

## Some Dynamic Properties of Attitude Structures: Context-Induced Response Facilitation and Polarization

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Attitudes can be seen as object evaluations stored in memory. Accordingly, attitude structure may be seen as a memory structure with dynamic implications for information processing. In this article, an associative network model for the representation of stored attitudes was assumed, and 2 manifestations of the notion of spreading activation within the confines of such a model were examined. Study 1 demonstrated that giving one attitude response could facilitate a 2nd attitude response if the 2 shared a structural link in long-term memory. Studies 2 and 3 showed that spreading activation could also result in polarization of attitude responses, so that answering questions on 1 attitude issue might result in more extreme responses to a 2nd linked attitude issue. These results have implications not only for theories about attitudes but also for measurement issues in political survey research.

For many years, social psychologists have been interested in the structure of attitudes. In the literature that has accumulated on this topic, attitude structure is discussed in two quite different ways. Some researchers focus on the internal structure of a single attitude, viewing it as a composite of beliefs about the attitude object, affective responses to the object, and behavioral tendencies (e.g., Breckler, 1984; Katz & Stotland, 1959). Other social psychologists have explored the structure of systems or sets of attitudes and beliefs, assuming that the cognitive elements in such sets are linked to one another according to psychological principles (Abelson & Rosenberg, 1958; Cartwright & Harary, 1956; Festinger, 1957; Heider, 1958). The latter approach to attitude structure, on which we focus in this article, has been of substantial interest outside psychology. For example, it is often cited in an important debate within political science concerning the degree to which the general public's attitudes on government policy issues are derived from or structured by broad ideological principles such as liberalism and conservatism.

Typically, the examination of attitude structure in this second sense has proceeded by estimating the consistency between

different attitude responses across different attitude issues or objects that are presumed to be structurally linked with each other. Thus, the structure of a set of attitudes has been inferred from the degree to which evaluations of a given attitude object are predictable from or correlated with evaluations of other structurally linked attitude objects. Although this approach to attitude structure seems to us to have been a relatively productive one (see the review of this literature provided by Judd & Krosnick, 1989), it seems somewhat limited in its focus and theoretical utility. As assessed by attitude-attitude correlations, attitude structure seems to be a relatively static phenomenon, suggesting predicability of responses across people but having few if any implications for ongoing cognitive processes within the person such as judgment, retrieval and activation of information from memory, and the processing of contextual information. Yet, we know from work in other domains that the structure of knowledge stored in memory does have these sorts of dynamic implications for information processing (e.g., Anderson, 1983; Anderson & Bower, 1973; Collins & Quillian, 1969). Accordingly, it seems reasonable to examine the structure of attitude systems by exploring their dynamic implications.

Our approach to the issue of attitude structure has its roots in the recently growing consensus within social psychology that responses to attitudinal questions are based on a search of relevant information from memory (Tourangeau & Rasinski, 1988). Such a search may result in the retrieval of an evaluation or attitude that has previously been stored in memory, or it may result in attitude-relevant information from which an attitude response is fashioned (Fazio, 1989; Judd & Krosnick, 1989). In either event, attitude responses are assumed to be based on evaluative information that is retrieved from memory. Thus,

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this growing consensus suggests that evaluative information and summary evaluative judgments are stored in long-term memory and retrieved when fabricating an attitude response.<sup>1</sup>

The view that attitude responses are based on retrieved evaluations that are stored in memory suggests that the structure of a person's attitudes may be seen as the organization of object evaluations and relevant evaluative information in memory. The advantage of such a view is that it provides a basis for speculating about the dynamic characteristics of such a structure for information processing, storage, and retrieval, using what cognitive psychologists have discovered about the dynamic properties of other sorts of elements in long-term memory.

One especially relevant principle in the cognitive psychology literature is that of spreading activation through an associative network (Anderson, 1983). An associative network may include a variety of pieces of information, including evaluations of objects, that are stored in a long-term memory structure. These pieces of information may become activated by environmental and contextual circumstances. Given a sufficient level of activation, a given piece of information is likely to be retrieved from memory and to come into conscious awareness. Activation of a piece of information has implications for other stored pieces of information, depending on the structure in which they are stored. If two pieces of information are structurally linked to each other in the associative network, activation of one of them should spread to the other, increasing the probability that the second piece will also come into conscious awareness.

If we make the assumption that attitudes may be stored much like other pieces of information in long-term memory, we may suppose that attitude structures manifest processing results consistent with the notion of spreading activation. If a particular attitude is brought to mind, the activation of that stored evaluation ought to increase the activation levels of other attitudes with which it is linked in long-term memory. Thus, studying the dynamics of attitude activation provides a way to gauge the extent and nature of links between attitudes, thus revealing attitude structure.

From the existing literature, attitude activation might be presumed to have two sorts of effects. First, Fazio has shown that repeated activation of an attitude tends to make that attitude more accessible in the future (Powell & Fazio, 1984; see also Fazio, Sanbonmatsu, Powell, & Kardes, 1986). The more frequently we ask a subject about his or her attitude toward some object or issue, the shorter the latency in subsequent responses to that same object or issue. If attitudes are stored in some sort of long-term memory structure, then repeated activation effects should be found not only on responses to the same attitude object but also to other attitude responses concerning objects that are linked in long-term memory. In other words, because priming someone with a given attitude question can facilitate subsequent responses to that same attitude question, priming someone with one attitude question should facilitate responses to other linked attitude questions. The purpose of the first study that we report was to demonstrate this sort of priming of linked attitude responses.

