THE ACCESSIBILITY AND APPLICABILITY OF KNOWLEDGE

PREDICTING CONTEXT EFFECTS IN NATIONAL SURVEYS

ALEXANDER TODOROV

Abstract Using data from the National Health Interview Survey on Disability from 1994 and 1995, this research demonstrates that the size of accessibility effects (increased likelihood of using information activated by initial questions in responding to subsequent questions) can be modeled as a function of the applicability of the initial to the subsequent questions. When respondents reported a disability and were asked about the main condition causing the disability, they were more likely to report conditions they had been asked about earlier in the interview than alternative conditions. This accessibility effect was inversely related to the effect on reports of "other" or unclassifiable conditions. The more reports of primed conditions, the fewer reports of unclassifiable conditions. A log-linear model of the accessibility bias fit the data for all disabilities. For reports of specific conditions, a measure of the applicability of context accounted for 74.4 percent of the variance of the accessibility bias; for unclassifiable or "other" conditions, it accounted for 61 percent. When limited to "well-defined" disabilities, applicability accounted for 91.9 percent of the variance (a multiple correlation of .96). Finally, models of the context effects derived from the 1994 data were tested against the actual effects for the 1995 data. The correlation between predicted and actual effects was .80 across disabilities. The theoretical and the practical implications of the findings are discussed.

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The first models of context effects on survey responses were explicitly framed in terms of attitude questions (Schuman and Presser 1981; Strack and Martin 1987; Tourangeau and Rasinski 1988). Presumably, attitude questions are open to alternative interpretations suggestible by the context because of their subjective nature. However, further research has demonstrated the same response effects for nonattitude questions, including one’s race (Martin, DeMaio, and Campanelli 1990). For instance, Todorov (2000) has shown that initial questions in the National Health Interview Survey (NHIS) influenced respondents’ reports of difficulty seeing and legal blindness, and seriously affected the national prevalence estimates of vision disability.

The most parsimonious strategy for predicting and accounting for context effects in diverse knowledge domains is to formulate and employ general principles of knowledge use (Higgins 1996). Not only can such general principles account for context effects, but they can also be used to model these effects prior to actual and costly surveys. The purpose of this article is to demonstrate that context effects in nationally representative surveys can be modeled and predicted by applying these principles. Using data from the National Health Interview Survey on Disability from 1994 and 1995 (NHIS-D), this research attempts to model the size of context effects as a function of the applicability or relevance of the context.

Suppose that two respondents have medical condition A, but only one of them is asked whether or not she has the condition. Later in the interview both respondents report a disability that is related to condition A and then are asked about the main condition causing the disability. The respondent who was asked earlier about condition A would be more likely to report condition A than the other respondent. This response effect could be described as an accessibility effect—increased likelihood of using information activated by initial questions in responding to a subsequent question. Suppose that another two respondents have condition B, but only one is asked about the condition. Later in the interview these respondents report the same disability as the pair of respondents with condition A and then are asked about the main condition causing the disability. The respondent who was asked earlier about condition B would be more likely to report condition B than the other respondent.

In the above situation, which context effect will be stronger—the effect for condition A or the effect for condition B? Note that conditions A and B are equally accessible and, thus, accessibility alone cannot account for differences in the size of the effect. The effect should be stronger for the condition more closely linked to the disability. For instance, if the disability is “difficulty walking,” condition A is “lumbago,” and condition B is “dermatitis,” the effect should be stronger for condition A. In other words, the size of accessibility effects is a function of the applicability of knowledge activated by the initial questions.

Accessibility and applicability are two general principles of knowledge activation and use (Higgins 1996). The accessibility principle has received the lion's share of research in psychology and has even been claimed to be a basic psychological law (Sedikides and Skowronski 1991). This principle states that exposure to information related to a construct leads to higher accessibility of the construct and increases the likelihood of its use. Accessibility effects have been demonstrated with both on-line (e.g., reaction times) and off-line (e.g., ratings) measures.[1] People are faster to retrieve semantic associates of concepts to which they have been exposed (Judd et al. 1991; Neely 1977) and are more likely to provide a response consistent with these concepts (Schul and Schiff 1993; Schwarz, Strack, and Mai 1991; Skelton and Strohmetz 1990; Tourangeau and Rasinski 1988; Tourangeau et al. 1989).[2]

The applicability principle has received relatively little attention. This principle refers to the degree of match between features of the activated construct and the attended features of the stimulus (Higgins 1996). The better the match between the accessible knowledge and the stimulus input, the stronger the effect of the accessible knowledge on the response. The first applicability findings came from accessibility studies that showed that accessibility effects are constrained. Priming is inefficient when the primes are not related to the target information (Higgins, Rholes, and Jones 1977), and priming on one dimension does not generalize to other dimensions (Erdley and D'Agostino 1988; Moskowitz and Skurnik 1999).

In the present view, applicability constrains accessibility effects—a highly accessible concept may not be applied when it does not share any relevant features with the stimulus. In fact, a recent metanalysis of priming effects on person judgments (DeCoster and Claypool 1999) found that applicability was the strongest moderator of priming or accessibility effects. Crucially, priming was successful only when the primes were applicable.

1. This article deals with accessibility of concepts triggered by variables external to the individual such as initial questions in a survey interview or priming procedures. This is different from the research on attitude accessibility (Fazio et al. 1982) in which accessibility is conceptualized as a function of the strength of association between the attitude object and its evaluation. For an application of this latter research to survey situations, see Bassili (1993) and Bassili and Fletcher (1991). A similar distinction is made in the priming literature between chronic individual accessibility of social constructs and temporal accessibility induced by contextual factors (Higgins, King, and Mavin 1982).

