Journal of Personality and Social Psychology
2004, Vol. 87, No. 6, 779–795

0022-3514/04/$12.00 DOI: 10.1037/0022-3514.87.6.779

Attitudes in the Social Context: The Impact of Social Network Composition on Individual-Level Attitude Strength

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Four studies, using both experimental and correlational designs, explored the implications of being embedded within attitudinally congruent versus attitudinally heterogeneous social networks for individual-level attitude strength. Individuals embedded within congruent social networks (i.e., made up of others with similar views) were more resistant to attitude change than were individuals embedded within heterogeneous social networks (i.e., made up of others with a range of views). Mediational evidence suggests that attitudinally congruous social networks may increase attitude strength by decreasing attitudinal ambivalence and perhaps by increasing the certainty with which people hold their attitudes. These results suggest that features of the social context in which an attitude is held have important implications for individual-level attitude strength.

People do not form or maintain their attitudes in isolation—they do so within a rich social context. Attitudes are held by people who are embedded within elaborate social networks, by people who occupy specific social roles, by people who stand in particular power relations to one another, and by people who identify with certain social groups or categories. It seems a rather obvious point, then, that features of the social context in which people are embedded are likely to influence attitudinal properties and processes.

Indeed, researchers of the 1940s and 1950s devoted a good deal of attention to the structure and composition of the social context in which an attitude holder was situated and the impact of these contextual factors on attitude processes (e.g., Asch, 1956; Cartwright & Harary, 1956; Festinger, 1954; Festinger, Schachter, & Back, 1950; Heider, 1946; Newcomb, 1943; Schachter, 1951). In more recent decades, however, most attitude researchers have turned their attention to intraindividual attributes and processes—things that go on inside the heads of individual attitude holders—and interest in the social context in which attitudes are formed and maintained has waned. In fact, in their extensive review of the literature, Eagly and Chaiken (1993) cited the insufficient consideration of the social context of attitudes as one of the "serious omissions and limitations" of the contemporary attitude literature (p. 682).

Perhaps in part in response to this admonition, the attitude literature has witnessed a recent resurgence of research examining the effects of contextual factors on attitude processes. Increasingly, attitude researchers have begun to explore the impact of factors such as group membership and social identity, social roles, culture, and social norms (for a recent review, see Terry & Hogg, 2000). The current research follows in this spirit by exploring features of the immediate social environment in which people are situated and tracing their implications for attitude properties and processes. In particular, this work focused on the composition of the *social networks* in which people are embedded—that is, the webs of interpersonal relationships that link individuals to others in their social environment. We examined the impact of social network composition on the durability of people's attitudes and the psychological mechanisms through which features of social networks may affect individual-level attitude strength.

SOCIAL NETWORKS

The concept of a social network has been developed by sociologists and other social scientists to describe the structure of relational ties among actors in an environment (e.g., Burt, 1980; Burt & Minor, 1983; Marsden & Lin, 1982; Wasserman & Faust, 1994). *Actors* can be discrete individual, corporate, or collective social units, and *relational ties* are the links between pairs of actors. These ties can include kinship (e.g., parent–child), material transactions (e.g., proprietor–client), formal relations (e.g., employer–employee), or behavioral interaction (e.g., between friends), among others. Relational ties are channels for the transfer of resources, such as money, material goods, emotional support, or information. Rather than focusing on attributes of autonomous actors, social network analysts view characteristics of actors as arising at least in part from the properties of the relational systems in which they are embedded.

Like much prior research, we focus here on a particular type of social network: networks that are made up of the people with whom individuals maintain ongoing personal relationships and with whom they discuss important matters, often including friends,

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This research was supported by National Science Foundation Grant BCS-0242194 to Penny S. Visser. We thank Hart Blanton, Joel Cooper, Dale Miller, and Deborah Prentice for very helpful suggestions on an earlier version.

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family members, neighbors, and coworkers (e.g., Burt, 1984, 1985, 1990; Huckfeldt, Beck, Dalton, & Levine, 1995; Huckfeldt & Sprague, 1987, 1991; Marsden, 1987). Social networks of this sort vary along a number of dimensions (e.g., size, diversity of network members, strength of ties), and a great deal of research has explored the implications of these network features for various individual-level outcomes, including health (e.g., S. Cohen, 2001; Haines & Hurlbert, 1992), subjective well-being (e.g., Pinquart & Soerensen, 2000), loneliness (e.g., de Jong-Gierveld, 1987; Green, Richardson, Lago, & Schatten-Jones, 2001), and access to specific types of information (e.g., Eckert, 1988; Granovetter, 1973; Mor-Barak, Altschuler, & Durby, 1996; Wegener, 1991), among others.

In the current research, we focused on the attitudinal composition of people's social networks. Some people are embedded within networks made up of others who uniformly share their views on a particular issue, which we refer to as *attitudinally congruous networks*. Others' social networks are made up of people who hold a range of views, some with which they agree and others with which they disagree. We refer to these as *attitudinally heterogeneous networks*. In the work reported here, we examined the impact of the attitudinal composition of a person's social network on properties of his or her own attitudes.

Of course, the notion that people's attitudes may be influenced by the attitudes held by others in their social environment is not new (e.g., Cartwright & Harary, 1956; Festinger, 1954; Festinger et al., 1950; Heider, 1946; Newcomb, 1953; Schachter, 1951). Interpersonal persuasion, conformity, and structural balance are just some of the processes by which the attitudes held by individuals are likely to be shaped by the opinions of their social network members. And indeed, studies of social networks have yielded evidence consistent with these sorts of effects. In an extensive investigation of citizens and their social networks during a national election, for example, Huckfeldt and Sprague (1991) provided evidence consistent with the claim that people's candidate preferences are influenced by the views of their network members. They found that the candidate preferences of a person's social network members accounted for variance in the person's voting behavior, even after controlling for his or her political party identification and a host of demographic characteristics. Similarly, attitudes held by members of a person's social network have been shown to predict changes in his or her attitudes over time, again consistent with social influence processes (e.g., Kenny, 1994; MacKuen & Brown, 1987). This evidence suggests that people's political attitudes are socially structured, reflecting not only their own thoughts and feelings but the preferences of important others as well (e.g., Huckfeldt & Sprague, 1991).

ATTITUDE STRENGTH

To date, however, virtually all of this work has focused on the relation between social network composition and the valence of people's attitudes, and attitude researchers have long recognized that attitudes vary in other important ways as well. In particular, attitudes vary in strength—some attitudes are tremendously durable and consequential, whereas others are highly malleable and largely ineffectual. This distinction between strong and weak attitudes is central to the attitude literature, providing important conceptual leverage for determining when and how attitudes influence thinking and action.

A great deal of research has explored the specific features of attitudes that differentiate those that are strong from those that are weak, and roughly a dozen strength-related attitude features have been identified (for a review, see Petty & Krosnick, 1995). For example, attitudes tend to be stronger to the degree that they are (a) based on a substantial body of knowledge (e.g., Wood, 1982), (b) deemed important by the attitude holder (e.g., Krosnick, 1988), (c) held with great certainty (e.g., Budd, 1986), highly accessible in memory (e.g., Fazio, 1986), (d) evaluatively extreme (e.g., Osgood, Suci, & Tannenbaum, 1957), and (e) unconflicted (e.g., Kaplan, 1972). Although each of these attributes is related to the strength of an attitude, a growing body of evidence indicates that they are distinct constructs, none of which fully accounts for variability in attitude strength (e.g., Krosnick, Boninger, Chuang, Berent, & Carnot, 1993; Lavine, Huff, Wagner, & Sweeney, 1998; Visser, Krosnick, & Simmons, 2003).

As the above discussion implies, the focus within the attitude strength literature has been on intraindividual factors—attributes of a specific attitude that are associated with its strength. It is quite plausible, however, that features of the social context in which the attitude holder is situated may also influence attitude strength. In fact, although no direct evidence yet exists, several hypotheses about the impact of social network composition on individual-level attitude strength can be derived from existing social psychological theory and findings, and different theoretical frameworks imply a number of distinct psychological mechanisms through which social network composition may exert its effects.

