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From individual preference construction to group decisions: Framing effects and group processes

Kerry F. Milch [a,*], Elke U. Weber [a], Kirstin C. Appelt [a], Michel J.J. Handgraaf [b], David H. Krantz [a]

[a] Department of Psychology, Columbia University, 1190 Amsterdam Avenue, MC 5501, New York, NY 10027, United States
[b] Department of Psychology, University of Amsterdam, The Netherlands

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ABSTRACT

Two choice tasks known to produce framing effects in individual decisions were used to test group sensitivity to framing, relative to that of individuals, and to examine the effect of prior, individual consideration of a decision on group choice. Written post-decision reasons and pre-decision group discussions were analyzed to investigate process explanations of choices made by preexisting, naturalistic groups. For a risky choice problem, a similar framing effect was observed for groups and individuals. For an intertemporal choice task where consumption was either delayed or accelerated, naïve groups (whose members had not preconsidered the decision) showed a framing effect, less discounting in the delay frame, opposite to that observed in individuals. Predecided groups showed a non-significant effect in the other, expected direction. In all cases, process measures better explained variability in choices across conditions than frame alone. Implications for group decision research and design considerations for committee decisions are addressed.

The framing of an issue can substantially influence preferences and decisions. Politicians and advertisers are well aware of this phenomenon, and anyone trying to strategically influence others' responses (or trying to avoid being strategically influenced) would be advised to understand the underlying mechanisms. In their seminal work, Kahneman and Tversky (1979) and Tversky and Kahneman (1981) found that when the outcomes of risky choice options were framed in terms of gains, decision makers were risk averse, but when outcomes were framed in terms of losses, decision makers were risk-seeking, even when the outcomes were objectively equivalent. Evidence of outcome framing effects has since been reported in a range of decision domains, including medical decisions (Marteau, 1989), consumer evaluations (Levin, Johnson, Russo, & Deldin, 1985), and public health campaigns (see Kühberger, 1998, and Levin, Schneider, & Gaeth, 1998, for reviews).

Most of these studies have focused on individual decision makers (Levin et al., 1998). However, many important political, economic, environmental, and organizational decisions are made by groups. Group decisions differ from individual decisions in critical ways. One obvious difference is the diversity of opinions, background knowledge, and communication styles that exists in groups.

Framing effects in group decisions

In this paper, we aim to extend the current understanding of framing effects from individual to group decisions, investigating whether groups show the same framing effects as individuals. The few existing studies of framing effects in group decisions have focused on decision outcome as the dependent variable. The results have been mixed and even contradictory. For instance, Neale, Bazerman, Northcraft, and Alperson (1986) examined risky choice framing effects among individuals and groups using several scenarios, including a variation of Tversky and Kahneman's (1981) Asian disease problem. Participants completed a decision questionnaire individually and then reconsidered the same scenarios in groups, with identical framing. Neale et al. (1986) found the usual gain/loss framing effect for individual decisions and a reduced framing effect for group decisions. Neale and colleagues conjectured that their findings were due to "social accentuation", arguing that groups focus their attention on more relevant issues than individuals and disregard irrelevant information, such as the framing of choice options.

Paese, Bieser, and Tubbs (1993) also examined risky choice framing effects among individuals and groups. Across four scenarios, they found mixed results that did not show the same pattern as those of Neale et al. (1986). A key difference was prior exposure; while Neale et al. (1986) gave participants the same frames in the group and individual conditions, Paese et al. (1993) varied whether group frame was the same or different from individual frame. For their version of the Asian disease problem, Paese et al.

* Corresponding author. Fax: +212 854 3609.
E-mail address: kaf2109@columbia.edu (K.F. Milch).

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(1993) also found a framing effect at the individual level, but groups who had received the same frame as individuals showed increased framing effects, at least for the gain frame. In contrast, groups who had received the opposite frame as individuals showed reduced framing effects. The inconsistency between the Neale et al. (1986) and Paese et al. (1993) group decision results might be resolved by examining process data to understand how frames affect the ways in which groups mentally represent decision options and make choices (as recommended by Kerr, MacCoun, & Kramer, 1996).