A problem with this demonstration is that the basis for the spreading activation is ambiguous because we cannot rule out

the possibility that the priming effect has been produced by simple semantic similarity links. In other words, assume we showed, for instance, that attitude responses to the issue of the Equal Rights Amendment subsequently facilitated attitude responses to the issue of abortion rights. This sort of priming effect might be due to associations between the two issues in an attitude structure, as we hypothesized. Alternatively, the priming effect could simply be a result of semantic similarity between the two objects. It might then have been obtained even if the response to the probe was not attitudinal in nature. For instance, we might ask subjects not whether they were in favor of or opposed to each of these two issues but whether or not each issue was a "women's issue." We would expect the response to the first issue to facilitate the response to the second simply because of the overlap in meaning shared by these two issues, apart from any connection between the two in an attitude structure. What we needed to overcome this problem was to show effects of spreading activation from one attitude to another with responses that were purely attitudinal in nature.

Our second and third studies were designed to accomplish this. In these studies, we examined the effects of spreading activation on the extremity of attitudinal responses. This work was based on the hypothesis that repeated attitude responses to an issue or object would polarize subsequent responses to that issue or object. Two different research traditions provide support for this hypothesis. First, research on the effects of mere exposure (Harrison, 1977; Zajonc, 1968) is clearly relevant. Initially, this research showed that repeated exposure to an attitude object led to more positive evaluations of that object. Subsequent work, however, showed that this effect was only found for objects that were initially evaluated positively or neutrally. Repeated exposure to objects that are initially negatively evaluated seems to lead to somewhat more negative evaluations (Brickman, Redfield, Harrison, & Crandall, 1972; Perlman & Oskamp, 1971). Although simple exposure is not necessarily the same thing as repeated attitude expressions to an object, the polarizing effects of exposure should be even stronger when the exposure involves explicit evaluation.

The second line of work that more indirectly supports the hypothesis that repeated expressions will increase the extremity of attitude responses comes from the work of Tesser and colleagues (Tesser, 1978; Tesser & Leone, 1977). Tesser showed that thought devoted to an attitude resulted in attitude polarization. Admittedly, the thought manipulation used in Tesser and colleagues' work involved much more than simply responding to an attitude inquiry one or more times: The subject was encouraged to think for some duration about his or her attitude and why he or she held that attitude. Yet, repeated attitude ex-

<sup>1</sup> This view does not imply that attitudes are unchanging entities that the person can always retrieve at will from memory. To the contrary, what is actually stored in memory and what is retrieved from memory in fashioning an attitude response more than likely will change dynamically over time, in response to both contextual and persuasive cues. Although we view attitudes as evaluations that are stored in memory, we certainly do not assume a static or fixed memory trace that is inevitably retrieved.

pressions seem to constitute a mild or partial repeated-"thought" manipulation that might result in polarization of subsequent responses.

Although Powell and Fazio's (1984) primary goal was to examine the effects of repeated attitude expressions on the facility of subsequent responses, they also examined effects on the extremity of subsequent responses. Although they failed to present the relevant means, they reported in a footnote that repeated expressions had no effect on the extremity of subsequent responses. We believe, however, that this failure to find support for the hypothesis that repeated expressions affect the extremity of attitude responses does not definitively argue against the hypothesis. As explained elsewhere (Downing & Judd, 1990), the failure to find effects in this study was likely due to the fact that all attitude responses were given on scales for which subjects might well remember the approximate extremity of their earlier responses. Consistency demands thus may have caused subsequent responses to remain approximately the same as those given earlier. Downing and Judd recently showed a reliable extremity effect of repeated expressions when the initial expressions were given using a forced-choice, dichotomous response format, in which subjects expressed only the valence of their attitude, not its extremity. Thus, in spite of the Powell and Fazio results, there now exists empirical support for the hypothesis that repeating attitude responses will affect their extremity.

Our second and third studies were designed to show that this sort of response polarization would generalize across attitude responses that were linked or related in long-term memory. Thus we presumed that when one attitude was activated in memory, not only would it become relatively more extreme (as demonstrated by Downing & Judd, 1990) but also that the spreading activation would lead to the polarization of other linked attitudes through spreading activation.

### Study 1

In this first study, we examined whether attitudinal responses to an object would be facilitated by our first asking a person to report another attitude to which the first was linked in long-term memory. To accomplish this, subjects were asked to provide an evaluative judgment of each of a series of attitude objects as quickly and as accurately as possible. The attitude object and the evaluative response scale varied from trial to trial; judgment latencies were recorded. We viewed response latency as a measure of attitude activation and therefore expected that judgments would be reported more quickly when the previous stimulus items tapped linked attitudes than when they tapped unlinked attitudes.

### Method

**Subjects.** Subjects were 169 undergraduates at the University of Colorado, 104 women and 65 men. The majority of subjects (129) participated in partial fulfillment of an introductory psychology course requirement. The remaining 40 subjects were solicited from sign-up sheets placed in the lobby of the psychology building; they were paid \$5 for their participation.

**Procedure.** Subjects arrived in the laboratory and were seated in front of a computer screen and button box. The button box had two

buttons, one labeled good/pleasant/like and the other labeled bad/unpleasant/dislike. Subjects were told that they would see some names of things (like football teams, rock stars, and political issues) on the screen and that their job was to evaluate each one as quickly and as accurately as they could by pressing one of the two buttons. They were also told that on each screen, they would be shown which judgment was called for—that is, whether the choice was good/bad, pleasant/unpleasant, or like/dislike. Subjects did not know how many trials there would be. After 36 trials were completed, the computer screen went blank, and further instructions were provided by the experimenter.