2. Although there are procedural differences between accessibility effects in priming experiments (e.g., Bargh and Pietromonaco 1982) and in survey situations, the same principle can be used to explain the effects. For instance, in priming experiments the priming is usually disguised as part of a study unrelated to the participant's later response, whereas in surveys, the respondent's response to initial (priming) questions may have clear implications for later responses. However, in both cases these later responses are influenced by the knowledge brought to mind by the initial questions or the priming manipulation. For example, when a college student is asked about her general satisfaction with life, she may be more likely to base her response on her dating experience if she was asked earlier about this experience than if she was not asked (Strack, Martin, and Schwarz 1988). The reason for the disguised presentation of priming stimuli in experiments on social judgments (Bargh 1992) is to disentangle the contributions of automatic and controlled processes to the observed priming effects.

Generally, experimental research has studied accessibility effects in highly applicable contexts. However, this strategy narrows the range of the effects and does not allow for precise quantitative estimates of the effects as a function of moderating factors. In the few studies that manipulated applicability, applicability has been studied as a binary factor, namely, applicable versus inapplicable primes (e.g., Banaji, Hardin, and Rothman 1993). When applicability is operationalized as a continuous variable, accessibility effects should change as a positive function of applicability. Thus, applicability should predict the size of accessibility effects.

Studying applicability systematically can be done either by (*a*) holding the context constant and manipulating the relevance of the target information (e.g., Higgins and Brendl 1995), or by (*b*) holding the target information constant and manipulating the relevance of the context to this information. The data from the NHIS-D provided an opportunity to study the applicability principle by using the latter design.

The notion that context effects can be modeled as a function of the applicability of context to the target questions was tested on data from the NHIS-D 1994 and 1995.[3] One of the objectives of the NHIS is to measure the prevalence of chronic conditions in the population. Because the list of conditions of interest is too long, respondents are randomly assigned to six condition checklists corresponding to major body systems. In 1994 and 1995, after these condition questions had been administered, all respondents were asked questions from the Disability Supplement (DS). If a respondent reported a disability, she was asked what the main condition was causing the disability. This can be viewed as an experimental design in which the context, specifically its applicability to the disability questions, is manipulated between respondents and the target issue, the disability questions, is held constant across respondents.

In the first part of this article, accessibility effects on reports of medical conditions as the cause of specific disabilities were examined. In the second part, the size of these effects was predicted by measures of applicability-independent likelihood judgments linking the context and the reports of disabilities. Finally, regression models of the accessibility effects as a function of applicability derived from the 1994 data were tested against the 1995 data.

Study 1: Effects of Accessibility of Knowledge

According to the accessibility principle, people should be more likely to report conditions they had been asked about earlier in the interview as the cause of their disabilities than alternative conditions. Specifically, the explicit condition questions in the beginning of the interview should elicit more reports of

3. All analyses and interpretations are the sole responsibility of the author and not of the National Center for Health Statistics.

medical conditions. Later in the interview, respondents with a disability who were asked about the condition causing the disability should be more likely to consider conditions reported earlier than alternative conditions.

Conditions, which were reported as the cause of disabilities, were coded in terms of the same conditions to which respondents had been assigned in the beginning of the interview. Reports of conditions that did not fit any of the condition categories were classified as "other." An additional hypothesis to consider is that the context affects both reports of specific conditions and reports of unclassifiable or "other" conditions. Previous research has shown that context effects on survey responses are more likely when the question refers to ambiguous circumstances (Schober and Conrad 1997) or when the respondents do not have a strong opinion about the issue (Hippler and Schwarz 1986).

In the present case, one can argue that the context should mainly affect the reports of respondents who are uncertain or lack knowledge about the condition causing their disability. When the uncertainty is high, most of these reports would not fit the condition categories and would be classified as "other" conditions. However, following explicit questions about specific conditions, the "uncertain" respondents should be likely to report a condition among them and then to consider this condition as a potential cause of their disability when asked about the condition causing the disability. That is, a strong context should move the "other" reports to reports of primed conditions. The more reports of primed conditions as causes of disabilities, the fewer reports of nonclassifiable or "other" conditions.

An important question is to what degree the accessibility effects are a result of the respondent's conscious inferences about the implications of her earlier response or a result of relatively automatic processes. In both cases, the initial questions elicit responses that are cognitively accessible for later use. The question is about the use of this activated knowledge. An explanation of the context effects on reports of conditions causing disabilities is in terms of the respondents' motivation to be consistent. For instance, when a respondent who reports a condition (e.g., "lumbago") and later a disability related to this condition (e.g., "difficulty walking") is asked about the main condition causing the disability, she may report the condition reported earlier in order to appear consistent. Alternatively, when asked about the condition causing the disability, the respondent may respond with the first applicable thing that comes to mind, namely, an earlier reported condition related to the disability.

One strategy used in priming experiments to disentangle the contributions of relatively automatic and more inferential processes is to oppose the demands of the primed knowledge and the demands of the participants' explicit task. This is rarely the case in survey situations. In such situations, both automatic and controlled processes may act in concert to produce the same effect. For example, in the present case, the "automatic" and "consistency" explanations make the same predictions for respondents who reported a condition before the disability questions. However, these explanations differ with respect to respondents who did not report a condition in the beginning of the interview but reported this condition later as the cause of their disability. In fact, this seems the only situation in which the consistency demand is clear and strong. If the accessibility effects are entirely due to consistency pressure, respondents who did not report a condition when explicitly asked about this condition should not report it later as a cause of their disabilities. In contrast, an account based on automatic processes can account for such cases of inconsistency.

Method

DATA SOURCES

The analyses were on data from the 1994 and 1995 NHIS core questions asked every year and the DS questions (National Center for Health Statistics 1998a, 1998b). The NHIS is a representative nationwide household survey of the noninstitutionalized population of the United States. Data are collected each week on a probability sample. The face-to-face interviews are conducted by personnel of the U.S. Bureau of the Census.