SOCIAL NETWORK HETEROGENEITY AND DECREASED ATTITUDE STRENGTH

Informational Influence

A number of related theories suggest that attitudinal congruity or consensus within a person's social network will increase individual-level attitude strength. Social comparison theory, for example, suggests that because objective criteria are often lacking, people assess the correctness of many of their views by comparing their own attitudes to the attitudes of those around them (e.g., Festinger, 1950). More recent evidence suggests that even when objective information is readily available, people often pay more attention to and are more powerfully influenced by comparative information (e.g., Klein, 1997). According to social comparison theory, "an opinion, a belief, an attitude is 'correct,' 'valid,' and 'proper' to the extent that it is anchored in a group of people with similar beliefs, opinions, and attitudes" (Festinger, 1950, p. 272). Attitudes held with certainty are more durable than those held with less certainty (e.g., Gross, Holtz, & Miller, 1995). Thus, social network heterogeneity may decrease individual-level attitude strength by reducing the confidence that people have in the correctness of their attitudes.

Normative Influence

In addition to providing information about the state of reality, reference groups also provide information about what attitudes,

beliefs, and behaviors are deemed appropriate or desirable (e.g., Deutsch & Gerard, 1955; Kelley, 1952). Conformity to the standards of the reference group brings with it social rewards (e.g., acceptance, liking), and deviation from these standards can elicit social sanctions (rejection, derogation). This suggests a second mechanism through which attitudinally congruous social networks may confer individual-level attitude strength: by exerting social constraints on the attitudes that network members hold and express. People surrounded by significant others who share a particular attitude may be socially rewarded for expressing views that reinforce the majority opinion, and they may be socially punished for expressing divergent views (e.g., Schachter, 1951). Attitudinally congruous social networks, then, may cement an individual's attitudes by raising the interpersonal costs of attitude change.

Ambivalence

Social network composition may also influence attitude strength by regulating the ambivalence an individual experiences with regard to an attitude object. Although traditionally conceptualized as *intrapsychic evaluative tension* (i.e., simultaneous positive and negative reactions to an object), recent evidence suggests that the subjective experience of ambivalence can arise from interpersonal evaluative tension as well (Priester & Petty, 2001). That is, even when their own reactions to an object are univalent, people can experience ambivalence if important others hold views that are discrepant from their own. Ambivalence is negatively associated with attitude strength (e.g., Armitage & Connor, 2001). Thus, attitudinally heterogeneous networks may weaken attitudes by increasing ambivalence toward an object.

Attitude Expression

People embedded within attitudinally congruous social networks may be more inclined to express their views than are people in heterogeneous networks, for whom such expressions may create discord. Publicly expressing one's views and otherwise behaviorally committing to them renders attitudes stronger (e.g., Brehm & Cohen, 1962; Hovland, Campbell, & Brock, 1957). Repeated expression can also cause attitudes to become more extreme (e.g., Downing, Judd, & Brauer, 1992), and extreme attitudes tend to be stronger than moderate attitudes (e.g., Ewing, 1942; Fazio & Zanna, 1978). In addition, repeated expression increases *attitude accessibility*, or the speed and ease with which the attitude comes to mind (e.g., Fazio, Chen, McDonel, & Sherman, 1982), and highly accessible attitudes tend to be stronger than less accessible attitudes (e.g., Fazio, 1995). Through all of these processes, congruous social networks may increase individual-level attitude strength by providing a forum that encourages attitude expression.

Simultaneous Processes

Each of these potential mechanisms provides a plausible account for why being embedded within a social network characterized by a diverse range of views on a particular issue may render an individual's attitude on that issue weaker. These processes are not mutually exclusive, however. In fact, the impact of social network composition on individual-level attitude strength seems likely to be quite complex, reflecting the operation of multiple simultaneous processes.

THE CURRENT RESEARCH

In four studies, we examined the relation between the attitudinal composition of an individual's social network with regard to a particular object and the durability of his or her attitude toward that object. We also explored several potential mechanisms through which network composition may affect individual-level attitude strength. In our first study, we created social networks in the laboratory and manipulated their attitudinal heterogeneity. We then examined the consequences of social network composition when individuals were later confronted by a challenge to their attitudes. In our second study, we again manipulated the heterogeneity of views to which participants were exposed, but we also varied whether these views were attributed to social network members or to past research participants, enabling us to disentangle the informational value of learning others' views from the specific effects of network composition. In Studies 3 and 4, we examined the impact of the heterogeneity of people's actual social networks on their openness to attitude change.

STUDY 1

In our first study, we invited groups of 6 participants into the lab ostensibly to take part in a study on group interactions. Participants were stationed in individual cubicles and were told that they would be discussing a variety of issues and completing tasks together, first via a set of networked computers and later face-to-face. In fact, all participants interacted with a computer program designed to simulate responses from the other participants. This enabled us to manipulate the composition of the networks with respect to two target attitudes: Participants were randomly assigned to attitudinally congruous social networks (in which all network members held attitudes that were congruent with the participants') or to attitudinally heterogeneous networks (in which network members held a range of attitudes, some of which were congruent with and others discrepant from participants' attitudes). We then assessed the impact of network composition on attitude change when participants were presented individually with a counterattitudinal persuasive message later in the study.

Method

Participants

Seventy-six undergraduates participated in this study in partial fulfillment of a course requirement.

Procedure and Materials

Initial Attitude Measures

Participants first individually completed a survey of their attitudes toward various social, political, and campus issues, including the target issues: senior comprehensive exams and mandatory student service. Attitudes toward each topic were measured using a 7-point scale (endpoints labeled *strongly favor* and *strongly opposed*) and 7-point semantic differential scales (endpoints labeled *good–bad*, *wise–foolish*, and *beneficial–*

harmful). Responses to each set of attitude measures were averaged together (Cronbach's αs = .93 and .94, respectively).[1]

Instantiation of Social Networks

To simulate the dynamics of actual social networks, our design incorporated three features that are characteristics of real-world social networks. First, members of actual social networks share a psychological bond, and as such, the views expressed by network members are likely to be more meaningful than are the views of nonmembers. In an effort to create such a bond, participants ostensibly worked together with the members of their networks to successfully perform a group activity. Recent evidence indicates that these kinds of group tasks increase group cohesion (e.g., Kramer, Kuo, & Dailey, 1997). Second, members of real-world social networks share their views on various topics. To instantiate this element of social networks, participants expressed their views to the members of their networks and were ostensibly exposed to the views of their network members. Finally, members of real-world social networks anticipate future interaction with one another. To instantiate this element of social networks, participants were told that after their computer-mediated interaction, they would come together face to face to continue discussing various issues and working together on group tasks.

Group task. After they completed the initial survey, participants read that they would complete some activities with the other members of their group and that the performance of their group would be compared with that of other groups. To enhance the plausibility that participants were in fact working with the other members of their group in real time, an instruction screen appeared on completion of the initial survey (and at several other points throughout the study) indicating that not all group members had finished the current task and asking participants to be patient until the remaining individuals were ready to proceed. After a brief pause, the next instruction screen appeared, and participants continued the experiment. Participants then completed a group "brainstorming" activity, during which the name of an object appeared on participants' screens and they each listed as many uses for the object as they could think of in 2 min. After 2 min, a screen appeared telling participants that the computer was combining their responses, and after a short delay, participants read that their group's performance ranked at the 94th percentile of groups that had participated in the experiment previously. The brainstorming task and positive feedback were administered to reinforce the cover story and to bolster the feeling that participants were interacting with other group members as part of a meaningful social unit.

Computer-mediated discussion. Participants next read that they would be taking part in an "electronic bulletin board discussion," which would involve expressing their own opinions on a given topic and reading the opinions of the other network members. The opinions ostensibly posted by the other network members were programmed to appear on participants' screens at varying time intervals (delays ranged from 12 s to 30 s) to increase the plausibility that the messages were being posted by the other participants in real time. The opinions contained informal language, and some made reference to prior postings. A text box appeared on the participants' screens in which they were instructed to type their own opinions on the issue.

The topic for the first bulletin board discussion was the institution of a senior comprehensive exam that all students would be required to pass in order to graduate. We chose this topic because we knew that the vast majority of participants would oppose the policy, enabling us to construct social networks that would be attitudinally congruous or attitudinally heterogeneous relative to participants' own views on the issue. Further, using a novel attitude object (that participants had never discussed within their actual social networks) enabled us to completely control network homogeneity through our experimental manipulation.

For the attitudinally congruous condition, the opinions posted to the electronic bulletin board were designed to be consistent with participants' own views on the issue. For the heterogeneous condition, some of the messages were consistent with participants' views on this issue, and others were inconsistent with their views on the issue. To avoid introducing new information that may itself have caused attitude change, all of the opinions simply conveyed whether the person was for or against the policy and did not include reasons or arguments in support of that position (see the Appendix for bulletin board messages).

