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Memory Bias and Response-order Effects

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Abstract: The order in which response categories are presented has often been found to influence respondents' answers to survey questions. Recently, Krosnick and Alwin (1987) proposed that primacy and recency effects on verbally-presented response categories are due to biases in remembering the response categories and in generating reasons for choosing the categories. To test their model, four health questions were administered to respondents in a telephone survey. Contrary to the predictions derived from the model, presenting the response categories at a fast rather than a slow pace did not reduce the frequency with which the items presented first were selected. Collapsing across pace, only one of the questions showed a primacy effect and none showed a recency effect.

Key words: Response-order effects; cognition and surveys.

1. Introduction

In a closed survey question, the respondent is presented with two or more alternative responses and is asked to select one. Survey researchers have long known that response-order effects can occur, i.e., the order in which the response alternatives are presented can influence the respondent's answer. Although not all studies have demonstrated response-order effects (Powers, Morrow, Goudy, and Keith (1977)), most have found order effects on some questions but not on others (Belson (1966); Bishop (1987); Carp (1974); McClendon (1986); Payne (1951); Schuman and Presser (1981)). There are different types of response-order effects. Primacy effects occur when a response alternative is chosen more frequently because it is placed first or near the beginning of the list (Carp (1974); Monsees and Massey (1979)). Recency effects occur when a response is chosen more often because it is placed last, or near the end of a list (McClendon (1986)). Several studies have found primacy effects on some questions and recency effects on others (Belson (1966); Payne (1951); Schuman and Presser (1981)). Response-order effects can be large: in several studies, reversing the response categories resulted in a change of 14% or more in the frequency with which a response category was chosen (Belson (1966); Monsees

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and Massey (1979); Schuman and Presser (1981)).

A theory explaining the cause of response-order effects would be very helpful, guiding questionnaire designers to predict the occurrence of such effects, and perhaps reducing or even eliminating the effects. Recently, Krosnick and Alwin (1987) offer psychological models of response-order effects both for response categories presented visually and for categories presented verbally. They suggest that primacy and recency effects for items presented verbally are partly due to memory bias. Memory experiments in psychological laboratories show similar primacy and recency effects. The primacy effect is usually attributed to the extra time available to rehearse the first items that are presented, increasing the likelihood that they will enter long-term memory and thus be recalled later (Crowder (1969); Glanzer and Cunitz (1966)). The recency effect is attributed to the fact that the last items presented prior to the memory test can be retained in short-term memory and then recalled (Craik and Levy (1970); Waugh and Norman (1965)).

Krosnick and Alwin (1987) suggest a second reason for response-order effects for items presented verbally. Presentation of the second alternative terminates processing of the first one relatively quickly. More and deeper processing can be devoted to the final item(s) read. Hence, compared with the first item(s), reasons supporting the selection of the final item(s) are more likely to be generated. A recency effect would typically be expected.

In their paper, Krosnick and Alwin (1987) report data only for items presented visually. In order to test their suggested explanations for response-order effects on items presented verbally, the experiment presented in this paper manipulated the pace at which the response categories were presented to respondents. The memory bias part of the model predicts that, in comparison to the fast-paced treatment, in the slow-paced treatment the first response-alternative(s) is more likely to be chosen, and the last response-alternative(s) less likely to be chosen. Primacy effects in memory experiments decline when the pace of presentation of the items is increased, as there is less time available to rehearse the early items (Murdock (1962); Postman and Phillips (1965)). These early items are therefore less likely to enter long-term memory and be recalled later. In contrast, recency effects remain unchanged when pace is increased (Murdock (1962)). This is because the final items are held in short-term memory prior to being recalled, and short-term memory is largely unaffected by the pace of presentation.

The "reasons generation" part of the Krosnick and Alwin (1987) model also predicts that in the fast- rather than the slow-paced treatment, the early response categories will be chosen less often. Less time is available to think about the early response-categories, reducing the likelihood that the respondent will generate reasons for choosing one of these items. Compared with the slow-paced treatment, in the fast-paced treatment respondents are more likely to generate reasons why the later items are true for them, and thus are more likely to choose a later item.