Neale et al. (1986) suggested that future studies look not only at choice outcomes, but also investigate process measures to understand how groups may provide protection against decision biases commonly found with individuals. The current study does precisely that, adding an examination of group decision processes to the more typical comparison of group vs. individual choice outcomes. We develop a comprehensive framework for coding the processes by which group decisions are constructed. We show that process data (in the current study, group discussion transcripts and written reasons provided by individuals and groups) are important and provide insights beyond those of decision outcomes alone.

There is some evidence from studies of persuasive-arguments theory (e.g., Vinokur & Burnstein, 1974) that the frequency and persuasiveness of pro-risk and pro-caution arguments are directly related to individuals' initial preferences and the likelihood of risky shift in group decisions. This suggests that arguments generated by individuals and groups should be good predictors of their choices and should provide a deeper understanding of how frames influence the choices of both individuals and groups. Several studies (e.g., Brauer, Judd, & Gliner, 1995; Hoffman & Maier, 1964; Hoffman & Maier, 1967; Poole, McPhee, & Seibold, 1982; Winquist & Larson, 1998) have demonstrated the predictive power of discussion content. We are the first, to our knowledge, to examine the predictive power of such argument-based process measures for framing, and to combine it with an investigation of the role of individual exposure to a decision before group discussion.

The fact that groups are often, but not always, less susceptible to framing effects than individuals (Kühberger, 1998) may be due to the conflicting influences of group and situational characteristics. In particular, groups have more resources than individuals (Hill, 1982; Maier, 1967), tend to catch errors that individuals miss (Shaw, 1932), and have been shown to be more accurate in some judgment tasks, including numerical estimation and judgments of risk (Hastie, 1986; Sniezek & Henry, 1989). On the other hand, Stasser and Titus (1985) and Schulz-Hardt, Brodbeck, Mojzisch, Kerschreiter, and Frey (2006), using hidden profiles paradigms, in which group members must communicate and combine the unique information they each have to reach an optimal judgment or decision, have shown that during discussion group members often fail to share their unique knowledge. Moreover, several studies have shown that groups are just as susceptible as individuals (and sometimes more so) to other biases in decision making, such as conjunction errors (Tindale, 1993), anchoring effects (Whyte & Sebenius, 1997), and the representativeness heuristic, at least when descriptions are informative (Argote, Devadas, & Melone, 1990). While groups often outperform the average individual member on problem solving and judgment tasks, group performance has been found to be inferior to that of the best group member on other tasks. Hastie (1986) points out that for tasks with easily demonstrable solutions (i.e., "Eureka!"-type problems), group performance tends to be relatively high, sometimes matching that of the group's best member.

According to Laughlin and Ellis (1986), a demonstrable response satisfies four conditions: (1) the response falls within an agreed upon verbal or mathematical system; (2) there is enough information for the solution to be found; (3) group members unable to reach the solution have enough information to accept a correct solution proposed by another member; and (4) there must be enough time, motivation, and resources for a group member with the correct solution to explain it to the others. We used two very different decision scenarios in this study, yet both are high in demonstrability. Although both tasks required participants to indicate a preference (and thus, there was no "correct" answer), we propose that in our first task (a modified Asian disease problem (Tversky & Kahneman, 1981)), the recognition that "200 people [out of 600 total] will definitely be saved" also means that "400 people will definitely die" is an important and highly demonstrable part of the decision making process that makes the two frames logically equivalent. In this case, the task satisfies the four conditions of demonstrability. For our second task (involving a choice between a smaller monetary prize today and a larger prize in three months), the choices that individuals or groups make depend on their discounting of future outcomes. People generally discount future outcomes far more than economic rationality would suggest (see Weber et al., 2007), and thus less discounting (which is consistent with selection of the larger, later option) would generally be considered more desirable. Thus, while there is no "correct" response, the presence of a generally more desirable response suggests partial satisfaction of condition 1 (agreement on a verbal or mathematical system), and fulfillment of conditions 2, 3, and 4 (see Laughlin, 1999, for more on demonstrability and collective induction).