At this point, subjects filled out a questionnaire containing a variety of 7-point rating scales. First, they were asked to indicate their attitude on each of four critical political issues on scales ranging from *strongly oppose* (1) to *strongly favor* (7). These issues are described in the next section where we describe the stimulus materials. Subjects also rated how personally important each attitude was to them.

Next, subjects answered 12 questions of the following form: "If you knew where someone stood on Issue A, how confident would you be in predicting where he or she stood on Issue B?" All possible pairs of the four issues were substituted for Issues A and B. Thus, each issue appeared as Issue A with each other issue as B. The response scale for these 12 questions ranged from *very confident* (1) to *not at all confident* (7). As described later, these judgments were thought to reveal implicational links between different attitudes that subjects might store in memory.

Finally, subjects answered multiple-choice political knowledge questions designed to tap their knowledge of current political events and actors. These questions had been used in earlier work to assess political expertise (Lusk & Judd, 1988).

**Stimulus items.** The first 30 timed evaluation trials were practice trials intended to familiarize subjects with the task. On these trials, stimulus items were nonpolitical attitude objects (e.g., the Denver Broncos, Elvis Presley, psychology courses, the University of Nebraska). Individual stimulus items appeared with varying frequency during these trials; some sequential trials consisted of identical stimulus items. The response option pair (good/bad, pleasant/unpleasant, and like/dislike) varied randomly from trial to trial, although positive responses were always associated with one button and negative responses were always associated with the other.

On the last six trials, the stimulus items were political issues, chosen from the following set: nuclear weapons freeze, nuclear test ban, equal rights amendment, and right to abortion. Each subject saw only two of these issues, one for Trials 31 through 33 and the other for Trials 34 through 36. During Trials 31 through 33, the first issue was evaluated using all three response-option pairs; during Trials 34 through 36, the second issue was evaluated using all three response-option pairs. The order of the response options within each set of three trials varied between subjects.

Subjects were randomly assigned to issue pair and to the order in which the issues were evaluated. Thus, during the last six trials, each subject saw one of six possible issue pairs in one of two possible orders. Of the six issue pairs, we judged two to involve issues that should have been related in an attitude structure (nuclear weapons freeze and nuclear test ban; equal rights amendment and right to abortion). We considered the other four pairs to involve issues that were unlikely to be linked in long-term memory. Manipulation-check data that are discussed later confirmed these judgments about whether pairs of issues were related. The analysis we report examined response latencies on

<sup>2</sup> To remove positive skew in the raw latencies, we examined log-transformed latencies. We applied an inverse log transformation to the means reported in the text and figures to put them back in the millisecond metric. Analyses of the raw response latencies produced results essentially identical to those reported in the text.

the second issue seen as a function of whether the stimulus issue on trials 31 through 33 was related to the issue presented subsequently.<sup>2</sup> Because subjects were randomly assigned to the six pairs of issues, specific issues and pairs of issues were unconfounded with whether linked or related pairs were presented.

### Results

To test our assumption that issues within the two sets (i.e., two nuclear issues and two women's issues) were linked in memory and that pairs of issues from different sets were linked less strongly, we examined subjects' confidence rating of inferring a person's attitude on one issue from their attitude on another issue. Across pairs of issues and subjects, the mean confidence rating for within-set issue pairs was 2.20, and for between-set pairs, it was 4.70. The difference between these two values was highly reliable,  $F(1, 168) = 592.10, p < .001$ . Furthermore, the within-set issue pairs all had mean confidence ratings at least 1.8 units less than any of the means for the between-sets pairs. Thus, subjects reported much more confidence in predicting attitudes within sets than between sets. In earlier theoretical work (Judd & Krosnick, 1989), we argued that links between attitudes in a long-term memory structure reflect both patterns of spreading activation and information about implicational relations between pairs of linked attitudes. These implicational relations concern one's awareness that a person's espousal of a position on one issue has implications for what that person should espouse on another linked issue. The confidence measure was a direct assessment of these implicational relations. Now that we have shown that within-set issues share implicational relations more strongly than between-set issues, it remains to be seen whether an attitude response on one issue can facilitate a response on another issue within sets more than between sets. This amounts to a test of the hypothesis that links in attitude structures reflect both patterns of spreading activation and implicational relations between the represented attitudes.

Our primary question about response facilitation after a linked priming issue was examined by analyzing the judgment latencies on Trial 34 as a function of two between-subjects variables: sex of subject and whether the preceding three trials involved a related (within-set) issue or an unrelated (between-sets) one. Average latency of responses on Trials 31 through 33 was entered in this analysis as a covariate.

Figure 1 contains the mean response latencies for Trials 31 through 36 as a function of whether issue pairs on the two sets of trials were related. As these means suggest, responses on Trial 34 were reliably faster if the issue judged during the preceding three trials was a related rather than an unrelated one,  $F(1, 166) = 3.92, p < .05$ . No effect of sex of subject was found, nor did the predicted response facilitation depend on subject's sex. We conducted similar analyses on response latencies for Trials 35 and 36; as expected, no differences were found on those trials as a function of whether the issue judged on Trials 31 through 33 was a related one or not. This is hardly surprising because, as the mean latencies on Trials 31 through 33 suggest, judging an issue the first time has a dramatic effect on the ease with which that same issue is subsequently judged (Powell & Fazio, 1984). Thus, on subsequent trials the earlier judgment to the same issue serves as a priming stimulus, overwhelming the