The Krosnick and Alwin (1987) model was tested by manipulating interviewer pace, rather than other factors that affect memory performance, because interviewer pace can be controlled by the survey organization. In addition, as interviewer pace tends to vary across survey organizations, pace differences may help explain the discrepant findings on response-

order effects that are reported in the literature.

2. Methods

All the questions used in this experiment were taken from a nationwide telephone survey conducted in 1979 by the National Center for Health Statistics (Schoenborn, Danchik, and Elinson (1981)). The wording of the questions and the response categories are given below. The response categories are printed in the positive-to-negative order. The reverse order constitutes the negative-to-positive order.

Question 1: All in all, how happy are you these days? Would you say:

> Very happy, pretty happy, or not too happy?

Question 2: How would you compare your level of physical activity with other people your age? Would you say you are:

> Much more physically active, somewhat more active, somewhat less active, or much less physically active?

Question 3: During an average week, would you say that you experienced:

> Almost no stress at all, relatively little stress, a moderate amount of stress, or a lot of stress?

Question 4: Would you say your health in general is:

> Excellent, very good, good, fair, or poor?

Question 4 had produced a large primacy effect when verbally administered in a small-scale study (Means, Nigam, Zarrow, Loftus, and Donaldson (1989)). No response-order studies of the other three questions are known to the authors.

The survey was conducted by the Center for Survey Research, Indiana University, using their computer-assisted telephone interviewing (CATI) facility, in October and November 1987. A sample of Indiana telephone exchanges was randomly selected, and primary numbers were generated by a version of the Waksberg sampling technique (Waksberg (1978)). The data were collected by a staff of eleven interviewers and three supervisors. Interviewers contacted 1114 households. For each household it was randomly determined whether a male or female should be interviewed. An adult respondent of the assigned sex (aged 18+) was randomly selected on the basis of the number of adults of this sex living in the household. If no adult household member of the assigned sex lived there, the same procedure was followed to select an opposite sex adult household member. If the person selected was not available, at least six attempts to contact the person were made.

With the exception of the health items, all questions were administered at the fairly slow rate of two words every second, as recommended by Cannell and his colleagues (Cannell, Miller, and Oksenberg (1981)). Following a series of mainly closed questions about Indiana and about higher education, the four health questions were administered in the order printed above. The interview concluded with a series of demographic questions.

For the health questions, interviewer pace in reading the response categories (fast or slow) was crossed with response-order (positive to negative or negative to positive), to give four experimental treatments. Each respondent was randomly allocated to one of these treatments. Interviewers' terminals displayed the response categories in the appropriate order for the treatment selected and indicated the pace to be used. The

experimental treatment administered to each respondent was selected on the basis of the last two digits of his/her telephone number. Every interviewer administered approximately equal numbers of each of the experimental treatments. In all experimental treatments, the interviewer read the words in each health question and response category at the rate of about two words a second. The experimental treatments differed only in the length of the pause between each response category. In the slow-paced treatment, the interviewer paused for approximately 1.9 seconds between each response category. In the fast-paced treatment, the interviewer paused very briefly between each response category (less than 0.2 seconds). If the respondent asked to hear any part of the question again, the interviewer noted this and repeated the question and all the response categories at the same pace. If the question needed to be repeated a second time, interviewers were instructed to read it at "an appropriate pace." Interviewers were carefully trained in these procedures. They listened to a tape on which the response categories were read at a fast and slow pace, and for the slow-paced treatment they were taught to count two seconds between response categories by tapping with a foot or a finger. They then conducted practice interviews. Each interviewer was monitored frequently and given feedback until he/she was administering the pace procedures accurately. On all shifts throughout the survey, one supervisor spent the majority of her time monitoring interviews. Interviewers and supervisors knew that the pace/response-order experiment was a highly important component of the survey and that the pace procedures had to be accurately administered.

3. Results

The total sample size was 1890. Of these, 776 were ineligible cases or non-cases, primarily because they were non-working numbers or office numbers. Sixty-three of the ineligible and non-cases were designated as confirmed non-household, as six or more attempts to call them had been made.