Because the NHIS is a household survey, responses in the NHIS are based on both self-reports and proxy reports. Specifically, adult members of the household who are present for the interview report for all other household members. This poses problems for the study of context effects. Respondents are not randomly allocated to self-status and proxy status, and they may change their status during the interview. To avoid such problems, all analyses reported in this article are on self-reports, that is, on data from respondents who reported for themselves during the entire course of the interview.[4]

Respondents answered the DS questions after the core questions. The sample sizes (for self-respondents) were 41,130 (1994) and 38,807 (1995). Following the NHIS's standard practices, respondents were randomly assigned to one of six medical condition lists in the core section of the interview: sensory impairments ($N = 13{,}160$); bone, muscle, and skin ($N = 13{,}333$); digestive system ($N = 13{,}284$); glandular, nervous, and genitourinary systems ($N = 13{,}275$); heart and circulatory system ($N = 13{,}098$); and respiratory system ($N = 13{,}078$). The six condition lists correspond to different body systems and are designed to measure the prevalence of specific chronic conditions in the population. Because the list of all conditions is too long, the sample is divided into six representative subsamples and respondents in each of them are asked one of the six condition lists. Respondents for whom the

4. A copy of all analyses reported in this article based on data from all respondents is available on request from the author.

assigned condition list was unknown (259 for 1994 and 350 for 1995) were excluded from the analyses.

QUESTIONS IN THE NHIS

Interviewers started all condition lists as follows: "Now I am going to read a list of medical conditions. Tell me if anyone in the family has had any of these conditions, even if you have mentioned them before." The sensory impairments checklist contained 26 conditions; the bone, muscle, and skin list, 23; the digestive system list, 21; the glandular, nervous, and genitourinary systems list, 25; the heart and circulatory system list, 21; and the respiratory system list, 17 (see Adams and Marano 1995, app. 3, pp. 151–53). For instance, the sensory impairments checklist contained conditions such as "blindness in one or both eyes," "tinnitus or ringing in the ears," "a cleft palate or harelip," whereas the digestive system lists contained conditions such as "gallstones," "fatty liver," "hepatitis," and so on.

The condition lists questions were followed by questions about reported conditions. If a respondent reported a condition, she was asked 17 questions about the specific condition. These included whether a doctor was seen for the condition, its technical name, what part of the body was affected, the history of the condition, etc. Then, all respondents were asked 16 demographic questions.

The DS questions followed the demographic section. The first section of the DS was on sensory, communication, and mobility impairments. Respondents who reported "serious difficulty seeing" ($N = 3{,}315$; 4.2 percent), "trouble hearing" ($N = 4{,}344$; 5.4 percent), or "difficulty communicating and understanding" ($N = 1{,}023$; 1.3 percent) were asked what the main condition was causing the impairment. For instance, for the first disability the question read, "What is the MAIN problem or condition which causes (person's name) serious difficulty seeing?"

The sensory impairment section was followed by sections about difficulties in activities of daily living (ADL), instrumental activities of daily living (IADL), and functional limitations (FL). The ADL referred to bathing or showering, dressing, eating, getting in and out of chairs, using the toilet, and getting around inside the home. The IADL referred to preparing meals, shopping for personal items, managing money, using the telephone, doing heavy work around the house, and doing light work. The FL referred to difficulties with lifting, walking up steps, walking, standing, bending, reaching up and out, using fingers, and holding a pen. If the respondent reported any of those, she was classified as having difficulty with either ADL ($N = 2{,}438$; 3.1 percent) or IADL ($N = 7{,}773$; 9.7 percent) or FL ($N = 13{,}959$; 17.5 percent). For these six disabilities—difficulty with seeing, hearing, communicating, ADL, IADL, and FL—respondents were asked about the condition causing the disability.

ANALYTIC PROCEDURES AND PRELIMINARY ANALYSES

Analyses were performed on the condition reports for each disability and across disabilities. These reports were classified in the National Center for Health Statistics (National Center for Health Statistics 1995) in terms of the conditions asked in the beginning of the interview.[5] Conditions that did not fit these condition categories were classified as "other." This classification is a standard practice of the National Center for Health Statistics. As was noted above, respondents who reported a condition in the core part of the interview were asked 17 questions about the condition. Respondents who reported a condition for the first time in the DS were asked these questions at the end of the DS. The classification of conditions is based on the respondent's response to the "main condition causing disability" question and the responses to the 17 specific questions about the condition.

Reports of conditions coming from a specific condition list, that is, corresponding to a body system, were collapsed in order to create six categories of responses corresponding to the six condition lists. Thus, the tables for the analyses were six (contexts: condition checklists administered in the beginning of the interview) by seven (reports of condition categories matching the checklists plus reports of "other" or unclassifiable conditions). It should be noted that the "other" response category corresponds to a condition report, which did not fit the chronic condition classification. In addition to that, some of the condition reports were completely unclassifiable in terms of medical conditions. The percentage of these reports was as follows: 8.4 percent for causes of difficulty seeing, 6.1 percent for trouble hearing, 14.7 percent for communicating, 22.2 percent for ADL, 18.5 percent for IADL, and 16 percent for FL.

In complex surveys, standard statistical software underestimates the variance because it does not take into account the survey design. Initial analyses were performed on the data weighted for the probability of respondent selection for the interview and adjusted for the survey design with Rao-Scott approximation for chi-square test. These analyses perfectly agreed with the analyses of the unadjusted data. Further, the weighted and unweighted context effects correlated as highly as .99. Because focused tests of the hypotheses required model fitting possible with the unweighted data, the analyses were performed on them. The weighted estimates are available on request from the author.