Group member preparation and prior commitment to a decision

In addition to emergent group processes, another factor that may affect the quality of group decisions lies in the processes that occur before a group even convenes. The results of Paese et al. (1993) suggest a potentially important effect of preparation; groups that made the decisions in the same frame as the one in which they prepared the decision individually showed different susceptibility to framing effects than groups that prepared in the opposite frame. While Paese et al. (1993) focused on the effects of frame-switching, we focus on a more fundamental question: what is the effect of preparation per se? This is an important question, since in a range of organizational settings often groups are advised to prepare for meetings by reviewing materials and developing individual opinions. The general belief is that preparation will result in better group decisions. However, little research has examined the effects of such preparation. The typical protocol for group decision making studies involves having individuals express their preferences prior to group discussion (e.g., research on social decision schemes, Davis, 1973; jury decision making, Hastie, 1993; and hidden profiles, Stasser & Titus, 1985). The group decision is then compared to the initial positions of the individuals in the group to look for differences. In effect, rather than comparing groups to individuals, these studies are comparing *predecided groups* (groups whose individual members have already stated a preference) with individuals (for an exception see McCauley, Teger, & Kogan, 1971). We argue that comparing groups that encounter the decision for the first time as a group (*naïve groups*) with both individuals and with predecided groups can yield interesting insights into the effects of group deliberation on decision making.

A few studies have experimentally manipulated whether group members have seen and considered the decision individually prior to group discussion. The results from these studies suggest that predecided groups may be more susceptible to decision biases than naïve groups. Moon et al. (2003) found that predecided groups

were more likely to show sunk-cost effects, demonstrating less willingness to abandon failing projects than individuals. In addition, these groups were less willing to make "strong decisions" (Moon et al., 2003, p. 77) in terms of supporting or withdrawing support from a project than naïve groups. The effect of prior, individual consideration has also been examined with respect to the risky shift phenomenon (e.g., Castore, 1972; Gaskell, Thomas, & Farr, 1973; McCauley et al., 1971; Schellenberg, 1974). These studies yielded mixed results, but all underscore the importance of considering prior exposure and pretesting when comparing individual and group decisions.

Work on hidden profiles (Greitemeyer & Schulz-Hardt, 2003) has shown how individual pre-decision processes can lead to suboptimal group decisions. Their studies focused on individual-level explanations of the failure of groups to solve hidden profiles. Participants who were not given any information prior to reading a group discussion transcript performed better than participants who had considered the decision and developed a preference prior to exposure to the discussion transcript. We know of no work that has examined the effect of prior consideration on susceptibility to framing effects.

One can imagine how prior exposure could result in equivalent or increased framing effects at the group level due to group members' motivation to defend a predecided position. When a decision is presented for the first time in the group setting, this may lead to a reduction in framing effects at the group level, as there is less conflict between the motivation to reach a group decision and the motivation to defend one's own position. The current study extends the research on group framing effects by using not only a risky choice paradigm but also an intertemporal choice scenario with real outcomes and by including analysis of process measures in addition to the more typically studied choice outcomes. We make a distinction between *predecided groups* (whose members have read the decision scenarios and formed preferences privately prior to group discussion) and *naïve groups* (whose members encounter the decision for the first time as a group).

Important group decisions are generally not made by ad hoc groups of undergraduates without prior acquaintance but by groups of colleagues, relatives, or policy makers with preexisting and ongoing relationships. Most studies of group decision making, however, have used artificial, ad hoc groups. The current study, in contrast, used preexisting groups, drawn from campus organizations or work teams. While some of our results may differ from the findings in the current literature because of this change, we felt that it was important to undertake the significantly larger effort involved in recruiting these groups in order to generalize more readily our results to the reality of preexisting groups.

We next introduce a series of hypotheses that were tested in the present study. The first hypothesis follows from the general theoretical perspective sketched above.

Hypothesis 1a. There will be an interaction between frame and decision context (individual vs. group), such that groups will show weaker framing effects than individuals.

This hypothesis does not mean that groups will be immune to framing effects, simply that their choices will vary less as a function of frame than the choices of individuals. We further expected that this reduction in framing effects in groups would be stronger in naïve groups. We believed that predecided group members would be committed to their initial decisions and/or would use the initial decisions as anchors in the group deliberation. This leads to our next hypothesis.

Hypothesis 1b. There will be an interaction between frame and prior consideration (predecided vs. naïve group), with predecided groups showing stronger framing effects than naïve groups.