Attitude Change

Participants were then instructed to read a passage containing additional information about senior comprehensive exams. The passage contained strong arguments in favor of the exams. Immediately after reading the persuasive essay, participants reported their attitudes toward senior comprehensive exams using the same scales on which they had initially reported their attitudes, enabling us to assess attitude change.

Strength-Related Attitude Features

We also assessed two features of participants' attitudes that are related to attitude strength and that may account for the impact of network heterogeneity on openness to change: certainty and ambivalence.

Certainty. Participants indicated how certain they were of their attitudes toward comprehensive exams, how sure they were of their views on this issue relative to other issues, how certain they were that their views were right, and how sure they were that their opinions were correct. Responses were expressed on 5-point scales ranging from *not at all* to *extremely* and averaged together (Cronbach's α = .94).

Ambivalence. Participants indicated how conflicted they felt about the issue of senior comprehensive exams and the degree to which they had mixed feelings about the issue. Responses were expressed on 5-point scales ranging from *not at all* to *completely* and were averaged together (Cronbach's α = .89).

Second Computer-Mediated Discussion and Measures

Participants completed a second bulletin board discussion regarding a policy that would require all students to spend a set number of hours engaged in unpaid university service (e.g., grounds maintenance, cafeteria work). Participants in the congruous condition read opinions that were one-sided and proattitudinal for the majority of participants (i.e., against the policy), and participants in the heterogeneous condition read a mix of opinions on both sides of the issue. (Network composition was a between-subjects manipulation, so participants were assigned to attitudinally congruous or attitudinally heterogeneous networks for both topics.) After the second discussion, participants were again instructed to read a passage that would provide additional information about the policy. After reading the passage, which contained strong arguments favoring the policy, participants reported their attitudes toward the policy, the certainty of those attitudes, and their ambivalence toward the policy using the same scales described above.

Social Constraint

Participants were reminded that they would be meeting with the members of their network for a face-to-face discussion. In anticipation of the

[1] All of the variables in all of the studies were coded to range from 0 (reflecting the lowest scale value) to 1 (reflecting the highest scale value) so that all variables are expressed on the same metric in our analyses, regardless of the original number of scale points used to measure each variable. This coding simplifies comparisons of the magnitude of relations among variables without affecting any other properties of the measures.

meeting, they answered a series of questions assessing the degree to which they experienced subtle or overt constraints on their attitudes within their networks.

Social network cohesion. Participants indicated the strength of the bond they felt with the members of their network, which may have suggested subtle pressures to remain in step with the members of the network. They also indicated how much they felt a sense of unity or cohesion in their network and valued what the other network members said during the bulletin board discussions. Responses were expressed on 5-point scales ranging from *not at all* to *very much* and were averaged together (Cronbach's $\alpha = .76$).

Explicit social constraint. The second set of questions assessed more explicit social constraint. Participants indicated the extent to which they felt the face-to-face discussion would go less smoothly if they expressed views that were different from those of the other network members, how reluctant they would be to express divergent opinions, and how much they were inclined to express the same opinions during the face-to-face discussion as they had expressed during the bulletin board discussion because it was too much of a bother to explain that they had changed their minds. They also indicated whether changing their opinions would make it harder for them to get along with the other network members. Responses were expressed on 5-point scales ranging from *not at all* to *extremely* and averaged together (Cronbach's $\alpha = .75$).

Results

Attitude Change

To test the hypothesis that individual-level attitude strength is regulated by social network composition, we constructed indices of attitude change by subtracting participants' initial attitudes from the attitudes expressed after reading the persuasive messages. This yielded a measure of attitude change on which higher numbers reflected greater change in the direction advocated by the persuasive message.[2]

Senior Comprehensive Exams

As expected, an analysis of variance (ANOVA) conducted on this attitude change variable for the topic of senior comprehensive exams revealed a significant effect of network heterogeneity, $F(1, 46) = 4.58$, $p < .04$, such that participants in attitudinally congruous social networks showed less attitude change than did those in heterogeneous networks (Ms = .13 and .30, respectively).[3]

Mandatory Student Service

An identical pattern of attitude change emerged with regard to mandatory student service: Participants in heterogeneous social networks exhibited significantly more attitude change than did participants in congruous networks (Ms = .16 and −.02), $F(1, 58) = 10.19$, $p < .01$.

Potential Mechanisms

We explored several possible mediators of the relation between network composition and attitude change. Following the logic laid out by Baron and Kenny (1986), we first examined the impact of network composition on each of the proposed mediators. As expected, for both comprehensive exams, $F(1, 46) = 4.71$, $p < .05$, and mandatory student service, $F(1, 58) = 4.59$, $p < .05$, participants in heterogeneous networks experienced more ambivalence than participants in congruous networks. Surprisingly, network composition had no impact on attitude certainty and for comprehensive exams, $F(1, 46) = 0.18$, *ns*, and mandatory service, $F(1, 58) = 2.09$, *ns*, suggesting that certainty did not mediate the relation between network composition and attitude change. Similarly, network composition did not affect social cohesion, $F(1, 45) = 2.21$, *ns*, or perceived social constraint, $F(1, 45) = 0.39$, *ns*, for comprehensive exams, $F(1, 58) = 1.19$, *ns*, or mandatory student service, $F(1, 58) = 1.47$, *ns*.[4]

We next assessed the relation between ambivalence and attitude change, controlling for network composition. We did this by regressing attitude change on our measure of ambivalence and a dummy variable contrasting participants in the heterogeneous networks (coded 0) and those in the congruous networks (coded 1) separately for the two target issues. Consistent with mediation, ambivalence significantly predicted attitude change, controlling for network composition ($b = 3.26$, $SE = .92$, $p = .001$, and $b = 2.54$, $SE = .70$, $p = .001$, for comprehensive exams and student service, respectively). In each case, adding ambivalence to the regression equation substantially reduced the magnitude of the relation between network composition and attitude change: The regression coefficients dropped from −1.07 to −0.56 and from −1.07 to −0.76 for comprehensive exams and student service, respectively. Sobel (1982) tests confirmed that the mediated relation was significant or marginally significant in both cases ($z = 1.89$, $p < .06$, and $z = 1.96$, $p = .05$, for comprehensive exams and student service, respectively).

Discussion

The results of our initial study suggest that being embedded within a heterogeneous social network renders people more susceptible to persuasion. Our mediational analyses are consistent with the notion that heterogeneous networks affect individual-level attitude strength by increasing subjective ambivalence. Apparently, regardless of the level of intrapsychic evaluative tension that an individual experiences regarding an attitude object, discrepancies between one's own attitude and the attitudes of network members produce a subjective experience of ambivalence, heightening one's vulnerability to persuasive appeals.

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[2] Change scores provide a simple, intuitively sensible index, but they also have statistical properties that can be problematic (see J. Cohen & Cohen, 1983; Cronbach & Furby, 1970). A less intuitively obvious analysis involves regressing postmessage attitudes on premessage attitudes and a dummy variable contrasting the congruous and heterogeneous network conditions. We have run all of the analyses involving change scores this alternate way, and the results are virtually identical. For ease of presentation, we report the results of analyses using the change scores.

[3] Here and in Study 2, a handful of participants were dropped from the analyses because they expressed neutral or favorable attitudes toward the target issue (in this case, comprehensive exams) in the initial survey. In every case, however, participants were dropped from the two experimental conditions in roughly equal number.

[4] Because the internal reliability of the social constraint scales hovered at the lower bound of what is typically considered acceptable, we also ran these analyses using the individual scale items, with very similar results.

An alternative interpretation merits consideration, however. It is possible that the views ostensibly expressed by social network members simply provided participants with information about the views of fellow students more generally, and this information may have served as an additional persuasive message. That is, for participants in the attitudinally congruent condition, the fact that all of the other participants also opposed the target policies may have provided an additional reason for participants to hold a negative attitude toward the policies. For participants in the heterogeneous condition, the fact that some network members were supportive of the policies may have provided a reason to adopt more moderate attitudes. This would suggest that the observed differences in attitude change were not due to differences in attitude strength but to differences in the information to which participants were exposed. We addressed this possibility in Study 2.

STUDY 2

We conducted a second experiment in which we again manipulated the diversity of opinions to which participants were exposed. In this study, however, we also manipulated the source of these opinions. Replicating Study 1, some participants were led to believe that they were part of a computer-mediated social network and that they were working together in real time on various tasks, including computer-mediated discussions of various topics. As in Study 1, these participants were exposed to the views of their network members on two target issues, and these views were either congruent with participants' own views on the issues or were a mix of congruent and incongruent opinions.