Separate analyses were performed for each of the six disabilities. For each of the six (contexts) by seven (condition reports) tables, six comparisons indicated the effect of the specific context. For example, the effect of the "skin/muscle" context on the reports of conditions causing "difficulty hearing" was computed as the difference between the proportion of skin/muscle con-

5. For the correspondence between this classification of chronic conditions in terms of major body systems and lay perceptions, see Brewer, Dull, and Jobe (1989).

dition reports in the group exposed to these conditions and the proportion of these reports for the other five groups. The effects of the other five contexts were computed in the same way. That is, the magnitude of the context effects was computed as the difference between the conditional probability of a report of a condition given a matched context and the conditional probability of a report of the same condition given a nonmatched context. With six disabilities and six context effects per disability, there were 36 measures (each combination of context and disability) of the magnitude of the context effects on reports of specific conditions. The same procedure was performed to compute the context effects on reports of unclassifiable or "other" conditions.

For the analyses of the specific disabilities, each respondent reported only one condition. However, for the analyses across disabilities, each respondent with more than one disability could have reported the same condition more than once. To avoid this disproportionate contribution, the reports for this analysis were constrained so that each respondent provided only one specific condition. For instance, even if a person reported the same condition for three disabilities, the report was counted as a single condition.

An issue that has to be addressed before the main analyses is whether the context affected not only the reports of conditions causing disabilities but also the reports of disabilities. In fact, the effect of context was significant for reports of "trouble hearing," likelihood ratio chi-square $G^2(5) = 12.94$, $p < .02$, and reports of "difficulty seeing," $G^2(5) = 10.80$, $p < .05$. In both cases, the effect was entirely due to the difference between respondents who were asked about sensory impairment conditions and the remaining groups. Respondents in this group were more likely to report "trouble hearing" than the other respondents (6 percent vs. 5.3 percent), $G^2(1) = 10.12$, $p < .001$, and less likely to report "difficulty seeing" (3.7 percent vs. 4.2 percent), $G^2(1) = 7.24$, $p < .007$. The latter effect is analyzed and described in Todorov (2000).

Although the context affected the reports of two of the disabilities, this did not seriously affect the analysis of the reports of conditions as the cause of disabilities. One way to adjust for the effect on reports of disabilities is to weight the size of each context effect by the proportion of disability reports. For instance, the size of the accessibility effect for reports of sensory impairments as a cause of difficulty seeing was 10.7 percent. To adjust for the effect on reports of difficulty seeing, this effect was multiplied by the proportion of respondents who reported "difficulty seeing" in the sensory impairments checklist condition (3.7 percent) and divided by the proportion of all respondents who reported "difficulty seeing" (4.2 percent). The adjusted effect was 9.4 percent. These adjusted effects correlated highly with the unadjusted effects for both the reports of specific conditions, $r = .994$, $p < .0001$, and the reports of "other" conditions, $r = .996$, $p < .0001$. Thus, all analyses report the unadjusted effects.

Table 1. Rates of Reported Conditions Causing Disabilities as a Function of Context

	Context: Initial Questions		
Report of Conditions	Context Matched with Report (%)	Context Nonmatched with Report (%)	Difference: Size of Context Effect (%)
Sensory impairments	48.8 (1,580)	41.2 (6,768)	7.6
Bone, skin, muscles	26.6 (879)	21.5 (3,518)	5.1
Circulatory system	11.1 (366)	8.2 (1,337)	2.9
Respiratory system	4.3 (139)	3.0 (494)	1.3
Nervous system	4.8 (159)	3.9 (635)	.9
Digestive system	1.5 (49)	.8 (142)	.7

SOURCE.—National Health Interview Survey on Disability, 1994 and 1995.

NOTE.—The reports were on the causes of six different disabilities. The numbers in parentheses are the numbers of respondents who reported the corresponding condition as the cause of the disability. The percentages are column percentages.

Results and Discussion

As shown in table 1, respondents were more likely to report conditions to which they had been exposed in the beginning of the interview than alternative conditions. Almost 49 percent of respondents who were asked about sensory impairments conditions reported such conditions as the cause of their disabilities as compared to 41.2 percent of respondents who were asked other condition questions. That was the case for all other context groups: skin/muscle, 26.6 percent versus 21.5 percent; circulatory system, 11.1 percent versus 8.2 percent; nervous system, 4.8 percent versus 3.9 percent; respiratory system, 4.3 percent versus 3 percent; and digestive system, 1.5 percent versus .8 percent.

Table 2 shows a more detailed description of the effect of context across disability reports. This table is important because it illustrates the nature of the analyses for each disability. The analyses for the specific disabilities were performed on six contingency tables with the same structure as the one shown in table 2. These analyses for the specific disabilities yielded the same results

Table 2. Rates of Reported Conditions Causing Disabilities as a Function of Context

	Context: Initial Questions					
Report of Condition	Sensory Impairments (%)	Bone, Skin, Muscles (%)	Circulatory System (%)	Respiratory System (%)	Nervous System (%)	Digestive System (%)
Impairments	**48.8** (1,580)	41.5 (1,372)	40.1 (1,327)	41.0 (1,325)	41.6 (1,366)	41.8 (1,378)
Bone, skin, muscles	20.6 (666)	**26.6** (879)	22.0 (729)	21.6 (697)	21.3 (701)	22.0 (725)
Circulatory system	7.8 (252)	7.9 (261)	**11.1** (366)	8.5 (275)	8.4 (276)	8.3 (273)
Respiratory system	3.1 (100)	2.8 (91)	2.8 (93)	**4.3** (139)	3.8 (125)	2.6 (85)
Nervous system	3.0 (97)	3.6 (118)	4.1 (136)	4.1 (131)	**4.8** (159)	4.6 (153)
Digestive system	.7 (22)	.8 (25)	1.0 (33)	.9 (30)	1.0 (32)	**1.5** (49)
Other condition	16.0 (518)	17.0 (561)	18.9 (624)	19.5 (631)	19.1 (626)	19.2 (631)

SOURCE.—National Health Interview Survey on Disability, 1994 and 1995.

