < .10$
**$p < .05$
***$p < .01$
****$p < .001$
[a] Assault was the reference category and coded 0.
[b] No anchor provided was the reference category and coded 0.
[c] Other search method was the reference category in Model 1 and coded 0.
[d] In Model 2 only one dummy variable was used for search method: backward search (= 1) versus all other methods.

times greater than assault victims. Whites have odds of reporting their victimization 1.9 times larger than nonwhites.

An examination of crime type by race (data not shown) indicated that nonwhites were more likely than whites to be involved in assaults (53% and 23%, respectively), while whites were more likely to be involved in burglaries. Assaults were also more likely to involve those 18 to 29 years of age (51%). Whether the assailant or perpetrator was known to the crime victim has an interesting relationship with crime type. From the police records we found that 77% of the assault victims said they knew the assailant versus only 12% for robbery and 1% for burglary (data not shown). Thus, reporting is negatively

Table 4. Reporting by crime type and use of anchor points

Anchor-no anchor	Percentage who reported victimization		
	Crime type		
	Burglary	Robbery	Assault
Anchor-event mentioned	90	60	40
	(29)[a]	(10)	(10)
Anchor-no mention	80	68	26
	(81)	(25)	(46)
No anchor	85	78	29
	(89)	(32)	(51)

[a] Number in parentheses is the total number of respondents for that cell.

related to knowing one's assailant. One likely explanation for these relationships is that many of the assaults were either domestic quarrels or disagreements among acquaintances. The police may have been called to control the situation rather than because the respondent believed that a crime had occurred. These situations occurred primarily among young nonwhites.

While none of the three recall procedure variables was significantly related to reporting, a few patterns merit further investigation. First, the effects of the reference period manipulation may have varied by crime type (data not shown). The length of the reference period seemed to affect the reporting of robberies but not other types of crimes. Overall, 72% of the robberies were reported, however, for the six and nine-month recall periods the rates were 79% and 69%, respectively. Second, while use of anchor points was not, in itself, significant, it seemed to affect the reporting of specific crimes (Table 4). The rates of reporting burglaries and assaults increased to 90% and 40%, respectively, among respondents who used a personal event as an anchor point. The rate of reporting robberies, however, dropped to 60% among this group. Finally, the use of anchor points may affect how respondents search their memories (data not shown). Respondents who were not given an anchor were more likely than those who were given an anchor to say that they searched the "entire" reference period at once on both memory search questions even though searching the entire reference period at once was the dominant strategy for both groups. Furthermore, on the first memory search question only, those who used an anchor were somewhat more likely than no anchor respondents to say they conducted a forward search when thinking about crime events.

These analyses suggested testing the effects of recall procedures by crime type interactions. Four blocks of interaction terms were added sequentially to Model 1 in Table 3.

1. Crime type by memory search:
   - Entire period at once and robbery
   - Forward search and robbery
   - Backward search and robbery
   - Entire period at once and burglary
   - Forward search and burglary
   - Backward search and burglary
2. Crime type by use of anchors:
   - Anchor-event mentioned and robbery
   - Anchor-no mention and robbery
   - Anchor-event mentioned and burglary

Anchor-no mention and burglary

3. Crime type by length of recall:
   Robbery and 9-month recall
   Burglary and 9-month recall
4. Use of anchors by memory search:
   Anchor-event mentioned and entire period at once
   Anchor-event mentioned and forward search
   Anchor-event mentioned and backward search
   Anchor-no mention and entire period at once
   Anchor-no mention and forward search
   Anchor-no mention and backward search

The final model that was tested had a total of 32 variables; the 14 variables in Model 1 and the 18 interaction terms listed above. The only block of terms which produced a significant model effect was the crime type by memory search terms. The significant coefficients for this model were robbery compared to assault, burglary compared to assault, backward searching compared to other search methods, and the backward search with robbery interaction. Race was no longer significant ($p = .06$) and two interaction terms, forward search with robbery and backward search with burglary, had a $p = .06$. To determine whether these coefficients made a significant contribution to the model, the variables were added to the base model and tested incrementally.