Other participants completed the same activities, but they did so individually. These participants were also exposed to a set of opinions toward the target issues that were either attitudinally congruent or mixed, but the views were attributed to students who had previously participated in the study. If the results of Study 1 were due to the informational value of the views expressed in the bulletin board discussion, we should find similar patterns of attitude change regardless of whether the views are attributed to network members or to previous participants. However, if the results of Study 1 were due to the instantiation of at least minimally meaningful social networks that regulated the strength of participants' attitudes, we should find that the impact of opinion diversity is much smaller in the individual conditions than in the network conditions.

We also took additional steps to explore this possibility. In addition to the pre- and postmessage attitude measures, we also assessed participants' attitudes toward mandatory student service immediately after they were exposed to the attitudinally congruent or mixed opinions toward the issue, allowing us to determine more precisely when the attitude change observed in Study 1 had taken place. We also included a second target issue and presented participants with a set of attitudinally congruent or mixed opinions toward the issue (attributed either to network members or to previous participants) but did not expose them to a persuasive message on this topic. Later, participants expressed their opinions toward this issue again, permitting an assessment of attitude change. Both of these modifications were designed to provide additional evidence about whether the attitude change observed in Study 1 was in response to the opinion information (consistent with the notion that the views of other students served as a persuasive message) or to the persuasive message (consistent with the notion that social network composition primarily influenced the strength rather than the valence of participants' attitudes).

Method

Participants

One hundred one undergraduates participated in this study in partial fulfillment of a course requirement.

Procedure and Materials

Participants took part in the study in groups of 6. On arrival at the laboratory, they were escorted to private cubicles and randomly assigned to either network or individual conditions and to either attitudinally congruent or heterogeneous conditions.

Network Conditions

The cover story, procedures, and measures in the network conditions were similar to those in Study 1. As in Study 1, participants in the network conditions were told that the study was investigating group interactions and that they would be working with the other participants, both face to face and via networked computers. Participants completed initial attitude measures individually, including measures of their attitudes toward two target policies: the mandatory student service policy described in Study 1 and a policy that would permit campus security to conduct unannounced dorm searches to detect violations of university regulations or illegal activity such as underage drinking or drug use. Participants then completed the group brainstorming task and received favorable feedback about their group's performance. Participants next took part in the first bulletin board discussion on the issue of mandatory student service using the same procedures described in Study 1. As in Study 1, participants were either exposed to a uniform set of opinions in opposition to the policy or to a mixture of views on this issue. Unlike Study 1, however, participants reported their attitudes toward this issue immediately following the discussion. To disguise the purpose of these measures, participants were told at the beginning of the study that they would complete a separate attitude survey from a different researcher in addition to the main activities. This survey was administered in a different format (paper-and-pencil questionnaire rather than computer based), and the target attitude measures were embedded within a set of other attitude measures. Participants were told that in an effort to offset any systematic order effects, participants would be randomly assigned to complete the questionnaire early in the main study, in the middle of the main study, or late in the main study. They were told that the computer would indicate when they were to complete the secondary questionnaire. In fact, all participants completed the questionnaire after the mandatory student service bulletin board discussion. When they returned to the main study, they were presented with a persuasive message advocating mandatory student service and completed the same set of measures used in Study 1 to assess attitude change, certainty, and ambivalence.

Participants next completed a second bulletin board discussion, this time on the issue of unannounced dorm searches. Following this discussion, participants completed measures to assess attitude change, certainty, and ambivalence regarding unannounced dorm searches.

Just before participants were ostensibly to meet for the face-to-face discussion, they completed a series of questions designed to gauge perceived social constraint. They indicated the extent to which they valued what the other network members had said during the bulletin board

discussions, how much they were looking forward to the face-to-face issue discussion, how reluctant they would be to express opinions that were different from the other network members, how much they felt the discussion would go less smoothly if they expressed divergent attitudes, and how likely they were to simply agree with the opinions expressed by the other network members in the discussion because challenging their opinions was too much of a bother. Responses were expressed on 5-point scales ranging from *not at all* to *very much*. Because these items did not form an internally reliable scale, they were analyzed separately.

Finally, as a check on the manipulation of opinion diversity, participants were asked how much disagreement there was in the opinions expressed by the other members of their network on the issue of mandatory student service (none, a slight amount, a moderate amount, or a lot).

Individual Conditions

Participants in the individual conditions completed activities that closely paralleled those in the network conditions. Participants began by completing the initial attitude measures. They then individually completed the brainstorming task and received favorable feedback about their performance. Participants were then told that they would receive additional information about some of the topics about which they had expressed attitudes. First, they were told that they would be presented with a transcript of what some previous participants had to say about the first target issue: mandatory student service. These transcripts contained the identical information presented in the network bulletin board discussions of this issue, and the information was presented in the same form: Five opinions appeared on participants' computer screens sequentially, and the opinions were either all in opposition to the policy or were mixed. Participants were asked to type their own opinions into a text box that appeared on their screens, and to make this task parallel to that of the network conditions (in which participants' opinions were ostensibly viewed by others in the study), participants were told that their opinions might be anonymously shown to future participants.

Participants next completed the paper-and-pencil questionnaire in which they reported their attitudes toward mandatory student service. Participants were then presented with the persuasive message and the same postmessage measures collected in the network conditions. Next, participants were presented with ostensible transcripts containing past participants' views toward the issue of unannounced dorm searches, and they completed measures to assess attitude change, certainty, and ambivalence on this issue. As in the network conditions, participants were asked how much disagreement there was in the opinions expressed by previous participants on the issue of mandatory student service as a check on the manipulation.

Results

Attitude Change

For both issues, we created indices reflecting the difference between participants' initial attitudes and the attitudes expressed after exposure to others' opinions (ostensibly the views of network members or past participants). For mandatory student service, we constructed a second index reflecting the difference between their initial attitudes and the attitudes they expressed after reading the persuasive message.

Mandatory Student Service

As expected, a 2 (condition: network vs. individual) $\times$ 2 (distribution of opinion: congruous vs. heterogeneous) ANOVA conducted on the postmessage attitude change variable for the topic of mandatory student service yielded a significant interaction, $F(1, 77) = 5.29$, $p < .03$. To determine the nature of this interaction, planned contrasts compared the impact of opinion diversity separately for participants in the network and individual conditions. Replicating the results of Study 1, participants in the heterogeneous social networks exhibited significantly more attitude change than did participants in attitudinally congruent social networks, $t(77) = 2.18$, $p < .04$ (Ms = .14 and $-.02$, respectively).

As expected, the results were very different for the individual conditions. Participants in the individual conditions who were exposed to an attitudinally congruent set of opinions tended to exhibit more attitude change than did participants exposed to a mix of opinions (Ms = .25 and .12, respectively), although this difference was not statistically significant, $t(77) = 1.37$, *ns*.

Responses to the manipulation check indicate that these results were not due to differences between the network and individual conditions in the degree to which participants attended to and accurately recalled the distribution of opinions to which they had been exposed. The manipulation of opinion diversity was a highly significant predictor of perceived disagreement, $F(1, 77) = 177.17$, $p < .001$, and this effect was not moderated by the network–individual manipulation, $F(1, 77) = .14$, *ns*.

Taken together, these results suggest that the network composition effects observed in Study 1 cannot be attributed to the informational value of the opinion statements. This conclusion is reinforced by the attitude measures collected after participants had been exposed to others' opinions regarding mandatory student service but before they were exposed to the persuasive message. Neither the diversity of opinion to which participants were exposed nor the interaction between opinion diversity and the network–individual manipulation was a significant predictor of attitude change, $F(1, 77) = .56$, *ns*, and $F(1, 77) = .01$, *ns*, respectively. Similarly, neither the main effect of opinion diversity nor its interaction with the network–individual manipulation predicted changes in participants' attitudes toward unannounced dorm searches, $F(1, 70) = 1.93$, *ns*, and $F(1, 70) = .15$, *ns*, respectively.

Potential Mechanisms

Using the data from participants assigned to the social networks conditions, we again examined potential mediators of the relation between social network composition and openness to attitude change. Consistent with mediation and replicating Study 1, participants in heterogeneous networks were more ambivalent toward mandatory student service than were participants in attitudinally congruent networks, $F(1, 37) = 5.47$, $p < .05$. Participants in heterogeneous networks also held their attitudes with less certainty, $F(1, 38) = 4.50$, $p < .05$. Network composition did not affect any of the social constraint measures, suggesting that they did not mediate the relation between network composition and attitude change.