NOTE.—The reports were on the causes of six different disabilities. The numbers in parentheses are the numbers of respondents who reported the corresponding condition as the cause of the disability. The percentages are column percentages.

as the analysis of condition reports across disabilities. Within each disability, respondents were more likely to report the primed conditions. In fact, among the 36 context comparisons at each combination of context and disability, only two were negative, and the difference was less than 1 percent. The correlation between the magnitudes of context effects on reports of specific conditions and on reports of "other" conditions was $-.77$, $p < .0001$. The more reports of primed conditions, the fewer reports of "other" conditions.

The chi-square statistic, which was significant for all disabilities except difficulties in ADL, indicates only that reports and context are not independent (table 3, col. 1). The test of the specific accessibility hypothesis that the context affects the reports of conditions matched with it, that is, the main diagonal cells (see table 2), is equivalent of testing the fit of a quasi-independence

Table 3. Goodness of Fit of Models of Accessibility Effects on Reports of Conditions Causing Disabilities

	Fit of Models			
Difficulties with:	Independence ($df = 30$)	Quasi-Independence ($df = 24$)	Fit Improvement ($df = 6$)	Sample Size
Hearing	99.40***	21.12	78.28***	4,054
Seeing	58.45**	29.34	29.11***	3,014
Communicating	42.10*	13.04	29.06***	864
FL	95.79***	17.08	78.71***	11,644
IADL	56.28**	18.81	37.47***	6,261
ADL	27.37	24.02	3.35	1,887
All	169.03***	30.06	138.97***	19,657

Source.—National Health Interview Survey on Disability, 1994 and 1995.
Note.—The quasi-independence model specifies that independence holds in the table except in the diagonal cells, i.e., the cells in which context and reports are matched. *df* = degrees of freedom, ADL = activities of daily living, IADL = instrumental activities of daily living, and FL = functional limitations.
* $p < .07$.
** $p < .01$.
*** $p < .001$.

model. This model specifies that independence holds for all cells in the six by seven table except the ones on the main diagonal. As shown in table 3, the fit improvement over the independence model was significant for all disabilities except ADL where the initial test of independence was not significant. Moreover, the quasi-independence model fit the data for all disabilities.

Could the accessibility effects on reports of conditions as the cause of disabilities be explained in terms of the respondent's motivation to be consistent? First, it should be noted that a consistency demand is apparent only for closely related pairs of conditions and disabilities (e.g., "blindness in both eyes" and "difficulty seeing"). It is not clear how this demand can account for unrelated pairs of conditions and disabilities (e.g., "gallstones" and "difficulty communicating"). For example, three respondents (2.1 percent) who had reported conditions related to the digestive system, after being asked about such conditions, reported these conditions as the cause of their "difficulty communicating." None of the respondents who were asked about other conditions reported digestive system conditions as the cause of this disability. One may argue that this effect is negligible, but this is only the case when the effect is measured as a difference in percentages and not as an odds ratio.

As was noted, both "automatic" and "consistency" explanations predict that respondents who had reported conditions earlier in the interview should be likely to report these conditions as the cause of their disabilities. That was clearly the case across all disabilities. The accessibility effects were driven by the reports of this group of respondents. More interesting is the group of respondents who did not report conditions when being asked about such conditions but reported these conditions as the cause of their disability (3.2 percent, 286 reports across disabilities). According to the consistency explanation, there should not be any such responses. In other words, such responses should be attributed to random error. However, these responses varied systematically for the different combinations of context and disabilities. For example, among 59 respondents with "difficulty hearing" who did not report a sensory impairments condition after being asked whether they have such conditions, 47 respondents (79.7 percent) later reported a sensory impairment condition as the cause of their "difficulty hearing." For many unrelated pairs of context and disabilities, this proportion was either zero or close to zero. The correlation between the proportions of respondents who did not report a condition but reported this condition later as the cause of a disability (for each combination of context and disability) and the size of the accessibility effects was .75, $p < .0001$. How these proportions changed as a function of the applicability of context is considered below.

Two things should be noted for this finding. First, such "inconsistent" reports can be accounted for by relatively automatic priming processes. Second, the high correlation of these reports with the accessibility effects suggests that similar processes were operating for both respondents who reported a condition earlier in the interview and respondents who did not report such a condition. Of course, these arguments cannot rule out a consistency explanation, but they do show that this explanation is insufficient. It is most plausible to assume that the observed accessibility effects resulted from both relatively automatic and relatively deliberate inferential processes.

Study 2: Effects of Applicability of Knowledge

Respondents who reported a disability and were asked about the main condition causing the disability were more likely to report conditions to which they had been exposed earlier in the interview than alternative conditions. These findings demonstrate the accessibility principle. However, the magnitude of the accessibility effects was uneven for the different pairs of context and disability, ranging from practically 0 percent to 10.7 percent. The applicability principle can account for these differences in the size of the accessibility effects. For example, the strongest accessibility effects were for the reports of conditions causing difficulties seeing, hearing, and communicating in the sensory impairment context. This condition checklist covered conditions specifically related to vision, for example, blindness in both eyes, hearing, and communicating, and, thus, the match between disability and context was higher than for other disabilities and contexts.