Interviews were completed with 695 respondents, a 62.3% response rate. Females comprised 59% of the respondents and 46% of the respondents had 13 or more

Table 1a. Response distribution for the health questions as a function of response-order and pace (in percent)

Health question 1 All in all, how happy are you these days? Would you say						
Response-order	Very happy to Not too happy			Not too happy to Very happy		
Interviewer pace	Fast	Slow	Both	Fast	Slow	Both
Very happy	43.6	48.6	46.3	43.6	52.2	48.0
Pretty happy	46.8	44.3	45.4	44.2	37.5	40.7
Not too happy	9.6	6.8	8.0	11.6	9.8	10.7
Don't know	0.0	0.5	0.3	0.6	0.5	0.6
Number	(156)	(183)	(339)	(172)	(184)	(356)
Respondents asking to hear question again	15.4	12.6	13.9	11.6	6.5	9.0

Table 1b. Response distribution for the health questions as a function of response-order and pace (in percent)

Health question 2 How would you compare your level of physical activity with other people your age? Would you say you are						
Response-order	Much more physically active to Much less physically active			Much less physically active to Much more physically active		
Interviewer pace	Fast	Slow	Both	Fast	Slow	Both
Much more physically active	25.2	22.4	23.6	28.5	26.1	27.2
Somewhat more active	44.2	51.9	48.4	43.6	45.1	44.4
Somewhat less active	23.1	21.3	22.1	21.5	23.9	22.8
Much less physically active	5.1	3.8	4.4	4.7	4.3	4.5
Don't know	2.6	0.5	1.5	1.7	0.5	1.1
Number	(156)	(183)	(339)	(172)	(184)	(356)
Respondents asking to hear question again	25.0	14.2	19.2	21.5	14.7	18.0

years of completed education. Interviews took an average of 24 minutes to complete.

The second author and the supervisors monitored many interviews throughout the survey and found that interviewers were accurately following the pace instructions. As a further check, eleven interviews were audio-taped. Five of the interviewers had one of their interviews taped, and three interviewers had two interviews taped. The selection of interviews for taping represented an effort to tape most of the interviewers, and to tape interviews from all of the experimental treatments. The intervals between response categories were timed using a stopwatch. Mean interval between response

Table 1c. Response distribution for the health questions as a function of response-order and pace (in percent)

Health question 3 During an average week, would you say that you experience						
Response-order	Almost no stress at all to A lot of stress			A lot of stress to Almost no stress at all		
Interviewer pace	Fast	Slow	Both	Fast	Slow	Both
Almost no stress at all	7.7	5.5	6.5	4.7	8.2	6.5
Relatively little stress	17.9	18.0	18.0	18.0	19.0	18.5
A moderate amount of stress	48.1	53.0	50.7	47.1	49.5	48.3
A lot of stress	25.6	23.0	24.2	29.1	22.3	25.6
Don't know	0.6	0.5	0.6	1.2	1.1	1.1
Number	(156)	(183)	(339)	(172)	(184)	(356)
Respondents asking to hear question again	21.8	8.7	14.7	12.8	8.2	10.4

Table 1d. Response distribution for the health questions as a function of response-order and pace (in percent)

Health question 4 Would you say your health in general is						
Response-order	Excellent to Poor			Poor to Excellent		
Interviewer pace	Fast	Slow	Both	Fast	Slow	Both
Excellent	24.4	19.7	21.8	19.8	17.4	18.5
Very good	41.0	39.3	40.1	30.2	37.5	34.0
Good	23.7	27.9	26.0	29.1	32.6	30.9
Fair	9.0	9.8	9.4	18.0	9.8	13.8
Poor	1.9	3.3	2.7	2.9	2.7	2.8
Don't know	0.0	0.0	0.0	0.0	0.0	0.0
Number	(156)	(183)	(339)	(172)	(184)	(356)
Respondents asking to hear question again	7.1	3.3	5.0	7.0	3.3	5.1

categories in the slow-paced treatment was measured as 1.93 seconds. The standard deviation was 0.19. In the fast-paced treatment the interval was measured as 0.26 seconds with a standard deviation of 0.06. The actual interval was shorter than this, due to the time taken to press the stopwatch. There was no overlap in the pause latencies between the two treatments. The longest pause in the fast-paced treatment was measured as 0.4 seconds, and the shortest pause in the slow-paced treatment was measured as 1.3 seconds.