Mental representation of decision options

Our remaining hypotheses address the ways in which individuals and groups understand a decision scenario and reason through their decision. According to most normative theories of decision making, decisions should not violate the principle of description invariance (Tversky & Kahneman, 1986). That is, the way a scenario or options are described should not affect the choices people make. Shafir, Simonson, and Tversky (1993), however, suggest that different frames emphasize different kinds of information, which lead to predictably different choices. McKenzie (2004) has argued that frames "leak" information about the speaker's perspective and what he or she considers important or unusual, thus directing the recipient's attention to relevant information. Although two frames may be logically equivalent, they may not be "information equivalent", in the sense that the speaker's choice of frame conveys information about the speaker's beliefs and intents. Frisch (1993) points out that frames can influence choice by leading to different inferences about the choice outcomes.

Taken together, the work of Shafir et al. (1993) and McKenzie (2004) reveals that the framing of options impacts choice through the generation of arguments for available choice alternatives. We hypothesize that different frames highlight different features of the choice options, affecting people's retrieval of representations of the options and their value from memory. Investigation of these processes may illuminate how groups are able (or not) to circumvent the vulnerability to framing effects seen in individuals. To examine the mental representation of the decision options in our study and the way frame and decision preparation interact, we recorded and coded the group decision deliberations. To compare the representations of decisions under different frames, we asked both individuals and groups to write down their reasons for their decisions after they made them. Although having to provide reasons may alter the ways in which participants make choices (see Lerner & Tetlock, 1999, for a review of accountability effects in social judgment and choice), we felt it was important to include this element in our procedure. These reasons offer a window into the ways in which frame and decision context influence mental representation of decision outcomes, and the inclusion of process measures has been recommended by previous authors (Kerr et al., 1996; Neale et al., 1986; Paese et al., 1993). Moreover, because we asked all participants in all conditions to provide reasons for their decisions, this design feature cannot explain any differences between frames or decision contexts that might emerge.

Hypothesis 2. Written reasons will differ by frame, with more reasons favoring the option highlighted in the given frame.

We expected this effect to be weaker for groups since groups have access to a wider range of perspectives and engage in a broader range of information processing activities. Although Hinsz, Tindale, and Vollrath (1997) concluded in their review that groups, compared to individuals, tend to reduce the variability in the ways information is processed, they also pointed out that the same information may be mentally represented differently by different group members, potentially leading to the emergence of conflict during group discussion. The range of perceptions, opinions, and capabilities that group members bring to a discussion can lead to better decisions (Hinsz et al., 1997) and is one of the reasons many important decisions are made by groups. We anticipated that these differences would lead to a diversity of information processing strategies in groups and felt examination of the impact of these potential differences on predecided and naïve groups would produce a better understanding of the ways in which individual information processing relates to information processing by groups.

Our expectation of increased reframing in groups derived in part from an expectation that groups would rely more on analytic processing (using statistical or generally more abstract information) than experiential processing (affect-based, associative) when compared to individuals. We believed that an increased use of analytic processing during group discussion would be related to a reduction in framing effects (Neale et al., 1986). Because groups may potentially contain at least one member who is comfortable with and adept at quantitative reasoning, we hypothesized that groups would be more likely to use analytic processing than individuals (Marx et al., 2007). To test this hypothesis, written reasons provided by individuals and groups and group discussion transcripts were coded for argument type – analytic versus experiential.

A coding scheme, described in the Method section and Appendices, was created to examine the content of group discussion and the written reasons generated by individuals and groups, including the mention of different classes of goals. As Krantz and Kunreuther (2007) explain, decisions typically involve multiple goals, and context influences which goals receive greater attention and weight. We assumed that the group decision making context would activate consideration of social goals, such as helping a larger number of people over aiding a select few ("We would rather try to save everyone even if a few more end up sick."), or considering group members' needs and concerns in deciding how much prize money to receive and when ("But if we get $65 now you know you can throw a big party before we leave. And we don't have the money to do that now."). Thus, we predicted that social goals would appear more often in the group written reasons than in the individual written reasons and would play a larger role in influencing the group decisions than the individual decisions. We expected this effect to be particularly strong for naïve groups because the decision would be occurring completely within the group context.

Hypothesis 3. Social goals will appear more frequently in the reasons of groups, especially naïve groups, compared with the reasons provided by individuals.

We hypothesized that our process measures would be more sensitive predictors of individual and group choice than frame alone, and that frame would no longer be a significant (or as significant a) predictor when these process measures were included in the analyses. Specifically, we expected frame to affect choice, but we predicted that the written reasons and reasons provided in group discussion would mediate the effect of frame and be better predictors of choice than frame. As Levin et al. (1998) point out, the processes by which different frames may lead to different choices are not readily apparent from examination of decision outcomes alone.