Although applicability refers to the match between the activated knowledge and features of the stimulus, it is not merely a simple computation of feature-by-feature similarity. Applicability is a function of the *attended* shared features of the accessible knowledge and the target. Further, what counts as a shared feature depends on the specific question (Tversky 1977) and the lay theory about the stimuli (Medin 1989). In the NHIS-D, respondents were asked what the main condition was causing their disabilities. In this case, applicability refers to the causal relevance of the knowledge activated by the initial condition questions to the specific disability. To obtain measures of applicability, independent ratings of the likelihood that any of the primed conditions can cause the specific disability were collected. According to the applicability logic, these likelihood judgments should predict the magnitude of the accessibility effects. The stronger the judged causal relevance of the condition context to the disability, the stronger the accessibility effect.

In addition to the overall analysis on all pairs of contexts and disabilities, separate analyses were performed for difficulties seeing, hearing, and communicating, and difficulties in ADL, IADL, and FL. In terms of cognitive categories, the former type of disabilities can be viewed as "well-defined" or focused disabilities—they referred to a specific single difficulty and were identified by a single question—whereas the latter can be viewed as "non-well-defined" or unfocused—they referred to difficulties in any of a number of activities. For instance, a functional limitation status was assigned to both a respondent who reported "difficulty walking" and a respondent who reported "difficulty holding a pen," essentially treating them in the same way. In addition, the potential causes of difficulties in activities are less localized than the potential causes of difficulties seeing, hearing, or communicating.

Method

PARTICIPANTS AND PROCEDURES

Forty-eight undergraduate students from the Department of Psychology at New York University participated in a study on decisions about conditions and disabilities as part of a course requirement. Participants rated each of the six disabilities for each of the six condition lists (contexts), providing 36 ratings. In the beginning of the questionnaire, all disabilities were described in the same way as in the NHIS questionnaire. Then participants read all conditions for a particular context, for example, sensory impairments, and rated the six disabilities. For instance, for "difficulty seeing," participants read, "Imagine that a person has serious difficulty seeing, even when wearing glasses or contact lenses. How likely is it that this person's difficulty seeing is caused by any of the above conditions?" Next they rated the disabilities for the other five condition lists. The order of the condition lists was counterbalanced across participants. The likelihood judgments were made on an 11-point scale, ranging from 0 (not at all likely) to 10 (extremely likely). An analysis of the reliability of the judgments treating participants as the unit of analysis showed that they were highly reliable (Cronbach's alpha $= .98$). The ratings of all participants were averaged and the mean score was used as a predictor of the magnitude of the accessibility effects in the NHIS-D.

Results and Discussion

Across disabilities, the correlation of the mean likelihood ratings and the size of the context effects on reports of specific conditions was .60, $p < .001$ ($N = 36$). The correlation with the size of the effects on reports of "other" conditions was $-.58$, $p < .001$. When the analyses were limited to "well-defined" disabilities, these correlations increased to .93, $p < .001$ ($N = 18$) and $-.81$, $p < .001$, respectively. The correlations for the "non-well-defined" disabilities were .69, $p < .002$ ($N = 18$), and $-.59$, $p < .009$. In all cases, the applicability measure correlated highly and reliably with the magnitude of the context effects on both reports of specific conditions and reports of "other" conditions.

Importantly, for both types of disabilities the partial correlation between the applicability measure and the effects on "other" reports controlling for the effects on reports of specific conditions was not significant, $r = -.37$ for "well-defined" and $r = -.10$ for "non-well-defined" disabilities. But the partial correlation between applicability and the "proper" accessibility effects on reports of specific conditions remained significant after controlling for the effect on "other" reports, $r = .80$, $p < .001$, for "well-defined" and $r = .43$, $p < .04$ (one-tailed), for "non-well-defined" disabilities. These analyses show that the relation between applicability and the effects on reports of unclassifiable or "other" conditions is mediated by the relation between applicability and the accessibility effects on reports of specific conditions. The more applicable the context, the stronger the accessibility effect. The more reports of primed conditions, the fewer reports of unclassifiable conditions.

In the subsequent analyses, the size of the accessibility effects was regressed on the likelihood judgments. Across disabilities, a linear regression accounted for 36.5 percent of the variance of the context effects on the reports of specific conditions, $F(1, 35) = 19.53$, $p < .001$. As shown in table 4, after controlling for type of disability, the accounted variance increased to 74.4 percent, $F(2, 35) = 47.96$, $p < .001$. The variance accounted for the effects on the reports of "other" conditions was 61 percent, $F(1, 35) = 25.86$, $p < .001$.

Separate regression analyses for the "well-defined" and "non-well-defined" disabilities revealed the same findings (table 4). In fact, in the case of "well-

Table 4. Unstandardized Regression Coefficients of Applicability (Likelihood Judgments) as Predictors of Accessibility Effects on Reports of Conditions Causing Disabilities

	All Disabilities		"Well-Defined" Disabilities		"Non-Well-Defined" Disabilities	
	Specific Conditions	"Other" Conditions	Specific Conditions	"Other" Conditions	Specific Conditions	"Other" Conditions
Likelihood judgment	1.52***	−1.24***	−.73	.72	1.91**	−1.05**
(Likelihood judgment)^2			.21**	−.19		
Type disability	−5.16***	3.92***				
Explained variance (R^2)(%)	74.4	61.0	91.9	70.6	46.9	35.3

SOURCE.—National Health Interview Survey on Disability, 1994 and 1995.

NOTE.—The likelihood judgments were made on an 11-point scale, ranging from 0 (not at all likely) to 10 (extremely likely). Type disability is coded as a dummy variable: zero for "well-defined" disabilities and one for "non-well-defined" disabilities.

** $p < .01$.

*** $p < .001$.

defined" disabilities, an inspection of the raw data and the residuals indicated nonlinear trends. The quadratic function was significant, $F(2, 17) = 6.94$, $p < .01$, and the second-degree polynomial accounted for 91.9 percent of the variance of the context effects on the reports of specific conditions—a multiple correlation of .96. For the reports of "other" conditions, the quadratic function accounted for 70.6 percent of the variance. For the "non-well-defined" disabilities, only the linear trend was significant, accounting for 46.9 percent of the variance for the reports of specific conditions and 35.3 percent for the "other" conditions.