We started by testing Model 1 (Table 3) excluding the two crime type variables. The model tested significant ($\chi^2/df = 25.42/12$, $p = .01$). As already shown in Table 3, the model with burglary and robbery is significant. Next, method of searching was tested. Model 2 without the three methods of searching variables tested significant ($\chi^2/df = 96.88/11$, $p < .001$). Adding the three variables to the model and testing their effects indicated a nonsignificant effect ($\chi^2/df = .471/3$, $p = .93$). Based upon this result, method of searching was collapsed into one dummy variable, backward searching (= 1) versus all other methods. With this new variable as part of the model, we tested the effect of adding two interaction terms to the model: backward search and robbery, and backward search and burglary.

The results of this last model are shown as Model 2 in Table 3. The two interaction terms add significantly to the model ($\chi^2/df = 8.54/2$, $p. = .01$). The interpretation of the results for crime type is conditional on the method of searching. Robbery and assault victims who use backward searching are about equally likely to report the crime. But, when other methods of searching are used, robbery victims are much more likely than assault victims to report the crime. Burglary victims compared to assault victims are always more likely to report the crime. Overall, the effect of search method conditional on crime type indicates that robbery and burglary victims who use other search methods are more likely to report the crime than robbery and burglary victims who use backward searching. However, assault victims who use backward searching compared to those who use other search methods are more likely to report the crime.

The models were rerun with the three continuous variables – age, education, and years at current address – as multiple dummy variables following the coding used in Table 2. The results were similar to those presented in Table 3 and the same variables were significant. In addition, an examination of partial plots and scatterplots of the continuous independent variables and the

Table 5. Mean and absolute value of the mean of the crime record date minus the victim reported date by demographic characteristics of the victim, crime type and recall procedures (in days)

Demographic characteristics, crime type, and recall procedures	Mean error	Std. dev.	Absol. value of mean error	Std. dev.	*N*
Entire sample	−5.70	41.16	25.9	32.5	231
Age					
18–29	−7.67	44.57	29.9	33.7	66
30–44	.53	34.30	22.8	25.5	81
45 and over	−10.17	44.09	25.6	37.1	84
Race					
White	−5.49	41.67	26.3	32.8	198
Other	−6.47	39.05	23.4	31.7	32
Gender					
Male	−5.60	36.30	23.2	28.4	110
Female	−5.79	45.28	28.3	35.8	121
Marital status					
Married	−4.28	42.39	25.8	33.8	112
Other	−8.12	38.84	25.4	30.4	117
Education*[a]					
Less than high school	−11.06	50.35	32.3	39.9	50
High school graduate	−10.18	42.44	27.6	33.7	89
Some college	1.57	33.15	20.8	25.7	91
Crime type*[a], ***[b]					
Burglary	−2.33	33.52	21.3	25.9	164
Robbery	−17.30	56.32	36.7	45.9	44
Assault	−7.52	53.19	37.4	37.7	23
Reference period***[a]					
6 months	6.48	39.88	27.0	29.9	65
9 months	−10.46	40.79	25.4	33.5	166
Anchor-no anchor					
Anchor-event mentioned	−3.18	23.94	16.1	17.8	34
Anchor-no mention	−6.68	41.12	26.2	32.3	88
No anchor	−5.69	45.47	28.6	35.7	109
First memory search					
Entire period at once	−8.61	39.14	22.3	33.2	89
Backward	−5.19	30.20	20.7	22.2	27
Forward	.06	45.91	30.1	34.3	49
Other	−6.26	44.30	27.9	33.3	41
Second memory search					
Entire period at once	−8.18	44.16	27.7	35.2	102
Backward	−11.61	40.29	24.9	33.5	36
Forward	3.43	33.64	22.2	25.3	44
Other	−4.39	41.22	25.6	32.2	46

*$p < .10$
**$p < .05$
***$p < .01$
[a] Refers to the mean error.
[b] Refers to the absolute value of the mean error.

dependent variable in Table 3 indicated no non-linear relationships. The reader should note that we have used the same data to select and test effects, which could lead to selection bias. Thus, this analysis should be viewed as exploratory, and the statistical tests should be interpreted with caution.