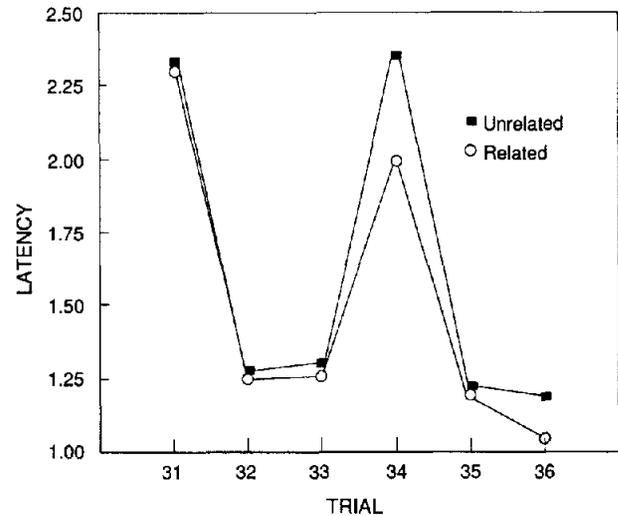


Figure 1. Mean judgmental latencies.

effect of whatever issue was seen on even earlier trials. A further analysis revealed that the facilitating effect of seeing a related issue on Trials 31 through 33 did not depend on which of the three response options was presented to subjects on Trial 34.

In addition to this temporary facilitation of an attitude response because of an immediately prior response to a linked attitude, we wished to document chronic differences in the accessibility of the attitude responses and to determine whether these chronic and temporary accessibility effects combine additively or interactively, following the work of Bargh, Bond, Lombardi, and Tota (1986). We expected attitudes that were more extreme to be chronically more accessible, a relationship that Fazio has documented in his research (Fazio et al., 1986; Fazio & Williams, 1986). The correlation between attitude extremity and response latency in our data equaled  $-.27, p < .01$ .

The magnitude of the temporary priming effect may depend on the chronic accessibility of either the priming attitude or the target attitude. To assess these effects, two separate interactive models were estimated. In the first, we regressed Trial 34 judgment latency on the extremity of the attitude measured on Trials 31 through 33, whether that attitude was linked to the attitude measured on Trial 34, and their interaction, again controlling for average latencies on the previous three trials. The interaction proved to be reliable,  $F(1, 164) = 4.22, p < .05$ . The prediction functions generated by this model are graphed in Figure 2. As this graph shows, the facilitating effect of reporting a linked attitude emerges only if the priming attitude is relatively extreme. Thus, the degree to which an attitude response can facilitate another attitude response that is linked in a memory structure apparently depends on the relative strength or extremity of the priming attitude.

A second parallel model was specified to examine whether the magnitude of the priming effect depended on the extremity of the primed or target attitude. The interaction in this analysis did not approach statistical significance. Thus the extremity of the priming attitude apparently moderates the degree to which it will prime a related target attitude, but the extremity of the

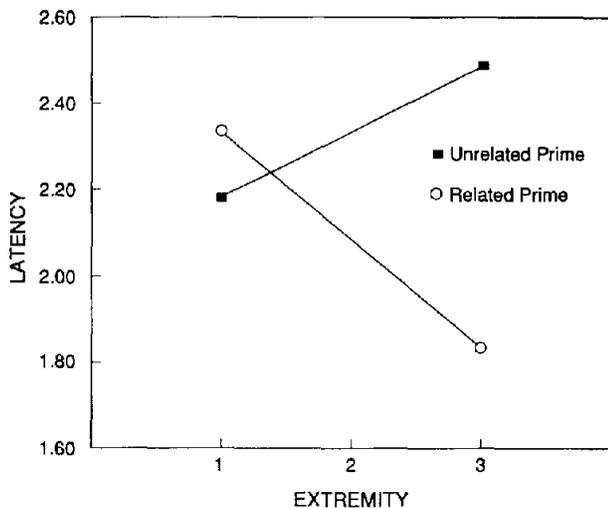


Figure 2. Latency as a function of priming issue extremity.

target attitude itself serves no parallel moderating role. Consistent with the conclusions of Bargh et al. (1986) in the person perception domain, chronically more accessible responses apparently are no more easily primed than less accessible responses, although the extent to which a prior response can serve as a prime or can generate spreading activation does seem to depend on its own extremity or accessibility.

### Discussion

These results indicate that reporting an attitude on one issue facilitates subsequent reports of related or linked attitudes. Thus, as they are stored in memory, attitudes seem to have the ability to prime one another when they are seen as sharing implicational relations. In other words, patterns of spreading activation seem to be associated with the implicational links that define an attitude structure. Also, the degree to which one attitude response can prime another apparently depends on the strength of the priming attitude. However, the strength of the target attitude, although related to response latency on that attitude, does not moderate the magnitude of the priming effect.

These results are quite consistent with our earlier speculations about the dynamic properties of attitude structures. Thinking about one attitude seems to increase the level of activation of attitudes that are linked in a long-term memory structure, thereby facilitating subsequent responses to those linked attitudes. We acknowledge, however, that these results are also consistent with a semantic priming effect, in which comprehension of one phrase or stimulus is facilitated by using a priming stimulus that is semantically related to the target stimulus. Thus, the facilitating effect we document as a function of a related prime may simply be due to an effect of the priming stimulus on the speed with which the target stimulus is comprehended, regardless of the type of judgment, evaluative or not, made in response to the target stimulus item. The priming effect might then be found with semantic or nonattitude judgment tasks as well.

A bit of evidence in the present results suggests, however, that

the priming effect we have demonstrated is uniquely tied to attitude responses and thereby revealing of attitude structures rather than simple semantic associations. If the facilitating effect of the prime is due entirely to semantic rather than attitudinal associations, we see little reason why the magnitude of the priming effect should depend on the extremity of the attitude toward the priming stimulus issue. If the facilitation we have documented was entirely due to semantic priming, then we suspect that it should be obtained for all subjects rather than for just those whose evaluations of the priming issue are relatively extreme.