Hypothesis 4. Reasons provided by participants will (partially) mediate the effect of frame on the choices of individuals and groups and will be better predictors of choice than frame alone.

Analysis of the reasons provided by participants also allowed us to test hypothesized process explanations of choice phenomena (Johnson, Häubl, & Keinan, 2007; Weber et al., 2007). Framing effects for such problems as the Asian disease scenario have been explained by the certainty effect (Kahneman & Tversky, 1979), i.e., the fact that certain outcomes are overweighed, relative to their probability. Since the overweighed certain loss of life in the loss frame is a negative, and the overweighed certain gain of life in the gain frame is a positive, the risky option is preferred in the loss frame, and the certain option is preferred in the gain frame. While observed choice data have been consistent with this explanation, the process measures collected in our study allowed us to test the certainty effect hypothesis explicitly as a process-level explanation of observed choices.

Hypothesis 5. Individuals or groups who provide (written or spoken) arguments that point out the certainty of an outcome in the risky choice will be more likely to make the frame-consistent choice.

Method

Participants

One hundred two individuals (41 men, 61 women) in 34 three-person groups participated in this study. Participants were recruited through flyers, email, and personal communication and came from clubs, organizations, and work teams from Columbia University or other locations in or near New York City. Sixty-two percent of the groups were drawn from student clubs. The remaining 38% consisted of groups of people who worked together in university laboratories or offices. The median age was 22; the range was 18–43.

Procedure

Upon arrival at the decision lab, the three members of a group were presented with one frame of either the West Nile Virus task or the Prize Money task, selected at random, to be completed individually by each group member in the *pregroup* condition. These scenarios are described in detail below. Participants were told to read the scenario, make a decision, and provide written reasons for their decision. This part of the study was completed individually and privately without any group discussion. For each participant, this part of the study yielded an individual decision and individual written reasons for either the West Nile Virus or the Prize Money decision.

After the experimenter collected participants' pregroup decisions and written reasons, the group convened and was given a copy of each scenario in turn (*group* condition). Half of the groups thus consisted of individuals who had already individually made a decision on the West Nile Virus scenario (predecided decision) but saw the Prize Money scenario for the first time (naïve decision). For the other half of the groups the reverse was true. Each group therefore made one predecided group decision and one naïve group decision. All members of a group were predecided for the same decision and naïve for the other decision. The groups were told to read and discuss the scenarios, reach a consensus, and indicate their decision and reasons for the decision in writing. The group discussion was videotaped and later transcribed. There was no difference between the scenarios that participants received in the pregroup condition and in the group condition (frame was constant), except that participants had to reach consensus in the group condition (and for the Prize Money decision, participants were told that the group decision would be binding, as further described below). Upon completion of the study, participants were debriefed and paid.

Framing manipulations and design

Groups were randomly assigned to one set of frames (loss and accelerate *or* gain and delay) for the entire study. Each member of a given group received the same framing as the other group members and everyone received the same framing both times they saw a scenario (i.e., in the pregroup and group conditions).

Decision scenarios

One decision scenario was a modified version of Tversky and Kahneman's (1981) Asian disease problem, changed to increase

personal relevance for participants. The scenario described an outbreak of West Nile virus threatening the New York City area. Participants were told that an estimated 600 students at Columbia University would become infected and experience severe symptoms and that there was no known vaccine. Participants were asked to make a forced binary choice, selecting one of two potential research programs for the university to pursue in order to develop a vaccine. Outcomes were framed differently between groups. In the *loss* frame, participants were told that if Program A was chosen, 400 students would become infected with the virus and experience severe symptoms. If Program B was chosen, there was a 1/3 chance that no one would become infected and a 2/3 chance that all students would become infected. In the *gain* frame, Program A was associated with 200 students being protected against the virus, and Program B was associated with a 1/3 chance that everyone would be protected and a 2/3 chance that no one would be protected.