The second dependent variable of interest examines how accurately respondents who reported the crime were able to recall the date of the event. The mean errors and the absolute value of the mean errors in reporting the date of the crime by respondent characteristics and recall procedures are presented in Table 5. A negative value in the mean error column indicates that respondents telescoped the date forward and reported the crime as occurring more recently than the police record date. Conversely, a positive value indicates backward telescoping of the event. The mean error for the total sample was about six days later than the police record date. Length of reference period is significantly related to the mean error – those who had a six-month or shorter recall period were more accurate reporters. Of interest is the

Table 6. Multiple regressions for the days deviation – crime record date minus victim reported date – and the absolute value of days deviation by demographic characteristics of the victim, crime type and recall procedures

	Days deviation		Absolute value of days deviation	
	B	SE(*B*)	*B*	SE(*B*)
Age	−.20	.18	−.04	.14
Race (white = 1)	2.04	7.97	4.37	6.22
Gender (male = 1)	−.72	5.59	−2.94	4.37
Marital status (married = 1)	2.79	5.67	4.20	4.43
Education	.83	1.03	−1.08	.80
Crime type[a]				
Robbery	−7.21	10.78	−3.32	8.42
Burglary	6.65	9.76	−17.53**	7.61
Recall (9 months = 1)	−14.13**	6.30	−1.77	4.92
Anchor[b]				
Event mentioned	2.05	8.15	−10.87*	6.36
No event mentioned	.53	5.93	−.77	4.63
Recall procedure[c]				
Entire period at once	−8.10	7.32	.88	5.72
Forward search	2.34	8.80	−5.90	6.87
Backward search	−8.22	9.15	−5.51	7.14
Constant	−.18	18.43	54.70****	14.38
Adjusted R^2	.01		.03*	
N	226		226	

*$p < .10$
**$p < .05$
****$p < .001$
[a] Assault was the reference category and coded 0.
[b] No anchor provided was the reference category and coded 0.
[c] Other search method was the reference category and coded 0.

fact that respondents with a six-month recall period were more likely to backward telescope, that is, to report the crime as occurring before the record date. Whereas, the respondents with a nine-month recall period were more likely to forward telescope or bring the date forward. Education and crime type are weakly related ($p < .10$) to the mean error. Those with some college or more and burglary and assault victims had on average the smallest mean error.

Crime type is the only variable significantly related ($p < .01$) to the absolute value of the mean errors in reporting the date of the crime. Burglary victims were most accurate in reporting the crime date. None of the demographic variables (age, race, gender, marital status or education), length of the reference period or how the respondents searched their memories are related to the magnitude of the date reporting errors.

Table 6 presents the results of a multiple regression analysis for these independent variables regressed on the two forms of the date reporting error dependent variables. For these analyses, age and education were continuous variables. The multiple regression results are similar to those reported in Table 5. Length of reference (recall) period is significantly related to days deviation. Burglary compared to assaults is the only variable significantly related ($p < .05$) to the absolute value of days deviation. Specifically, compared to assault victims, respondents whose homes were burglarized were more accurate in reporting the date of victimization. Mention of a personal anchor event was marginally significant ($p = .09$). Compared to no anchor respondents, these respondents had a smaller date reporting error.

Reinforcement and date tagging are two possible explanations for the more accurate reporting. For burglary, it is likely that some respondents reported the event to their insurance companies. The additional reporting and the completing of forms may have served to reinforce the date of the event. In addition, most of the burglary victims were married. An environment where multiple individuals have been exposed to the event may reinforce the event through discussions of replacing items, protecting against future occurrences, and through other mechanisms. Previous research (Wagenaar 1986; Means et al. 1989; Linton 1982) indicates that the dates of most events are not stored in memory, but can be inferred or estimated when they are associated with important personal events. Thus, anchoring the reference period with a personal event may have assisted in the more accurate dating of the victimization. However, we are not able to sort out whether date tagging is operating or whether respondents who were able to mention an event have better recall strategies (cf. Huttenlocher, Hedges, and Prohaska 1988; Fuhrman and Wyer 1988).

5. Discussion

What does this research tell us about improving reporting? First, neither of the two experimentally manipulated factors – length of reference period and anchoring the start of the reference period – significantly affected the rates of reporting burglary, robbery, or assault. Perhaps these particular crimes, or at least burglary and robbery, are highly salient for most of the population. These manipulations might show some effect on reporting rates for less salient and more mundane events.

Second, only one of these factors – length of reference period – had a significant effect on the accuracy of respondent reports of victimization dates. The length of the

reference period was related to the direction of telescoping in the reporting of dates. Backward telescoping occurred more frequently than forward telescoping among respondents with a six-month recall period, while forward telescoping was more common among respondents with the nine-month reference period. These results are consistent with research in other areas (Rubin and Baddeley 1989; Thompson et al. 1988). Anchoring the start of the reference period had only a marginal effect on the accuracy of date reporting. Respondents who mentioned personal events that were then used to anchor the start of their reference periods were somewhat more accurate in reporting victimization dates than either respondents who could not think of personal "anchor" events or the no-anchor group. This was reflected only in the magnitude of the date reporting errors, not in the direction of the reporting errors. Although this finding is only marginally significant, it is consistent with the notion that the use of anchors or landmarks reduces telescoping (Loftus and Marburger 1983) and helps respondents to date events more accurately (Means et al. 1989; Strube 1987).