Nevertheless, it would strengthen our argument about the role of spreading activation within attitudinal structures considerably if we could identify another effect of such activation that could be tied uniquely to attitude responses. As argued in the Introduction, there is both theoretical and empirical support for the hypothesis that activation of an attitude increases the extremity of a subsequently generated attitude response toward the same attitude object. Thus, Downing and Judd (1990) have shown that simply responding to an attitude item a single time results in greater extremity of a subsequent response to that same item. In Studies 2 and 3, our goal was to show that this sort of polarization could occur across attitude issues that were linked in an attitude memory structure. Study 2 examined responses to two different attitude issues that were known to be linked. We simply varied the order in which responses were given to the two issues, attempting to show that second responses would be more extreme than first responses, collapsing across which issue was first and which was second. The third study examined this same hypothesis in a more extensive design, varying not only the issue sequence but also whether the two issues that were responded to were linked.

### Study 2

#### Method

**Subjects.** As a means of fulfilling a course requirement, 59 introductory psychology students participated in this study, 29 men and 30 women. Subjects participated in groups of 4 to 6.

**Procedure.** Subjects completed questionnaires that included questions on two social issues, capital punishment and handgun control.<sup>3</sup> Two forms of the questionnaire were prepared. One form asked the questions about capital punishment before the questions about handgun control. The other form asked the handgun control questions first. Subjects were randomly assigned to one issue sequence or the other.

Two different kinds of questions were asked on each issue. Subjects first reported their own attitudes on the issue on a 7-point pro/anti

<sup>3</sup> To select an issue pair for this study, we gathered pretest data about implicational links between all possible pairs of six issues, just as in Study 1. These six issues were capital punishment, handgun control, school busing, tuition increases on campus, a proposal to extend the school semester, and a cutback in varsity sports on campus. During a single experimental session, 24 subjects reported their confidence in predicting someone's attitude on one issue given knowledge of their attitude on another issue. Responses were made for all possible pairs of the six issues on a 7-point scale ranging from *not at all confident* (1) to *very confident* (7). Of the pairs of issues, the highest average confidence ratings were given to the capital punishment-handgun control pair ( $M = 4.75$ ). This pair was therefore selected for use in Study 2.

self-rating scale. Second, 6 hypothetical persons were described in short phrases (e.g., a 38-year-old lawyer in Denver), and subjects judged the likely position of each person on the same 7-point pro/anti rating scale. These latter judgments were included to increase the amount of time that the subject spent thinking about their attitude on the first issue prior to responding to the second one.

### Results

To determine whether attitude self-ratings became more extreme as a function of issue order, a three-way mixed-model analysis of variance was conducted, treating issue sequence (capital punishment first versus handgun control first) and subject sex as the between-subjects factors and order (first versus second issue) as the within-subject factor. The dependent variable in this analysis was the extremity of subjects' self-ratings, defined as the absolute value of deviations from the scale midpoint.

This analysis revealed a reliable order effect, as predicted. When an issue was considered as the second issue, self-ratings were reliably more extreme than when an issue was considered first,  $F(1, 55) = 7.26, p < .01$ . Because each issue was considered first by half of the subjects and second by the other half, this order effect was not confounded with issue. There was a marginally reliable Order  $\times$  Sequence interaction,  $F(1, 55) = 2.97, p = .09$ . This effect is equivalent to a main effect for issue; subjects gave somewhat more extreme self-ratings on the issue of capital punishment than on the handgun control issue. The relevant means, broken down by sequence and order, are presented in the top half of Table 1. Finally, there was a main effect for sex,  $F(1, 55) = 5.33, p < .025$ , with men providing more extreme responses than women. No interactions involving subject sex were reliable.

A potential problem with this analysis was that the extremity shift on the second issue that we demonstrated may have resulted from a more simple directional shift in self-ratings. That is, the majority of subjects on these two issues may have become more liberal, for instance, on the second issue as a function of responding to questions on the first issue, rather than more extreme. If subjects on average tended to be somewhat liberal on the two issues, then this directional shift would emerge as an extremity shift. To overcome this potential problem, we repeated the analyses using subjects' actual self-ratings on the two issues as a repeated measures covariate (Judd & McClelland,

1989). Thus, we analyzed extremity scores as a function of sex, sequence, and order, controlling for the actual self-ratings subjects gave themselves. If the extremity differences we showed as a result of order were due to directional shifts, then they should disappear when the actual self-ratings are controlled.

Both the order,  $F(1, 54) = 8.88, p < .005$ , and sex,  $F(1, 54) = 5.48, p < .025$ , main effects remained reliable in this analysis of covariance. Thus, the extremity shift on the second issue that emerged from the preceding analysis amounted to a shift away from the scale midpoint in both directions rather than a directional shift. The Order  $\times$  Sequence (i.e., issue) effect was no longer reliable under this analysis, suggesting that greater extremity on the issue of capital punishment really is due to an issue difference in mean self-rating rather than to an extremity difference per se. The relevant adjusted cell means are included in the bottom half of Table 1.

### Discussion

As expected, these results suggest that providing an attitude response on one issue tends to increase the extremity of responses to a second linked attitude issue. Our argument is that this occurs through the spreading of activation between linked attitudes and the effect of that activation on response extremity.

The obvious shortcoming of this study arises from the fact that all subjects were presented with pairs of linked or related issues, varying only the order of those issues. Because the degree of linkage between issues did not vary, we cannot be sure that the extremity shifts observed here would not have occurred if the attitudes involved were not linked in long-term memory. In our third study, we overcame this problem by varying whether subjects answered questions about two linked issues or two unlinked issues.