The second scenario involved an intertemporal choice about the delay or acceleration of additional compensation ("Prize Money"). We explained that two groups had been randomly preselected for whom the decision would be real (i.e., their decision would affect how much additional compensation they would receive and when they would receive it). This task (delay versus accelerate framing) did not conform to the strict definition of framing but to a looser construal of the concept, in that the two versions did not represent different descriptions of the exact same scenario but described two versions of a choice that can be considered nearly equivalent from the perspective of economic theory (Frisch, 1993). In the *delay* frame, participants were told that, in addition to the $5 participation compensation issued to each group member, their group could possibly receive an additional $65 at the end of the study today, or they could choose to delay receipt by three months in order to receive a larger amount of money. In the *accelerate* frame, participants were told their group could potentially receive an extra $75 in three months, or they could choose to receive a smaller amount of money at the end of the study today. The experimenter explained that all prize money, whether received at the end of the study today or in three months, would be divided evenly among the three participating group members.

Participants expressed their preference by making a series of choices between an immediate and a delayed option of different denominations (i.e., using a choice titration procedure). In the *delay* frame, participants were asked whether they would prefer $65 today or $70 in three months, whether they would prefer $65 today or $75 in three months, with the three-month value increasing in $5 increments up to $120. In the *accelerate* frame, participants indicated their preference for a series of options beginning with a choice between $75 in three months or $20 today. The "today" value increased in $5 increments up to $70. Participants were told that an amount of money (between $70 and $120 in the *delay* condition and between $20 and $70 in the *accelerate* condition) had been randomly selected by the experimenter, and the value of that pre-determined amount in combination with the group's expressed preference would determine whether they received the extra money today or in three months. This procedure ensured that participants would express their true preferences between each set of choice options, without any strategic misrepresentation (Becker, DeGroot, & Marschak, 1963). In addition, participants in the pregroup condition were told that the group decision would be binding, but that the experimenters were interested in the individuals' personal preferences.

The dependent measure for this task was the discount factor, which was calculated using Read's (2001) formula: $\delta = (x_1/x_2)^{(1/(t_2-t_1))}$, where x_1 is the amount received today ($t_1 = 0$) that is seen as equivalent to x_2 received in 3 months ($t_2 = \frac{1}{4}$ year). The discount factor indicates how much $1 now is worth in a year; $\delta = 1$ indicates no discounting and smaller values ($\delta < 1$) indicate increasing discounting.

Content analysis

Two independent, blind raters coded the written reasons provided by individuals and groups and the transcripts of the group discussions. To obtain a base measure of how many distinct ideas were provided by each group during discussion (analogous to the reasons provided by individuals and groups in writing), the discussion transcripts were coded for "thought-units" (Gottman, 1979), using the definition provided by Weldon, Jehn, and Pradhan (1991) as "a sequence of words conveying a single thought". Groups provided between 11 and 317 thought-units for the West Nile Virus scenario ($M = 83.82, SE = 10.42$) and between 22 and 292 thought-units for the Prize Money scenario ($M = 81.27, SE = 9.46$). There were no effects of frame or prior exposure (predecided vs. naïve) on the number of thought-units for either scenario.

Additionally, the types of reasons participants provided for their decisions were classified into several non-mutually exclusive categories. To understand whether individuals and groups were justifying their choices based on personal experience and anecdotes or based on appeals to logic and rationality, written reasons were coded for experiential versus analytic arguments. Written reasons were also coded for evidence of different kinds of goals, including social goals. Given the nature of the two decision tasks in this study, the "social goals" category had a slightly different meaning as a function of scenario. For the West Nile Virus task, social goals most commonly referred to serving the greater good. For the Prize Money task, they usually referred to the concerns of the participating group or the broader organization from which the group was recruited.

In addition, to assess what information was potentially being "leaked" by the frame (Hypothesis 2), coders used scenario-specific codes to classify written reasons on different dimensions specific to a given scenario and frame, such as illness (West Nile Virus) or a need for immediate money (Prize Money). Complete lists of codes are in Appendices A and B. Coders were given instructions and examples and then coded 25% of the total material along a given dimension. Codings of this 25% were used to establish acceptable levels of interrater agreement, which was calculated using the intraclass correlation coefficient and ranged from .76 to .96 as a function of coding category. If agreement was below .75, the coders met with each other and one of the authors to resolve discrepancies. Once agreement was established at .75 or higher, a single coder finished coding the rest of the material. The relevant subset of these codes was used to analyze the discussion transcripts.