The method or direction of memory search appeared to affect reporting rates but not accuracy of reported dates. Robbery and burglary were much more likely to be reported than assaults; however, the use of backward searching had a dampening effect on the recall of robberies and burglaries. Conversely, assault victims who used backward searching compared to other methods were more likely to report their victimizations.

A couple of observations on the direction or method of memory search are in order. Unlike the previous studies mentioned above (Whitten and Leonard 1981; Fathi et al. 1984; Loftus and Fathi 1985), we did not instruct respondents to search their memories in a specific manner. Rather, we asked them, after the fact and at two different points in the interview, to tell us how they "thought about" the reference period (Figure 2). The number of "don't know" responses to these questions – 51 the first time it was asked, but only 16 the second time – indicates that, as we expected, the question was not easily understood. The task of determining how they searched their memories may be difficult for respondents, particularly the first time they are presented with the question.

The fact that most respondents said they searched the "entire period at once" suggests that most of them retrieved the event first, and then tried to determine whether or not it occurred during the reference period rather than sequentially searching through the reference period to determine whether such an event had occurred. The respondent's search of the reference period was most often for the date, not for the event. This supposition is consistent with our finding that neither length of reference period nor use of anchors affected reporting rates and also with conclusions of Loftus and Marburger (1983). If it is true that respondents retrieve the events first and then try to date them, it may improve reporting accuracy to simulate this sequence in designing questionnaires by first asking whether the event of interest has ever occurred, followed by questions to determine whether the event occurred within the specified reference period. Combining the two factors of time frame and occurrence in a single question may overly complicate the recall task. For some commonly occurring events or behaviors (e.g., doctor visits, voting, etc.) it may not be reasonable to ask whether the event has ever occurred. In these cases, however, it might improve reporting accuracy to ask

one or two questions about salient features of the most recent occurrence to stimulate recall before asking about the time period or date of the event. This may also counteract the backward telescoping tendencies of near-term respondents and the forward telescoping tendencies of longer-term respondents.

Another important finding concerns an unexpected relationship between two of the recall procedures. We believe that the procedure for providing an anchor point to mark the start of the reference period may have influenced how respondents searched their memories. Although searching the "entire period at once" was the dominant strategy, respondents who were given no anchor were more likely than those who were given an anchor to say that on both questions they searched the "entire period at once." Also, on the first memory search question, respondents who used an anchor were somewhat more likely than those in the no-anchor group to say they "started from the beginning and thought forward." The statements and question for establishing an anchor point occurred just prior to the first memory search question and appear to have focused respondents' attention on the beginning of the reference period so that when they thought about the period they started at that point and worked forward. It is important to realize that a procedure intended to aid one aspect of recall (e.g., providing anchor points) may cause respondents to search their memories in ways they would not otherwise have used and that the "altered" method of memory search may result in poorer recall or accuracy. Another possibility is that provision of an anchor may have influenced how respondents interpreted and answered the memory search question rather than how they actually searched their memories. In either case, procedures designed to aid recall should be thoroughly tested in context before they are used in large scale data collection efforts.

A final point to note is the marked underreporting of assault. Several factors may contribute to this underreporting. First, since assault often occurs during domestic quarrels or disagreements between friends or acquaintances, the "victims" may not define the event as a crime. Second, respondents may conceal the event to avoid discussing it with an interviewer, especially if the other person is present during the interview. Third, if the assault was one of several similar events, it may be forgotten more easily than a burglary or robbery. Fourth, race may also be a factor. Nonwhites were more likely than whites to be victims of assault and they were less likely than whites to report their victimizations. To overcome some of these problems, it may be better to ask about any incidents when the police were called or situations where police were involved. Information from follow-up questions could then be used to determine whether the event met the definition of an assault.

We believe that these results can be generalized to other events which are salient and occur infrequently. At the same time, this study provides further support for the need to examine respondents' information processing strategies as a method of investigating measurement error.

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