We next added ambivalence and certainty to the regression equation predicting attitude change. Both ambivalence and certainty were significant or marginally significant predictors of attitude change, controlling for social network composition ($b = .51$, $SE = .07$, $p < .01$, and $b = -.27$, $SE = .16$, $p = .10$ for ambivalence and certainty, respectively). When ambivalence and certainty were added to the regression equation, the magnitude of

the relation between network composition and attitude change was reduced to nonsignificance: The regression coefficient dropped from −0.16 to −0.03. Sobel (1982) tests confirmed that the mediated relation was significant in the case of ambivalence and marginally significant in the case of certainty ($z = 1.98$, $p < .05$, and $z = 1.71$, $p < .10$).

Discussion

In Studies 1 and 2, participants embedded in heterogeneous networks were more susceptible to a persuasive message than those situated in attitudinally congruent networks. In line with some of our initial hypotheses, the impact of network composition on openness to attitude change was partially mediated by ambivalence in both studies. Attitude certainty also partially mediated this relation in Study 2. Two additional findings from these studies further clarify the relation between social network composition and openness to attitude change. First, the impact of attitudinal diversity on openness to change was only observed when those attitudes were expressed within the context of a social network. The identical attitude information expressed by a set of people who were not connected, at least temporarily, by network ties had no impact on individual-level openness to attitude change. This reinforces the notion that features of the immediate social context—and not just the information received through social channels—have implications for attitude strength. Second, the impact of social network composition was evident only after participants were confronted with a strong challenge to their attitudes. Network composition was unrelated to the attitudes that participants expressed after the network discussions but before their attitudes were challenged. This reinforces the notion that social network composition can affect the strength of people's attitudes even if it has no effect on the valence of their attitudes.

STUDY 3

The design of Studies 1 and 2 enabled us to experimentally manipulate social network composition and examine the impact on individual-level openness to attitude change. However, the social networks that we created in the laboratory were of course highly artificial, and the processes that we observed may not correspond to those that occur within actual social networks. We set out in Study 3, therefore, to examine the effects of social network composition and the psychological mechanisms through which they operate in real-world social networks. To do so, we measured changes in participants' attitudes in response to a persuasive message as well as the attitudinal composition of participants' actual social networks.

On the basis of our experimental results, we expected that congruity of opinion within people's social networks regarding a specific attitude object would be positively associated with individual-level attitude strength. Furthermore, we expected that the relation between network composition and attitude strength would be mediated, at least in part, by attitude ambivalence and perhaps attitude certainty. We also explored once again the possibility that perceived social constraints may also mediate the relation between network composition and openness to attitude change.

This design also allowed us to explore additional processes that may unfold within actual social networks, enabling us to examine a wider range of potential mechanisms. For example, we explored the possibility that people embedded within attitudinally congruent social networks may express their views more often than do people in heterogeneous networks and that they may come to hold more extreme attitudes.

We also explored the possibility that people embedded within heterogeneous social networks may decrease the importance they attach to their attitudes. According to balance theory (Heider, 1946, 1958), one way for people to reduce the psychological discomfort of disagreeing with valued others about a target issue is to decrease the importance they attach to the issue. This may suggest that attitude importance partially mediates the relation between network composition and attitude strength.

In addition, as in Study 2, we explored the possibility that the views of an individual's social network members may be impactful simply because they provide information about the overall level of social support for his or her views in the general population. More specifically, we examined the relation between the diversity of opinion within people's social networks and their beliefs about the distribution of opinion in the general public, and we tested the possibility that perceived support for one's views in the larger population may mediate the relation between network composition and attitude strength.

Finally, by examining naturally occurring variation in social network heterogeneity, we anticipated being able to explore the full range of opinion distributions. In Studies 1 and 2, we contrasted fully congruent networks with those that contained an even mix of opinions. Although a reasonable starting point, this precluded the identification of nonlinearities in the relation between network composition and attitude strength. In particular, we were interested in exploring how network composition affects attitude strength as the balance of opinion shifts from an even mix of views to an increasingly uniform set of incongruent opinions.

Method

Participants

One hundred seven undergraduates participated in partial fulfillment of a course requirement. Participants were selected because they held positive attitudes toward capital punishment, ensuring that the persuasive message (arguing against capital punishment) was counterattitudinal for all participants.

Materials and Procedure

On arrival, participants were given a booklet to complete individually. An introduction explained that the booklet consisted of four brief surveys contributed by four different researchers studying related issues. Each questionnaire began with an introduction ostensibly written by the contributing researcher, and the questionnaires used different formats and type fonts. This was done to reduce suspicion that we were measuring some attitudes twice to assess the impact of a persuasive message and that we were interested in the link between social networks and attitude change.

Initial Attitude Measures

Participants expressed their attitudes toward capital punishment on a 7-point bipolar scale with endpoints labeled *strongly favor* and *strongly*

oppose and on three 7-point semantic differential scales with endpoints labeled *good–bad*, *wise–foolish*, and *beneficial–harmful*. These measures were embedded within a set of questions assessing attitudes toward a variety of issues. Responses were averaged to form a composite attitude measure (Cronbach's $\alpha = .96$).

Persuasive Essay and Attitude Change Measures

In a second survey, participants read an essay for the ostensible purpose of performing an "editorial evaluation." The essay contained strong arguments against capital punishment. After reading the essay, participants evaluated it along several dimensions and were then asked to report their attitudes toward capital punishment on the grounds that their attitudes may have affected their evaluations of the essay. Participants' attitudes were measured using the same scales described above.

Social Network Measures

A third survey assessed features of participants' social networks. A social network was described as consisting of the people with whom one discusses important issues and events, such as friends, family members, or coworkers. Participants were asked to list up to seven members of their own social networks.

Attitude congruence. In Studies 1 and 2, we manipulated the attitudinal composition of the networks such that from the perspective of the participant, each network was attitudinally congruent or attitudinally heterogeneous. To parallel this conceptualization of network composition in the current study, we assessed the degree to which participants' networks were characterized by congruence between the participant's attitude on the target issue and the attitudes of his or her network members. To assess attitude congruence, participants were asked a series of questions about each of the network members they named, including the extent to which they agreed or disagreed with the network member's views on the issue of capital punishment, using 5-point scales ranging from *strongly agree* to *strongly disagree*. Responses were averaged across network members to create a continuous variable indexing the overall level of congruence between participants' attitudes and the attitudes of their network members on this issue.

Social constraint. Participants indicated the degree to which they felt a strong sense of unity or togetherness with the members of their social networks, how reluctant they would be to express an opinion that was different from those of the other network members, and the extent to which conversations with their network members would go less smoothly if they expressed opinions that were different from the others'. Participants responded on 5-point scales ranging from *not at all* to *very much*. These items did not form an internally reliable scale (Cronbach's $\alpha = .18$) and were analyzed individually.

Perceived social support. Participants estimated the proportion of Americans who shared their views on the issue of capital punishment.

Attitude Attributes

In the final survey, participants answered questions assessing features of their attitudes related to the strength of those attitudes. When multiple items were used, they were averaged together to form composite indices.

Attitude certainty. Participants indicated how certain they were of their views on this issue, how certain they felt that their opinions were correct, and how sure they were of their views on this issue relative to other issues on 5-point scales ranging from *not at all* to *absolutely* (Cronbach's $\alpha = .90$).

Attitude ambivalence. Participants indicated the extent to which they felt conflicted and the degree to which they experienced mixed feelings about capital punishment on 5-point scales ranging from *not at all* to *completely* (Cronbach's $\alpha = .88$).

Attitude extremity. On the basis of participants' initial attitude measures, a measure of attitude extremity was constructed reflecting the distance of participants' attitudes from the scale midpoint.

Attitude importance. Participants indicated how important this issue was to them personally, how much they personally cared about this issue, and how important capital punishment was to them relative to other issues using 5-point scales ranging from *not at all* to *extremely* (Cronbach's $\alpha = .92$).

Frequency of attitude expression. Participants reported how frequently they expressed their views on this issue in their conversations with others on a 6-point scale ranging from *never* to *very frequently*.

Order Manipulation

All participants completed the initial attitude measures first and the measures of attitude attributes last. The order of the second and third questionnaires (containing the attitude change and the social network measures, respectively) was counterbalanced across participants.

Results

Network Composition

We began by examining the average level of opinion diversity within participants' social networks. It is interesting that virtually all of the networks ranged from full attitudinal congruence to an even mixture of opinions. Only 4 participants reported that they disagreed with more than half of the members of their networks regarding the issue of capital punishment.