The faster pace resulted in significantly more respondents asking to hear one or more of the four health questions again. In the fast-paced treatment, 56.4% of respondents did not ask for any of these questions to be repeated, while 27.7%, 12.2%, 3.4%, and 0.3% asked for one, two, three, and four of the questions to be repeated, respectively. The corresponding figures in the slow-paced treatment were 71.1%, 22.6%, 4.9%, 1.4%, and 0%.

As can be seen in Table 1a–1d, frequency of repeat requests varied across questions. The fewest repeat requests concerned the health status question with only 5.0% of respondents asking to hear it again. The greatest number of requests for repeats concerned the physical activities question, with 18.6% of respondents making this request. One respondent refused to answer the question on stress; there were no refusals on the other questions.

To test for response-order effects, the data were collapsed across pace, and Kendall's Tau was computed on responses to each question. Analyses were conducted for all respondents, and also separately for respondents of lower educational attainment (0–12 years of completed education) and higher educational attainment (13+ years). "Don't know" responses were excluded from the analyses. As a directional hypothesis was made for the effects of pace, but not of response-order, one-tailed and two-tailed tests of significance were used, respectively. There was a significant effect of response-order on just one of the questions, the health status item (Question 4), namely a primacy effect (Tau $C = -0.0986$, $p = 0.009$, two-tailed). The primacy effect was significant for respondents of lower

Table 2. Response distribution for the health questions as a function of years of education (in percent)

Health question 4 Would you say your health in general is				
Years of completed education	0 to 12 years		13 or more years	
Response order	Excellent to Poor	Poor to Excellent	Excellent to Poor	Poor to Excellent
Excellent	18.4	14.0	25.6	23.7
Very good	34.5	29.0	45.7	40.4
Good	31.0	35.5	20.7	25.0
Fair	12.6	18.5	6.1	7.7
Poor	3.4	3.0	1.8	2.6
Don't know	0.0	0.0	0.0	0.6
Number	(174)	(200)	(164)	(155)
Respondents asking to hear question again	6.9	5.0	2.4	5.1

educational attainment, but not for those of higher educational attainment (see Table 2). However, the trend was similar for both educational groups, and the difference between them did not exceed sampling error.

To examine whether pace influenced response-order effects, the effect of pace on respondents' answers to each question was examined separately for each of the response-orders. There were no significant effects by Kendall's Tau. Similarly, no significant effects were found when data from respondents with a lower and a higher educational attainment were analyzed separately. Since response categories heard for a second time may show little or no memory bias, the same analyses were conducted with the health questions that were repeated removed from the data set. Again, no statistically significant effects of pace were observed.

4. Discussion

For all four health questions, varying the pace at which the response categories were presented did not significantly affect respondents' answers. Individuals in the slow-paced treatment were no more likely to select the first categories than those in the fast-paced treatment. As discussed above, Krosnick and Alwin (1987) offer both a memory bias and a reasons generation explanation for response-order effects on items presented verbally. Both explanations suggest that primacy effects are more likely, and recency effects less likely, in slow- rather than fast-paced presentations of the response alternatives. The first item(s) can be rehearsed more when the response categories are presented fairly slowly, and thus should be better remembered. In addition, the extra time allows the first item(s) to be more deeply processed, and increases the likelihood that respondents will generate reasons supporting the selection of an early phrase. Close examination of the data fails to show even a trend in the predicted direction on any of the questions. Thus, the part of the Krosnick and Alwin (1987) model

pertaining to verbally-presented response alternatives was not supported.

A possible explanation for the lack of an effect of pace on answers to first and last response categories is that there were more repeat requests made by respondents in the fast- rather than the slow-paced treatment. Hearing the response categories for a second time is likely to reduce response-order effects due to memory bias, as respondents would have two occasions to remember the categories (it is unclear whether a reasons generation bias would be similarly affected). However, there was no change in the pattern of responses when the answers respondents gave after they had asked to hear a question again were excluded from the analyses. Thus, the lack of an effect of pace on responses appears not to be due to the difference in number of repeat requests across pace treatments.