Results

West Nile Virus task

Analysis of framing effects on choices

The framing manipulation affected individuals' choices in the pregroup condition, where the proportion of individuals choosing the risky and riskless options was different for the two frames, $\chi^2(1, N = 54) = 8.68$, $p < .05$ (Cramer's $\varphi = .40$). Consistent with the framing effect typically observed, there was a strong preference (80%) for the risky option in the loss frame, while individuals in the gain frame were evenly divided between the two options. This represents a choice shift, although not a choice reversal. According to Levin et al. (1998), a choice shift occurs when the preference for the risky option differs across frames "but is not both significantly greater than .5 in the negative

condition and significantly less than .5 in the positive condition" (Levin et al., 1998, p. 153).

For the group decision, a 2 (frame: loss vs. gain) × 2 (prior exposure: predecided vs. naïve) logistic regression analysis revealed no significant Frame × Exposure interaction, $\chi^2(1, N = 34) = 0.01$, *n.s.*, and no main effect of prior exposure, $\chi^2(1, N = 34) = 0.15$, *n.s.* Because there was no difference between the group decisions of predecided and naïve groups, the effect of frame on choice was examined in the combined group data (naïve and predecided groups together). For the group decisions, there was no relationship between frame and choice, $\chi^2(1, N = 34) = 2.56$, *n.s.*, (Cramer's $\varphi = .27$). As with the individual decisions, there was still a pronounced preference (82%) for the risky option in the loss frame. A slight majority of groups (56%) also selected the risky option in the gain frame. Cohen (1988, p. 227) suggests the following interpretation of Cramer's φ coefficient, a measure of strength of association: $.10 < \varphi < .30$ = small effect size, $.30 < \varphi < .50$ = medium effect size, and $\varphi > .50$ = large effect size. Thus, we observed a medium-size framing effect for individuals (.40) and a small-size framing effect (.27) for groups.

Two analyses were needed to directly compare the effect of frame on choice for individuals versus groups due to our experimental design. Some of our groups ($n = 18$) were comprised of individuals ($n = 54$) who had preconsidered the decision, and thus these individual and (predecided) group decisions were not statistically independent. On the other hand, statistical independence did hold for the comparison of the predecided group members' individual decisions with the naïve groups' ($n = 16$) group decisions. These two comparisons (individuals vs. predecided groups and individuals vs. naïve groups) required separate analyses, comparing the same individual decisions once with the predecided group decisions and once with the naïve group decisions. This separation unfortunately reduced the statistical power of our analyses.

The individual vs. predecided group analysis used a generalized linear model to compare the decisions made by the individuals alone with those made collaboratively by the same people in the predecided groups. Thus, each individual had a pregroup choice and a (predecided) group choice. A 2 (frame: gain vs. loss) × 2 (decision context: individual vs. predecided group) repeated measures logistic regression analysis revealed an effect of frame, $\chi^2(1, N = 108) = 10.90$, $p < .01$. There was no main effect of decision context and no interaction effect. Table 1 contains the probabilities of choosing the risky option as a function of frame and decision context.

In the second analysis, we conducted a 2 (frame: gain vs. loss) × 2 (decision context: individual vs. naïve group) logistic regression analysis to examine differences between individuals and naïve groups. There was a main effect of frame on choice, $\chi^2(1, N = 102) = 8.12$, $p < .01$. There was no main effect of decision context and no interaction effect.

In summary, we did not find support for Hypothesis 1a; the results of the separate interaction analyses comparing individuals vs. predecided groups and individuals vs. naive groups did not demonstrate significant attenuated framing for groups. Hypothesis 1b (greater reductions in framing effects for naïve versus predecided groups) was also not supported.

Analysis of written reasons

Different decision frames were predicted to activate different mental representations of the choice options that would influence participants' choices, as reflected in their written reasons (Hypothesis 2). To examine whether the two frames led to different mental representations, we compared the frequency of written reasons of different coded categories between frames.

Table 1
Probability of selecting risky option as a function of frame and decision context.

Frame	Individuals	Predecided Groups	Naïve Groups
Gain	0.50	0.50	0.60
Loss	0.80	0.80	0.83

Table 2
Mean references to social goals as a function of frame and decision context.

Frame	Individuals	Predecided Groups	Naïve Groups
Gain	0.46 (0.10)	0.13 (0.13)	1.00 (0.21)
Loss	0.80 (0.07)	0.70 (0.15)	0.50 (0.34)

Note: Standard errors are presented in parentheses.