Network Composition and Attitude Change

We next constructed an index of attitude change by subtracting participants' initial attitudes from the attitudes they expressed after reading the persuasive message and then regressed this measure of attitude change on the network heterogeneity index. Consistent with our previous results, greater discrepancy between social network members' views and participants' own views on the issue of capital punishment was associated with more attitude change in response to the persuasive message ($b = .49$, $SE = .13$, $p < .001$).[5]

Order Effect?

We next explored the possibility that the views of social network members may exert an impact on an individual's openness to attitude change only when those views have been made salient immediately preceding an attitude challenge. To test this possibility, we conducted an ordinary least squares regression predicting attitude change with (a) network heterogeneity, (b) a dummy variable contrasting participants who completed the attitude change measures before answering questions about their social network members with those who completed the measures in the reverse order, and (c) a term reflecting the interaction between network heterogeneity and order. If social network heterogeneity

[5] Here and in Study 4, we also explored the possibility that the relation between network composition and attitude change may be nonlinear, but in neither case were the quadratic or the cubic effects significant.

only affects individual-level attitude strength when the views of network members have been made salient, we would expect a significant interaction between network heterogeneity and order. In fact, neither the main effect of order nor the interaction between heterogeneity and order significantly predicted attitude change ($b = -.07$, $SE = .12$, *ns*, and $b = .15$, $SE = .27$, *ns*), suggesting that people need not explicitly bring their network members to mind for network composition to influence individual-level attitude strength.

Potential Mechanisms

Again following the logic outlined by Baron and Kenny (1986), we explored the potential mechanisms of this relation by first regressing each of the proposed mediators on our measure of social network composition. Consistent with mediation, several of the proposed mechanisms were indeed related to network composition. For example, participants in heterogeneous networks expressed more ambivalence regarding capital punishment ($b = .47$, $SE = .18$, $p = .01$), and they held their capital punishment attitudes with less certainty ($b = -.50$, $SE = .18$, $p < .01$). They also expressed their attitudes toward capital punishment less frequently than did participants in attitudinally congruous networks ($b = -.29$, $SE = .14$, $p < .05$). People in heterogeneous social networks also ascribed less importance to their capital punishment attitudes ($b = -.47$, $SE = .18$, $p < .001$). Contrary to our expectations, participants in heterogeneous networks tended to report greater reluctance to express an attitude that conflicts with the views of other network members ($b = -.40$, $SE = .22$, $p < .07$).

Network composition was unrelated to several other proposed mediators. Surprisingly, social network heterogeneity was unrelated to the perceived unity within the network ($b = -.16$, $SE = .16$, *ns*). Network composition was also unrelated to the perception that discussions with other network members would go less smoothly if participants expressed attitudes that were different from those of the other members ($b = -.02$, $SE = .22$, *ns*), and network heterogeneity was unrelated to attitude extremity and to perceived support for one's views in the general public ($b = -.11$, $SE = .23$, *ns*, and $b = -.07$, $SE = .14$, *ns*).

To explore the possibility that ambivalence, attitude certainty, attitude importance, reluctance to express a controversial attitude, or frequency of attitude expression may mediate the observed relation between network composition and openness to attitude change, we added all of these variables to the regression equation predicting attitude change. Only ambivalence predicted unique variance in attitude change controlling for all of the other potential mediators and social network composition ($b = .26$, $SE = .09$, $p < .01$). The magnitude of the relation between network composition and attitude change was reduced (from $b = .49$ to $b = .39$), and a Sobel (1982) test confirmed the significance of this mediated relation ($z = 1.97$, $p < .05$).

STUDY 4

The convergence of Studies 1, 2, and 3 despite very different research designs and different attitude objects reinforces the notion that the immediate social context affects individual-level attitude strength. However, all of these studies were conducted with undergraduate participants. A wealth of evidence suggests that young adults are more concerned than older adults about the approval of their peers and are more likely to regulate their attitudes and behaviors to remain in step with them (e.g., Pasupathi, 1999; Reifman, Klein, & Murphy, 1989; Tesch, 1983). It is possible, therefore, that young adults are unique in their sensitivity to the attitudinal composition of their social networks. To assess the generality of our findings, we examined the relation between network composition and attitude strength with a nationally representative sample of adults.

Method

Participants

A representative sample of 756 English-speaking adults living in private U.S. households was interviewed by telephone. The survey was conducted by the Princeton University Survey Research Center between February 19 and April 5, 2001. The sample was generated via random-digit dialing, and within-household sampling was done by asking the respondent with the most recent birthday to participate, a convenient quasi-random selection device that improves sample representativeness (Salmon & Nichols, 1983). Because the persuasive message used in the current study argued against the death penalty, we selected participants with positive attitudes toward the death penalty for inclusion in the study ($N = 463$).

Measures and Procedures

Initial Attitude

Participants were asked whether, in general, they favored or opposed the death penalty.

Attitude Change

Participants who favored the death penalty were presented with a brief persuasive message arguing against it (see the Appendix). They were then asked whether the passage made them feel more negative toward the death penalty or did not make them feel more negative toward it. Participants who said the passage made them feel more negative about the death penalty were asked whether they felt a lot more negative or a little more negative. Responses were coded 0 for participants who indicated that the passage did not change their views, .5 for participants who said they were a little more negative, and 1 for those who said they were a lot more negative.

Social Network Measures

Attitude congruence. A social network was defined for participants as in Study 3, and participants were asked to name up to five members of their own networks. Participants were then asked a series of questions about each network member, including the extent to which the participant agreed or disagreed with the network member on the issue of capital punishment. Follow-up questions assessed whether participants agreed or disagreed strongly or somewhat with each network member, and responses were averaged across network members to create a continuous variable reflecting overall network congruity on this issue.

Social constraint. In the previous studies, we found no evidence that social constraint mediates the relation between network composition and attitude strength. One possibility is that social constraint exerts subtle pressures that are not explicitly perceived by people within attitudinally congruent networks. In this study, we attempted to assess these subtle

pressures by simply asking participants how surprised their network members would be if they changed their views on this issue (not at all surprised, not too surprised, somewhat surprised, very surprised, or extremely surprised). Presumably, greater surprise at a change in one's views reflects a stronger expectation among network members that an individual will hold a particular attitude on this issue, and these expectations may subtly constrain the attitude.

Attitude Attributes

Participants indicated the extent to which they felt conflicted about the death penalty (extremely, very, moderately, slightly, or not at all conflicted), how certain they were of their views (extremely, very, moderately, not very, or not at all certain), and how important the issue was to them personally (extremely, very, somewhat, not too, or not at all important).

Order Manipulation

The order in which participants completed the attitude change and the social network measures was counterbalanced across participants.

Control Variables

Demographic characteristics. Race was coded 0 for Whites and 1 for non-Whites. Age was coded to range from 0 (meaning age 18) to 1 (meaning age 95, the highest age in the sample). Household income was coded to range from 0 (<$15,000 per year) to 1 (>$100,000 per year). Participants' highest level of education attained was coded to range from 0 (elementary school) to 1 (advanced degree).[6]

Political identification. Participants indicated whether they generally considered themselves Democrats, Republicans, or Independents. Those who named a political party were asked whether they were strong Democrats or Republicans or not very strong Democrats or Republicans. Independents were asked if they were closer to the Democratic or the Republican parties. The resulting 7-point political party identification ranged from *strong Democrat* to *strong Republican*.

Strength of party identification. A variable representing the strength of party identification was constructed with strong Democrats and Republicans coded 1.00, not very strong Democrats and Republicans coded .66, Independents who considered themselves closer to either the Democratic or Republican party coded .33, and Independents who did not consider themselves closer to one of the parties coded 0.

Political knowledge. Three questions assessed participants' knowledge about contemporary political events: whether they knew what job or office William Rehnquist held, whether they knew what job or office Tony Blair held, and whether they knew which party had the most members in the U.S. House of Representatives. These items were combined into a 4-point index of political knowledge.

Frequency of political discussion. Participants reported how often they discussed political matters with each network member (never, rarely, occasionally, or often). Responses were averaged together across network members.

Results

Network Composition

We again began by examining the average levels of opinion diversity in participants' social networks. As in Study 3, the vast majority of social networks ranged from fully homogeneous and attitudinally congruous to an even mix of opinions on the issue of capital punishment. Less than 8% of participants reported that they disagreed with more than half of their network members on this issue.