As was discussed in the first part of the article, the consistency explanation of the context effects predicts that if respondents did not report a condition when explicitly asked whether or not they had the condition, they should not report this condition later as the cause of their disability. Any such reports should be attributable to random error. However, the proportions of respondents who did not report a condition but reported this condition later as the cause of a disability varied systematically with the size of the context effects. Moreover, these proportions varied systematically with the applicability of context. A linear regression controlling for the type of disability accounted for 60.7 percent of the variance of these proportions, $F(2, 35) = 25.51$, $p < .001$. In the case of "well-defined" disabilities, a significant quadratic trend,

Table 5. Cross-Validation of Applicability Findings by Using Models Derived from 1994 Data to Predict Accessibility Effects in 1995

Accessibility Effects	Model Equations	Correlations
Specific conditions	$Y^{I} = -1.66 + .95 \times X - 3.92 \times Z$	.80*
"Other" conditions	$Y^{I} = 2.80 - .69 \times X + 2.12 \times Z$	.75*

SOURCE.—National Health Interview Survey on Disability, 1994 and 1995.
NOTE.—Applicability (*X*) was measured with likelihood judgments made on an 11-point scale, ranging from 0 (not at all likely) to 10 (extremely likely). Type disability (*Z*) is coded as a dummy variable: zero for "well-defined" disabilities and one for "non-well-defined" disabilities. Correlations are between predicted and actual accessibility effects.
* $p < .0001$.

$F(2, 17) = 7.66$, $p < .01$, accounted for 81.2 percent of the variance, a multiple correlation of .90. Clearly, such "inconsistent" reports of conditions as causing disabilities cannot be attributed to random error.

Cross-Validation of Applicability Findings

The above findings provide strong evidence for the explanatory and predictive power of the applicability principle. But could a model derived from one data set generalize to predict another data set? To validate the functions relating the likelihood judgments and the sizes of the context effects, models derived from the 1994 data were used to predict the context effects for 1995. Table 5 presents the regression equations of the accessibility effects as a function of the applicability of context.

As can be seen in table 5, the predicted size of the accessibility effects on the reports of specific conditions correlated highly with the actual effects for 1995 data. Across disabilities, the correlation was .80. The correlation for the "well-defined" disabilities was .87, $p < .001$, and the correlation for the "non-well-defined" was .70, $p < .001$. The correlation between the predicted and actual accessibility effects on reports of "other" or unclassifiable conditions was .75. The correlations for the "well-defined" and "non-well-defined" disabilities were .78, $p < .001$, and .46, $p < .06$, respectively.

General Discussion

In the NHIS-D from 1994 and 1995, respondents were randomly assigned to one of six chronic condition checklists. Later in the interview, all respondents were asked about a number of disabilities. Respondents who reported a disability and then were asked about the condition causing the disability were more likely to report conditions about which they had been asked earlier in the interview than respondents who had been asked questions about other conditions. This context effect was predicted by the accessibility principle of knowledge activation according to which exposure to concepts makes them more accessible in memory, thus increasing the likelihood of their use.

According to the applicability principle, the size of accessibility effects is a positive function of the applicability of context, that is, the initial questions, to the subsequent questions. In fact, independent lay judgments of the likelihood that any of the context conditions caused the specific disability, a measure of the applicability of context to the target question, accounted for more than 74 percent of the variance of the accessibility effects on reports of specific conditions as the cause of disabilities. When the analysis was limited to "well-defined" disabilities, the applicability measure accounted for 91.9 percent of the variance, that is, a multiple correlation of .96.

The size of the accessibility effects on the reports of primed conditions was inversely related to the size of the effects on the reports of conditions that did not fit the standard condition categories used in the NHIS. The more reports of primed conditions, the fewer reports of "other" or unclassifiable conditions. This finding suggests that the context mainly affected the reports of respondents who were uncertain or lack knowledge about the conditions causing their disabilities. Because of the high correlation between the effects on reports of specific conditions and reports of "other" conditions, the applicability measure also predicted the size of the accessibility effects on reports of unclassifiable conditions. Across disabilities, the applicability accounted for 61 percent of the variance of these effects.

Finally, models of the accessibility effects as a function of the applicability of context were derived from the 1994 NHIS-D data set and tested against the actual effects in the NHIS-D from 1995. These models predicted the actual effects reasonably well, especially in the case of "well-defined" disabilities. Across disabilities for the reports of specific conditions, the correlation between the predicted and actual effects was .80. For the reports of "other" or unclassifiable conditions, the correlation between the predicted and actual effects was .75.

Theoretical Implications

The present findings suggest that to account for the size of assimilative context effects, one should consider at least three general factors: accessibility, applicability, and ambiguity. Ambiguity determines the possible range of context effects. "Zero" ambiguity or uncertainty precludes the possibility of context effects. High levels of ambiguity will allow for large context effects. Ambiguity can have different facets: respondent related, such as lack of knowledge and lack of strong attitudes toward the target issue (see Hippler and Schwarz 1986), and not respondent related, such as lack of a straightforward mapping of question concepts into the respondent's circumstances (Schober and Conrad

1997). A strong context will "move" the responses of respondents who are generally uncertain about the response from some idiosyncratic default response to a response primed by the context. Statistically, a random pattern of responses of "uncertain" respondents will be transformed into a systematic response bias.