## Study 3

### Method

*Subjects.* Subjects were 53 female and 52 male undergraduates at Western State College of Colorado who participated in fulfillment of an introductory psychology course requirement.

*Stimulus materials and procedure.* All procedures in this study were identical to those of Study 2. However, in Study 3, two sets of two linked issues were used. The two attitude issues in one set (the economic issues set) were reduction of corporate taxes and regulations and end of federal rent subsidies for the poor. The other pair of issues (the women's issues set) was passage of the Equal Rights Amendment and more women working outside the home.<sup>4</sup> Subjects filled out exactly the same set of questions as they had in Study 2. This time, however, with four issues, there were 12 possible pairs of issues (counting different orders) that could be used in constructing questionnaires. Of these

Table 1  
Mean Extremity of Attitude Self-Rating  
as a Function of Order and Sequence

Issue order	Sequence	
	Capital punishment 1st	Handgun control 1st
Unadjusted		
1st	1.63	1.28
2nd	1.83	1.93
Adjusted		
1st	1.56	1.35
2nd	1.86	1.91

<sup>4</sup> We did not collect pretest data on confidence of generalization between pairs of issues. However, correlational data from the attitude self-ratings in this study support the claim that issues within these sets are more likely to be seen as related than are issues between sets. The correlations between taxes and rent subsidies attitudes was .31, and the correlation between attitudes toward the Equal Rights Amendment and working women was .46. In contrast, the average correlation between issues from different sets was  $-.02$ .

pairs, 4 involved within-set or linked issue pairs and 8 involved between-sets or unlinked issue pairs. Subjects were randomly assigned to these 12 possible pairs.

### Results

Extremity of self-ratings was analyzed using a four-way mixed-model analysis of variance. The three between-subjects factors were sex of subject (sex), whether the issue pair was linked or not (link), and whether the second issue came from Set 1 or Set 2 (issue). The within-subject factor was order (first versus second). Our basic prediction was that the order effect would depend on whether subjects responded to a linked pair of issues. The main effect for order in the analysis was not significant. The predicted Order  $\times$  Link interaction was significant,  $F(1, 97) = 3.28, p < .04$ .<sup>5</sup> The relevant means for this effect are presented in the top half of Table 2. As these means indicate, when subjects saw linked issues, self-ratings on the second issue were more extreme than they were on the first issue. With unlinked issues, on the other hand, self-ratings tended to be slightly more extreme on the first issue than on the second.

A number of other interactions involving the order factor were also reliable. Both the Order  $\times$  Issue,  $F(1, 97) = 13.37, p < .001$ , and the Order  $\times$  Issue  $\times$  Link,  $F(1, 97) = 5.11, p < .03$ , interactions were reliable. The top half of Table 3 contains the relevant means for interpreting these two interactions.

The best way to understand these two effects is to realize that they were produced by two different tendencies in the data. First, self-ratings on the women's issues were more extreme on average than they were on the economic issues, and second, as already reported, there was an extremity shift on the second issue rated in the linked condition, regardless of the issue set rated. To see how these two effects were responsible for these interactions, consider the means in the top half of Table 3. These means are broken down by order, second issue, and whether the two issues were linked or unlinked. The table also indicates, next to each mean, whether the particular mean extremity value is from the women's issues or the economic ones.

When dealing with subjects who saw linked issues, the second issue (whether it came from the women's issue set or the economic issue set) concerned the same general issue domain as the first issue they responded to. In these four cells of the top half of Table 3, we see that the self-ratings on the second issue are both more extreme than on the first issue and that, in addition, self-ratings on the women's issues are more extreme than on the economic issues. When we get to the unlinked condi-

Table 2  
Mean Extremity of Attitude Self-Rating  
as a Function of Order and Link

Issue order	Issues	
	Linked	Unlinked
Unadjusted		
1st	1.55	1.60
2nd	1.88	1.51
Adjusted		
1st	1.56	1.67
2nd	1.80	1.52

Table 3  
Mean Extremity of Attitude Self-Rating as a Function  
of Order, Link, and Issue Set

Issue order	2nd issue			
	Linked		Unlinked	
	Economic	Women	Economic	Women
Unadjusted				
1st	1.43 (E)	1.67 (W)	1.96 (W)	1.23 (E)
2nd	1.61 (E)	2.15 (W)	1.21 (E)	1.81 (W)
Adjusted				
1st	1.60 (E)	1.49 (W)	1.71 (W)	1.67 (E)
2nd	1.77 (E)	1.84 (W)	1.39 (E)	1.63 (W)

Note. The Es and Ws in parentheses indicate issue set (economic or women) that was rated.

tions, if an economic issue was second in order, a women's issue was responded to in first order, and vice versa. In these four cells of the top half of Table 3, we see that self-ratings on the women's issues, regardless of whether they were responded to first or second, were more extreme than self-ratings on the economic issues. In these four cells, there is absolutely no evidence of an extremity shift for second issues.

The final reliable effect in this analysis was a Sex  $\times$  Order interaction,  $F(1, 97) = 12.10, p < .001$ . Inexplicably, women became on average more extreme on the second issue than on the first, but men became slightly less extreme. Note that this interaction did not in turn depend on link,  $F(1, 97) = 0.01, p > .5$ . Thus, the Link  $\times$  Order interaction that we predicted did not vary with gender.