Network Composition and Attitude Change

Network composition was again associated with attitude change: People embedded within heterogeneous networks changed their attitudes more in response to the message than did people embedded in networks made up of like-minded others ($b = .17$, $SE = .06$, $p < .01$).

Order Effect?

We next added two predictors to the regression equation above: a dummy variable representing the order in which participants completed the social network and attitude change measures and a term reflecting the interaction between network composition and question order. Neither of these variables predicted attitude change, suggesting once again that participants need not have explicitly brought to mind the views of their network members in order to be influenced by them ($b = .08$, $SE = .09$, *ns*, and $b = -.02$, $SE = .11$, *ns*, for the main effect and interaction, respectively).

Controlling for Individual-Level Factors

We then examined the relation between network composition and susceptibility to persuasion, controlling for a range of individual-level factors that may also be related to the strength of people's political convictions. Specifically, we added to the original regression equation measures of participants' political party affiliation, the strength of their identification with a political party, and their level of political interest (reflected in the frequency of political discussions and levels of political knowledge). We also added demographic and socioeconomic status variables (race, age, education, household income). We also included a term reflecting the squared age variable to capture the curvilinear relation between age and openness to attitude change (Visser & Krosnick, 1998). Including all of these control variables in a multiple regression equation had little impact on the magnitude of the association between network composition and attitude change (see Table 1).

Potential Mechanisms

We again regressed each proposed mediator on our index of network composition. As in all of our previous studies, people embedded within heterogeneous networks were more ambivalent about the death penalty than were people in attitudinally congruent networks ($b = .13$, $SE = .06$, $p = .02$). Network heterogeneity was also negatively associated with attitude certainty ($b = -.21$, $SE = .05$, $p < .001$) and attitude importance ($b = -.20$, $SE = .05$, $p < .001$). As expected, people in attitudinally congruent social net-

[6] Because of a programming error, participants' gender was not recorded in the data set. Information about participants' gender was also not collected in the previous studies. Unfortunately, this precludes the potentially interesting exploration of possible gender differences in responsiveness to network composition.

Table 1
Predicting Attitude Change With Social Network Composition in Study 4

Predictor	*mb*	*SE*
Network heterogeneity	.14*	.06
Party affiliation	.02	.04
Strength of party identification	.00	.04
Frequency of political discussions	−.08	.06
Political knowledge	−.01	.04
Race	−.03	.04
Age	−.55**	.23
Age^2	.80**	.27
Education	−.05	.07
Income	.05	.05

* $p < .05$. ** $p < .01$.

works reported that their network members would be more surprised if they changed their views on this issue than did people in heterogeneous networks ($b = -.30$, $SE = .07$, $p < .001$).

We next added all of these variables to the regression equation predicting attitude change, controlling for network composition and the individual-level factors described above. Both ambivalence and certainty predicted unique variance in attitude change, consistent with the notion that each partially mediated the relation between network composition and attitude change ($b = .26$, $SE = .06$, $p < .001$, and $b = -.30$, $SE = .08$, $p < .001$, for ambivalence and certainty, respectively). With ambivalence and certainty in the equation, the magnitude of the relation between network composition and attitude change was reduced to nonsignificance: The regression coefficient dropped to .07, and Sobel (1982) tests confirmed the significance of these mediated relations ($z = 1.97$, $p < .05$, and $z = 2.91$, $p < .01$).

GENERAL DISCUSSION

A coherent portrait begins to emerge from these studies. The immediate social context in which a person is situated has implications not only for the valence of his or her attitudes but for the durability of those attitudes as well. People who are embedded within networks made up of like-minded others are more resistant to attitude change when they encounter a persuasive message than are people in attitudinally heterogeneous social networks. This feature of the social context appears to get inside the heads of attitude holders to affect individual-level attitude strength in theoretically sensible ways: through interpersonal evaluative tension that increases people's subjective ambivalence toward attitude objects. There was also some evidence that social comparison processes may play a role: In Studies 2 and 4, attitude certainty was also a partial mediator of the relation between network composition and attitude strength.

The consistency of our findings regarding social network homogeneity is striking. Across several different attitude objects, different samples drawn from different populations, and different testing conditions (involving both experimental and correlational designs and both self-administered questionnaires and telephone interviews), the same relation between social network composition and attitude strength emerged. This relation proved to be remarkably robust as well. It did not vary depending on the order in which the social network and attitude change measures were collected, and it remained significant after controlling for a wide range of individual-level correlates of attitude strength (e.g., strength of partisanship, knowledge).

All of this suggests that taking into consideration features of the social context may contribute to a richer understanding of attitude strength. The strength of an individual's attitudes seems not to be determined strictly by intraindividual factors but by interpersonal factors as well. A continued exploration of the social bases of attitude strength may shed light on processes that have not received much attention within the attitude-strength literature. Further, exploring the impact of social factors on attitude strength may enrich understanding of attitude properties that have been identified in the attitude-strength literature (e.g., certainty, ambivalence) by providing new insights into the social factors that give rise to them and the processes by which they operate. Finally, this approach may foster a more complete understanding of the dynamics of attitude strength, shifting the focus from changes that take place within the minds of attitude holders to changes that occur within the social context in which the attitude holder is situated.

Additional Mechanisms

Our data provide initial evidence of the psychological mediators responsible for the observed relation between network composition and attitude strength, but clearly much more remains to be learned. Although ambivalence consistently emerged as a mediator, it never fully accounted for the impact of network composition on attitude strength, and attitude certainty emerged as a mediator in two of our studies but not in two other studies. Finally, some factors that we strongly expected to mediate the relation did not appear to do so. This may suggest that our measures of some of the proposed mechanisms did not fully capture the relevant constructs or processes or that additional processes were unfolding that we have yet to identify. Multicollinearity among the potential mediators is also likely to have complicated our efforts to document the causal processes responsible for the observed relation. Not surprisingly, for example, ambivalence and certainty are quite strongly negatively correlated (on average, the correlations observed in our studies hovered around −.60), making it difficult to isolate their effects.

For now, we can be quite confident that ambivalence is partially responsible for the relation between network composition and attitude strength. Discrepancies between one's own attitude and the attitudes of network members seem to produce a subjective experience of ambivalence, rendering people vulnerable to persuasive appeals. Firm conclusions regarding the other potential mechanisms await future research that continues to shed light on these processes.

Social Networks and Attitude Inoculation

Our initial hypotheses suggested that being embedded within an attitudinally heterogeneous social network would be associated with lower individual-level attitude strength, and our data are consistent with this notion. However, there are also plausible reasons to have predicted the reverse: that being embedded within heterogeneous social networks may increase rather than decrease

attitude strength. For example, McGuire (1964) proposed that exposure to counterattitudinal persuasive messages can stimulate people to develop defenses to the attack, thereby "inoculating" the attitude against future persuasive attempts, just as small doses of a virus stimulate the body to develop antibodies that render it resistant to subsequent exposure to the virus. People in heterogeneous social networks might be expected to be more likely than those in congruous networks to be confronted by counterattitudinal persuasive messages, providing the opportunity and the motivation to develop strong defenses to persuasion. It is worth considering, then, why being embedded within attitudinally heterogeneous social networks seems not to inoculate people's attitudes against attack.

We believe there are several potential explanations. First, in Study 3 we found that the more heterogeneous participants' social networks were with regard to the issue of capital punishment, the less frequently participants expressed their views on this issue. This may suggest that when people in heterogeneous social networks identify issues on which they disagree, they avoid talking about those issues. As a result, people in heterogeneous networks may not be routinely exposed to attitude attacks and thus may be no more likely than people in attitudinally congruous networks to develop strong attitude defenses.

Second, McGuire (1964) explicitly posited that inoculation processes are set into motion by exposure to a weak attitude challenge. Such exposure, he proposed, motivates people to develop counterarguments to the challenge, and because the challenge is weak, people are in fact able to generate effective counterarguments. According to inoculation theory, this combination of motivation and ability to develop counterarguments to an attitude challenge yields an attitude that is less vulnerable to subsequent attacks. It is possible that when people in heterogeneous networks do discuss issues on which they disagree, they often encounter strong rather than weak challenges to their attitudes. If this is the case, members of heterogeneous social networks may find it difficult to refute the counterattitudinal messages that they are confronted with, rendering their attitudes weakened rather than inoculated.