Further studies need to be done to test how these factors interact. Most important, ambiguity and applicability need to be manipulated independently. In the present data, the role of ambiguity was inferred from the high correlation between the accessibility effects on reports of specific conditions and the effects on reports of unclassifiable conditions. A concern, pointed out by one the reviewers, is that ambiguity and applicability might have been confounded. However, this is inconsistent with the partial correlation analyses. If applicability and ambiguity were completely confounded, then the correlation between applicability and accessibility effects on reports of primed conditions should disappear when one controls for the effects on reports of "other" conditions. This was not the case. Applicability predicted the size of the accessibility effects independently of the effect on the reports of unclassifiable conditions.[6]

Previous work on context effects on survey responses has identified the conditions under which contextually primed knowledge is excluded or included in a judgment, that is, contrast and assimilation effects (Feldman and Lynch 1988; Martin 1986; Martin and Achee 1992; Schwarz and Bless 1992; Schwarz et al. 1991; Strack 1992a; Strack and Martin 1987; Tourangeau and Rasinski 1988).[7] Most of these models can be extended to account for the size of assimilation context effects. However, this research is the first attempt to model the size of such effects as a function of the applicability of context to the target judgment.

A model that seems to account for the present data is the accessibility-diagnosticity model (Feldman and Lynch 1988). This model assumes that the effect of an earlier response on a subsequent response is a function of the accessibility and diagnosticity of the earlier response. If the earlier response is accessible and perceived to be more diagnostic than other accessible knowledge, it will be used in responding to the subsequent response. Specifically, the applicability principle can be mapped into the diagnosticity principle in the accessibility-diagnosticity model. However, there are important differences in the assumed underlying processes. Diagnosticity is assessed against other

6. Most important, the correlation between the accessibility effects on reports of specific conditions and reports of "other" conditions, $r(36) = -.77$, $p < .0001$, remained highly significant after controlling for applicability, $r(33) = -.65$, $p < .0001$.

7. The context effects in the present studies were assimilation effects of initial on subsequent questions. Contrast effects are observed when the subsequent question follows the initial context question immediately (Ottati et al. 1989) and when respondents perceive these questions as belonging to the same conversational context (Schwarz et al. 1991). This was not the case in the NHIS-D. It is an empirical question whether the applicability of context will predict the size of contrast effects as successfully as the size of assimilation effects.

accessible alternatives. This process presumes a procedure similar to hypothesis testing. For example, the likelihood that an earlier reported condition will be reported as the cause of a disability is a function of its diagnosticity relative to other accessible conditions. Presumably, respondents remembered their earlier responses and then decided about their relevance by comparing them to other possible responses. This procedure works by filtering out information that is found nondiagnostic. Such a procedure is similar to other procedures suggested in the literature, where people check the accessible information for its appropriateness given sufficient cognitive resources and motivation (Schwarz and Bless 1992; Strack 1992b; Wegener and Petty 1997). In contrast to such procedures, the applicability principle refers to automatic computation of shared features between the accessible knowledge and the target judgment. That is, the applicability of the accessible knowledge is computed immediately without any explicit consideration of alternatives. Unfortunately, the present data do not allow a test of these underlying processes.

This difference in the possible underlying processes is related to a more general distinction between relatively automatic and relatively controlled processes (Bargh 1994). The question is to what extent accessibility effects in survey situations reflect automatic and/or relatively controlled processes. Such effects in experimental situations are considered automatic. However, in a survey situation respondents may respond to subsequent questions by thinking about the implications of their earlier responses. For instance, an explanation of the present accessibility findings is that respondents who reported conditions earlier in the interview felt pressure to be consistent when responding to the "condition causing disability" question. The analysis suggested that this is not a sufficient explanation of the observed effects. At the same time, it seems that accounts completely based on relatively automatic processes will be insufficient as well. Experiments that manipulate the initial context, for example, unobtrusive exposure to conditions not requiring a response versus explicit questions about conditions, will be helpful in disentangling the contributions of automatic and controlled processes.

Practical Implications and General Conclusions

This research has two major practical implications. First, it suggests that context effects can be modeled and predicted before administering large health surveys. Specifically, one can estimate expected response biases in small experimental studies before administering large surveys. Second, the inclusion of rich contexts before questions about the target issues will reduce the number of unclassifiable responses when open-format questions are used or the number of "don't know" responses when closed-format questions are used. Whether or not this increases or decreases the accuracy of the reports should be addressed in future studies.

Rating procedures, which are guided by experimentally grounded cognitive theories, can be used as a supplement to recent techniques introduced in survey research such as cognitive interviewing (DeMaio and Rothgeb 1996). In representative surveys, researchers are concerned with producing population estimates, which can be affected by a variety of response biases. Rating procedures are especially powerful to predict and correct for biasing effects on aggregated data. For instance, a researcher interested in the causes of vision disability in the population will arrive at quite different estimates depending on the initial checklists asked in the interview. The population estimate for sensory conditions causing this difficulty is 75.5 percent after the sensory impairment checklist and 65.5 percent after the other checklists—a difference of 10 percent. The prediction of the accessibility/ applicability model on the weighted data was a difference of 10.02 percent.

Rating procedures have also been used to predict differences between self-responses and proxy responses. The major federal surveys are household surveys, which rely heavily on proxy responses. The use of proxies reduces the survey cost but may bias the national estimates produced by the survey. In the context of the NHIS-D, Todorov and Kirchner (2000) demonstrated that ratings of informational aspects of disabilities, for example, observability, accounted for 70 percent of the variance of the differences between self-reports and proxy reports of 37 disabilities.

The findings in this article demonstrate that context effects on responses in nationally representative surveys can be predicted and modeled by the application of principles of knowledge activation derived from experiments in social cognition and cognitive psychology. Such research on national survey data can serve two objectives: it can extend the existing cognitive theories of knowledge activation and use, and it can be useful in modeling and correcting response biases in representative surveys with practical policy implications.

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