We also analyzed these extremity data including actual self-ratings as a within-subject covariate. As explained in Study 2, this permitted us to separate out extremity differences between first and second issues from directional shifts. In this analysis, the predicted Link  $\times$  Order interaction was reliable,  $F(1, 96) = 5.04, p < .05$ . Consistent with the analysis reported earlier, self-ratings on the second issue were relatively more extreme than on the first issue for subjects exposed to linked issues, even when their actual self-ratings were controlled. Subjects in the unlinked condition tended to make more extreme self-ratings on the first issue than on the second. The relevant adjusted cell means are reported in the bottom half of Table 2.

The only other reliable effect in this analysis of covariance was the Sex  $\times$  Order interaction that we also observed in the analysis of variance of these data,  $F(1, 96) = 12.94, p < .001$ ; women became more extreme on the second issue, and men became on average slightly less extreme on the second issue. Again, this interaction did not in turn depend on whether the first and second issues were linked.

<sup>5</sup> The reported probability here was from a one-tailed test of the hypothesis, motivated by the fact that we were examining a hypothesized effect that simply extended the results previously obtained in Study 2.

Both interactions involving issue that had been reliable in the earlier analysis were no longer reliable when self-ratings were controlled. Therefore, the issue differences reported earlier, with more extreme responses given to the issues in the women's set than in the economic set, apparently amount to directional differences in self-ratings between the two sets. Again, the relevant adjusted cell means are given in the bottom half of Table 3.

### General Discussion

This research was guided by the assumption that attitudes are evaluations of attitude objects that may be stored in memory along with other bits of information about those objects. They are abstracted judgments that may be based on beliefs about the attitude objects, prior experience with them, affective reactions they invoke, and persuasive communications received from others (Zanna & Rempel, 1988). However they are produced, they are stored in memory with varying strength and accessibility and are embedded in a memory structure.

Our fundamental argument is that such a structure of attitudes in long-term memory ought to have dynamic properties concerning information processing and retrieval, properties that characterize the structure of other nonevaluative pieces of information and judgments that are stored in long-term memory. The dynamic property documented in these studies is spreading activation. The notion of spreading activation posits that activation of one bit of information in memory increases the probability of activation of another piece of information in memory to the extent that the two pieces of information are linked in a memory structure. Accordingly, when a given attitude is retrieved from memory, linked attitudes should become activated.

We used two different procedures to demonstrate these ideas. In Study 1, we showed that answering attitude questions about one political issue increased the accessibility of attitudes on a second, related issue. This effect emerged over and above chronic differences in the accessibility of the second attitude. The degree to which reporting one attitude made another attitude more accessible depended on whether the two issues were linked to each other and on the extremity of the attitude on the first issue.

In Studies 2 and 3, we demonstrated an effect of spreading activation that seems uniquely tied to attitude responses. Downing and Judd (1990) showed that providing an attitude response increased the extremity of that attitude for the responder. If activation spreads between attitudes, then providing a response on one issue should lead to greater extremity of a second, linked attitude. Studies 2 and 3 demonstrated precisely this effect.

Although the results of Study 1 may be attributed to general semantic priming that might occur regardless of whether an attitude response is asked of subjects, the results of Studies 2 and 3 are less susceptible to this interpretation. Taken together, then, the combined evidence of these studies makes a compelling case for the view that attitudes are stored in long-term memory and that attitude structure can be usefully thought of as the structure of these in memory.

One area that obviously demands further attention in specifying the nature and organization of an attitude structure in mem-

ory concerns procedures for identifying links between stored attitudes. In the present work, we argued that subjects' perceptions of judgmental implications between issues are revealing of links along which activation can spread in a memory structure. But we have identified such judgmental implications between issues only at the aggregate level, rather than at the level of the individual subject. It would be useful to elicit information about links between issues seen by an individual subject and use this information to explore the spread of activation between attitudes.

One danger in identifying linked attitude issues is the confusion between different issues that are linked in memory and simply alternative measures of the same attitude issue. Spreading activation between two supposedly different attitudes would hardly be surprising if in fact we were really only measuring in two different ways the same evaluation. This is actually a rather subtle issue that we could not treat in detail in the present article. Suffice it to say, however, that the pattern of correlations between different attitudes in the present studies did not support the hypothesis that our linked attitudes were simply alternative measures of the same underlying attitude construct. The correlations between our linked attitudes lie in the .30 to .50 range. We would expect higher correlations if we were simply assessing alternative measures of the same underlying attitude.

We believe that our results replicate and extend findings in the cognitive psychology literature regarding spreading activation in associative networks. We argued that evaluative information as well as semantic information is stored in an associative network and that the notion of spreading activation, well documented in semantic network models, is also an appropriate metaphor for network models in which evaluative information is stored. We wish to underline, however, that the sort of associative network model that we used in this article remains only a metaphor that seems to handle nicely the present set of theoretical ideas. In the literature on representation in cognitive psychology, other representational metaphors have certainly been proposed. We strongly suspect that our results could be incorporated into these other metaphors as well. Thus, we are not suggesting that we have identified a unique structural representation for attitudes. We are simply saying that the present data suggest that attitudes are related in memory in some sort of a structure and that this structure has dynamic properties and implications.

The dynamic property of increased accessibility of linked attitudes shown in Study 1 is compatible with all network representation models. Activation serves to increase the accessibility of a given node in a memory structure; spreading activation makes linked nodes more accessible as well. Our results in the second and third studies are somewhat more surprising, given existing network representation models, and it seems appropriate to speculate about the exact mechanisms that may induce polarization of responses through activation of an attitude in a memory structure. Let us start most simply by assuming the Study 1 results: Activation of an attitude response increases the accessibility of that response in the future. In Fazio's terms (1989; Powell & Fazio, 1984), previous responses to an item strengthen the object-evaluation link in memory and make subsequent attitude responses easier.