Finally, in formulating inoculation theory, McGuire (1964) drew an analogy to a biological organism living in a germ-free environment, never called on to defend against disease. In keeping with this analogy, in his tests of inoculation theory McGuire intentionally focused on "cultural truisms"—widely held beliefs that have never been attacked. McGuire did not suggest that ordinary attitudes are likely to exist in "germ-free" environments, sheltered from attack (for a discussion, see Insko, 1967). Instead, for most attitudes—even attitudes that are widely shared—people are typically aware of counterattitudinal information. This suggests that even people who interact primarily with like-minded others nonetheless come into contact with opposing points of view, stimulating them to develop defenses to these challenges.

Homogeneous but Incongruous Social Networks

In all of our studies, the social networks we examined ranged from fully homogeneous and attitudinally congruent to those that contained a fairly even mix of viewpoints. In our experimental studies, this was by design. In our correlational studies, this was presumably a consequence of our participant selection criterion. To enable us to hold constant the persuasive message to which participants were exposed (thus avoiding the ambiguity of interpreting attitude change in response to two different messages that may vary somewhat in cogency and persuasiveness), we included in our correlational investigations only participants who held positive attitudes toward capital punishment. Recent surveys have indicated that approximately 70% of Americans favor capital punishment, a figure roughly matched in our own national survey. This would suggest, consistent with our data, that the vast majority of people who support capital punishment will find at least some support for their views within their social networks. This leaves open the interesting question of how individual-level attitude strength is impacted by social networks that are homogeneous but attitudinally incongruent. A number of possibilities seem plausible.

It may be that being embedded within a social network characterized by a fairly even mix of contradictory opinions produces maximal ambivalence. Recognizing that one's close associates are evenly divided on an issue may create particularly high levels of internal conflict, and beyond this point, further increases in the proportion of divergent points of view may not lead to increases in ambivalence. Similarly, the perception of equal numbers of network members on each side of an issue may lead to particularly intense uncertainty about the issue, which may not be exacerbated by further increase in the proportion of network members who hold a different view from one's own. This would imply a nonlinear relation between network composition and individual-level attitude strength: as the proportion of divergent opinions within a network increases, attitude strength may decrease but then level off as the balance of opinions shifts from an equal mix on both sides of the issue to a growing proportion of network members on the opposite side of the issue.

It is also possible that as the balance of opinions shifts from an even mix of views on an issue to an increasing proportion of network members who disagree with one's views, attitude strength may continue to decrease. That is, holding a minority opinion within one's network may produce further increases in ambivalence and uncertainty. This would imply a linear relation between network composition and individual-level attitude strength.

Finally, it may be that homogeneity of opinion per se is the driving force behind the observed results. Diversity of opinion within one's network may inspire maximal ambivalence and uncertainty, and consensus within the network (regardless of whether the consensual position is consistent or inconsistent with one's own view) may provide clarity about where important others stand on a given issue, reducing uncertainty and ambivalence. This would suggest a curvilinear relation between network composition and attitude strength.

Unfortunately, our data do not permit us to explore this issue.[7] Our objective in the current research was to determine whether social network composition regulates individual-level attitude

[7] Participants in our experiments who expressed initially positive attitudes toward the target issues (for whom the homogeneous social networks were therefore united in an attitude position that differs from their own) might seem to provide an opportunity to address this issue, but the persuasive messages to which all participants were exposed were proattitudinal for these participants, rendering comparisons of attitude change rates ambiguous.

strength and to identify one or more of the psychological mechanisms by which it operates. We look forward to additional research further clarifying the nature of the relation between the network composition and attitude strength.

Recursive Processes

We have emphasized the causal relation between social network composition and attitude strength, and we have presented experimental evidence consistent with this direction of causality. Most likely, however, the relation between attitude strength and properties of people's social networks involves recursive processes. Individuals do have control over the people with whom they associate, and they may select network members in part on the basis of attitude agreement, particularly regarding objects or issues toward which they hold strong attitudes (Byrne, London, & Griffitt, 1968; Clore & Baldridge, 1968). Individual-level attitude strength, then, may partially determine the composition of a person's social network.

Of course, selection on the basis of agreement on one attitude will almost certainly introduce discrepancies on some other attitudes. Our results suggest that the construction of networks that are attitudinally congruous with regard to a particular attitude will further strengthen that attitude, whereas the network heterogeneity that may be introduced regarding other attitudes will further weaken those attitudes. The strengthening of the focal attitude and simultaneous weakening of other attitudes may then increase the likelihood that people will choose new network members on the basis of the former and not the latter, extending the recursive relation between network composition and attitude strength.

Of course, social relationships develop for many reasons in addition to attitude similarity. In fact, there is considerable evidence that laboratory experiments may have overstated the degree to which interpersonal attraction in natural settings is driven by attitudinal agreement (e.g., Levinger, 1972; Sunnafrank, 1983, 1992; Wright & Crawford, 1971). For example, Levinger (1972) found that across a wide range of attitudes, goals, values, and general political ideology, pairs of college roommates who were friends before entering college and actively chose to share a dorm room were no more similar than were pairs of roommates who were randomly assigned to share a room. Further, follow-up data collected several months into the school year indicated that randomly assigned roommates who were initially similar on these dimensions did not come to like each other more than did randomly assigned roommates who were dissimilar on them (for similar evidence, see Curry & Emerson, 1970; Laumann, 1969; Newcomb, 1961; Wright & Crawford, 1971). All of this suggests that social network composition may not simply reinforce preexisting individual-level differences between strong and weak attitudes but may instead play a more primary role in determining the strength of people's attitudes.

Perceived Versus Actual Attitude Similarity

In our studies involving real-world social networks, our measures of network composition were constructed from individuals' perceptions of their network members' views. Clearly, people's perceptions of others' attitudes are sometimes inaccurate (e.g., Marks & Miller, 1987), and although investigations that explicitly assessed the accuracy with which people perceive the views of their social network members have revealed relatively high levels of accuracy, some distortions have been observed (e.g., Huckfeldt & Sprague, 1987). It is more accurate, therefore, to cast our findings in terms of perceived rather than actual social network composition.

Of course, perceived network composition is likely to be constrained by the actual distribution of attitudes within a network. People may prefer to believe that their network members agree with them, for example, but motivated perceptions of this sort are constrained by reality (e.g., Kunda, 1990). It may be unwise, therefore, to make too much of the distinction between actual and perceived network composition. When there is a discrepancy, we suspect that perceived agreement will be critical to attitude strength. All of the proposed mediators that we have discussed implicate perceptions of attitudinal agreement within networks rather than objective levels of agreement. For example, people should feel more certain that their views are valid to the extent that they perceive consensus among network members, even if that perception is incorrect. Similarly, people should experience ambivalence regarding an attitude object if they believe that network members disagree with their views toward the object, regardless of the veridicality of those beliefs. Nevertheless, future investigations that directly assess the implications of actual versus perceived network composition certainly seem warranted.

Conclusion

Each of us has, stored in memory, our own idiosyncratic array of summary evaluations of people, places, issues, and other objects. We do not form or maintain these attitudes in isolation, however. Instead, we hold our attitudes within a particular social context. These social contexts vary in a virtually limitless number of ways, with complex implications for the attitudes we hold. Understanding the interplay between features of the immediate social context and attitude properties and processes represents a tremendously important challenge for attitude researchers. We view the research reported here as an initial step toward meeting that challenge.

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Appendix

Study Materials

Study 1: Sample Bulletin Board Discussion Messages

Homogeneous Condition

Group Member #1: I basically don't like the idea of mandatory student service.
Group Member #2: Me too.
Group Member #3: I wouldn't support it.
Group Member #4: Me neither.
Group Member #5: I could write a book on why it's a bad idea.

Heterogeneous Condition

Group Member #1: I basically like the idea of mandatory student service.
Group Member #2: Me too.
Group Member #3: I could write a book on why it's a bad idea.
Group Member #4: I think it's a great idea.
Group Member #5: I wouldn't support it.

Study 4: Persuasive Message

As you may know, some people have spoken out *against* the death penalty recently. I'm going to tell you a few things that have been said, and then I'd like to hear what *you* think.

Some critics say that the death penalty is often handed out unfairly. In particular, they point to evidence that poor people and minorities are more likely to be sentenced to death than wealthier whites, even for the exact same crime.

Others argue that our legal system is not perfect, and we can never be 100% certain of someone's guilt. They point to several recent cases where DNA evidence has proven that death row inmates were actually innocent. In some cases, death row inmates have come within days of being executed for a crime they did not commit.

Because of this, some say that the death penalty should be abolished. Instead, they say that people who commit serious crimes should be given a life sentence with no chance of parole.

Received April 13, 2003
Revision received June 10, 2004
Accepted June 14, 2004 ■