Compared with the to-be-remembered items in a typical memory experiment, the response categories may be relatively easy to remember, both because there are fewer categories and because the categories are ordered. It might therefore be argued that primacy effects would not be expected. However, forgetting of the response categories is likely to occur, as the respondent must also retain the question stem in his/her limited capacity short-term memory. Future studies might more directly explore the extent to which forgetting of the response categories occurs by testing some respondents on their memory for the categories.

Krosnick and Alwin (1987) point out that their reasons generation hypothesis suggests that items presented verbally should show recency effects. Thus, the absence of a recency effect on any of the health questions, particularly in the fast-paced treatments, also argues against reasons generation being an explanation for response-order effects. The fact that the only response-order effect was a primacy effect (question 4) is particularly problematic for Krosnick and Alwin's model.

If response-order effects are viewed as an indication of poor data quality, it is noteworthy that these effects were not exacerbated by a fast pace. This is consistent with the common finding that telephone interviews elicit responses that are as good as those obtained in the usually slower-paced face-to-face interviews (e.g., Groves and Kahn (1979)). In contrast, however, a more direct measure of data quality on objective questions, that of recall accuracy, may be poorer in a fast-paced interview (Cannell et al. (1981)).

The frequency with which respondents request to hear a question again may prove to have uses beyond the testing of models of response-order effects. Examination of the data suggests that repeat requests may also serve as a measure of the difficulty respondents have in answering a question. The question with the fewest repeat requests, the health status question, had the shortest response-categories (although the question also had the greatest number of response categories). In addition, there were more repeat requests in the fast- than the slow-paced treatment. Finally, respondents who were elderly, who had lower educational attainment, and who had lower income were more likely to ask to hear one or more questions again. Several causes of difficulty in a question may well result in more repeat requests being made, for example, complex or ambiguous words, a large number of response categories, and an abrupt change of topic. Especially during pilot studies, information on the number of repeat requests could be collected along with other measures, such as the time respondents pause before answering a question, respon-

dents' ratings of how difficult they found the question, or their degree of confidence in their answer, and some interviewer-administered follow-up probes. These measures should reveal much about problems respondents have in comprehending survey questions, retrieving relevant information from memory, and deciding what answer to give (see Royston, Bercini, Sirken, and Mingay (1986); Royston and Bercini (1987)).

Given the often contradictory findings of response-order studies, it is worth examining the relationship between the findings of this study and that of other studies. There is some evidence that questions that are long and complex, which concern attitudes and facts that respondents are uncertain about and which have many response-categories, may show large response-order effects (Payne (1951); Rugg and Cantril (1944); Becker (1954)). However, seemingly contradictory findings have been reported in, for example, Schuman and Presser (1981) and McClendon (1986). With these criteria in mind, in some respects it is surprising that the health status question showed a response-order effect. Both the question and the response categories are quite short and use fairly simple language. In addition, as was suggested above, the fact that fewer respondents asked to hear this question again than any of the other health questions may also be an indication that the question is relatively simple.

In other respects, however, the health status question may well be difficult for respondents to answer. It had more response categories than any of the other questions in this study. In addition, the question may be very difficult for those respondents who conscientiously answered the question by first recalling a variety of information about their health; then trying to arrive at an overall impression of their health based both on the information retrieved and other knowledge; and finally deciding which of the rather vague response categories best applied. Clearly, in the absence of good criteria by which to evaluate the complexity of a question, it is hard to test whether difficult questions show more response-order effects than simpler questions.

For health researchers who use survey data derived from responses to these particular questions, the absence of a response-order effect on three of the four questions is somewhat reassuring. However, the question that showed the response-order effect is by far the most widely used of these questions. In addition, any of the questions may show response-order effects in other surveys. Response-order effects have sometimes been found to be stronger for the less-educated (McClendon (1986); Krosnick and Alwin (1987)), and may also be stronger for people who experience the most difficulty with survey questions, such as certain elderly populations and individuals for whom English is not their first language. As such people are particularly likely to suffer serious health problems, national and local area health surveys often focus on these groups. Until a satisfactory theory of response-order effects is developed, questionnaire developers should consider either testing for response-order effects in a large pretest or using more than one order of the response categories in the survey itself.

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