A number of studies have now shown a reliable relationship

between the latency of an attitude response and the extremity of that response (Downing & Judd, 1990; Fazio & Williams, 1986; Judd & Kulik, 1980; Powell & Fazio, 1984), although it has generally been assumed that these two variables are measures of different theoretical constructs. Latency is presumed to be an indicator of accessibility, whereas extremity has usually been seen as an indicator of the strength or intensity of the affective reaction to the attitude object. We suspect, however, that when subjects think about the intensity of their affective reaction to an object (i.e., when forming a judgment of the extremity of their response), they pay attention in part to the speed with which that reaction comes to mind. Thus, we suspect that extremity or intensity judgments are in part influenced by accessibility. Within the confines of our spreading activation model, we believe most simply that spreading activation results in increased accessibility of linked attitude responses. When subjects are then asked to record the intensity or extremity of their responses to a linked attitude issue, the increased accessibility affects the judged extremity. Thus, strictly speaking, spreading activation in our model has a direct effect on accessibility. We suspect that the polarization effect is an indirect one.

In addition to their implications for work on the representation of affectively charged information in memory and for social cognition more broadly, our results are clearly relevant to the extensive literature in both psychology and political science on the structure of political attitudes. Political scientists have long debated whether political attitudes in the general public are structured at all (Campbell, Converse, Miller, & Stokes, 1960; Converse, 1964; Nie, Verba, & Petrocik, 1979). Some have suggested that survey responses to political attitude items by and large reflect "nonattitudes" (Converse, 1970), implying that very little structure underlies the political attitudes of most of the citizenry. Others have appropriately suggested that the degree of such structure may vary over time as political issues become more or less salient or vivid to the public's eye.

As we stated in the Introduction, the degree of structure between different attitudes has generally been assessed by examining correlations or covariances between attitudes on different issues. Although such correlations almost certainly do indicate interattitude structure to some degree, there are many reasons why they should certainly not be used as the sole indicator for inferring such structure. What we hope to have shown is that attitude structures have dynamic properties in addition to the static between-attitudes predictions that they permit one to make. Rather than attempting to interpret whether attitudes are structured by examining the structure of between-subjects correlation matrixes and assuming that the matrix structure is isomorphic with the attitude structure, it seems fruitful to assess attitude structures as they exist in individual's long-term memories, exploring their dynamic implications for information processing, retrieval, and judgment. To address the long-standing issue of how the degree of structure of political attitudes varies over time and across respondents, our research suggests that one might fruitfully explore differences in the dynamic properties of attitude structure in addition to differences in between-subjects correlation matrixes.

The present results also contribute to the growing literature on questionnaire design in survey measurement of public opinion on social and political issues. Recently, there has been a

great deal of interest in context or order effects in surveys (e.g., Kalton, Collins, & Brook, 1978; Schuman & Presser, 1981; Tourangeau & Rasinski, 1988). Many experimental investigations have now demonstrated that answers to one survey question can be altered by varying the content of questions that are asked previously in the questionnaire. Nearly all of these studies have demonstrated directional shifts in responses as a function of question order, such as changes in the proportion of respondents expressing liberal or conservative views on an issue (DeLamater & MacCorquodale, 1975; McFarland, 1981; Rugg & Cantril, 1944; Turner & Krauss, 1978). The present studies document a new type of context effect, an effect on attitude extremity. We have shown that reports of a given political attitude will be more extreme if prior questions in a survey interview asked about attitudes to which the focal attitude is linked.

The effects of asking prior questions on making later attitude responses more extreme may be offset by the likely tendency of respondents to grow tired over the course of a long interview and devote less thought to their responses (Schuman & Presser, 1981). Later responses in a survey tend to be less extreme than those that come earlier, presumably as the result of respondent fatigue (Kraut, Wolfson, & Rothenberg, 1975). This effect of fatigue may operate in addition to the opposite tendency for later responses to become more polarized as a function of prior thought being devoted to linked attitudes, as documented in our research.

Our research contributes to the literature on context effects in a second way as well. Although many such effects have been documented in past studies, survey researchers are at a relatively early stage in terms of understanding the psychological processes that mediate these effects. Our work suggests that one effect of asking survey respondents a political attitude question is to increase the accessibility of attitudes on related political issues. Such increases in accessibility may increase the impact that these attitudes have on responses to subsequent questions in a survey, thereby altering the directions of attitudes that are expressed.

Finally, our results may help to solve a troubling puzzle in the questionnaire design literature. Extensive investigations have now been conducted trying to identify the people who are most susceptible to context effects and other sorts of response effects in surveys. One possibility is that respondents with relatively little cognitive sophistication may be most easily influenced by question variations, but this variable has succeeded in identifying highly susceptible people in the cases of only a few response effects (see Krosnick & Alwin, 1987; Schuman & Presser, 1981). A second variable that has been explored is the strength of the attitude being measured by the questions that show context effects; reports of weaker attitudes were presumed to be more affected by question or context alterations. However, this has turned out to be true in the case of only one sort of response effect (Krosnick & Schuman, 1988). The results reported here suggest that this latter research has been on the right track but has measured the strength of the wrong attitude. We found that asking an attitude question is only likely to increase the accessibility of linked attitudes when that attitude is itself relatively extreme and, presumably, strong. Therefore, instead of measuring the strength of the attitude measured later in a questionnaire, it might be useful to measure the strength of the attitude

measured earlier. Context effects may be strongest among people for whom that attitude is relatively strong.

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