There was no significant effect of frame on the total number of written reasons given by individuals or groups for either task.[1] Thus, frequencies of written reasons, instead of proportions, were used in the analyses described below. The same is true for predecided and naïve groups' reasons, as well as for individual and group reasons for the other scenario.

Differences in written reasons provided by individuals and groups. Individuals provided more written references to illness or death in the loss frame ($M = 0.80, SE = 0.13$) than in the gain frame ($M = 0.25, SE = 0.12$), $t(52) = 3.00$, $p < .01$, $d = .81$, and significantly more mentions of helping or saving in the gain frame ($M = 1.13, SE = 0.11$) than in the loss frame ($M = 0.57, SE = 0.10$), $t(50.53) = -3.70$, $p < .01$. These findings confirm that individuals tended to adopt the frame given to them in the scenario description, leading to greater activation of the concepts of "illness" and "death" in the loss frame and greater activation of "saving" and "protecting" in the gain frame. Groups in the loss frame also provided more written references to illness or death ($M = 0.56, SE = 0.18$) than groups in the gain frame ($M = 0.11, SE = 0.08$), $t(20.18) = 2.29$, $p < .05$, $d = .84$. There were no Frame × Decision Context interaction effects for references to illness/death in the individual vs. predecided group comparison or the individual vs. naïve group comparison.

Groups showed no framing effects with respect to written references to helping or saving. Groups in the gain frame produced an average of 0.78 ($SE = 0.17$) reasons related to helping or saving, and groups in the loss frame produced an average of 0.63 ($SE = 0.15$). There was no Frame × Decision Context (individual vs. naïve group) interaction for references to helping/saving. Naïve groups in the loss frame had an average of 0.67 references to helping/saving ($SE = 0.33$), and naïve groups in the gain frame had an average of 0.90 ($SE = 0.23$). There was a significant Frame × Decision Context (individual vs. predecided group) interaction effect on references to helping/saving, $F(1, 52) = 7.21$, $p < .01$, with predecided groups in the gain frame producing an average of 0.63 ($SE = 0.14$) help/save references and predecided groups in the loss frame producing a mean of 0.60 ($SE = 0.13$). While individuals showed a framing effect on the number of reasons that related to helping or saving, when these same individuals discussed the decision in groups, the framing effect disappeared.

To test Hypothesis 3, that groups would invoke social goals in their reasons more than individuals, we conducted a 2 (frame: gain vs. loss) × 2 (decision context: individual vs. predecided group) ANOVA with decision context treated as a repeated measure. Means and standard errors for individuals and groups are pre-

[1] The mean number of written reasons provided by individuals in the West Nile Virus task was 2.90 ($SE = 0.28$) for the loss frame and 3.42 ($SE = 0.43$) for the gain frame, $t(52) = -1.04$, *n.s.* Groups in the loss frame provided a mean of 2.38 ($SE = 0.29$) written reasons, and groups in the gain frame provided a mean of 2.44 ($SE = 0.32$) written reasons, $t(32) = -0.16$, *n.s.* The written reasons reflect only a subset of the total number of reasons mentioned during group discussion, and thus these averages are different from the mean numbers of thought-units coded during the group discussions.

sented in Table 2. There was a main effect of frame, $F(1,52) = 12.80$, $p < .001$, with social goals (e.g., doing what is best for society) appearing more frequently in the loss frame ($M = 0.75, SE = 0.09$) than the gain frame ($M = 0.29, SE = 0.10$). There was also an effect of context, with participants invoking social goals more commonly in their pregroup decisions ($M = 0.63, SE = 0.07$) than in their group decisions ($M = 0.41, SE = 0.07$), $F(1,52) = 8.69$, $p < .01$. There was no interaction effect.

To compare individuals with naïve groups we conducted a 2 (frame: gain vs. loss) × 2 (decision context: individual vs. naïve group) ANOVA. There were no main effects but a significant interaction effect, $F(1,95) = 12.74$, $p < .001$, with naïve groups invoking social goals more in the gain frame and individuals invoking social goals more in the loss frame. Taken together, these results do not show that groups always invoke social goals more than individuals, although under certain circumstances they do (e.g., in a gain frame, without prior consideration of the decision).

Differences in written reasons provided by predecided and naïve groups. A 2 (frame: gain vs. loss) × 2 (prior exposure: naïve vs. predecided) ANOVA was conducted to examine the relationship of frame and prior exposure on the written reasons groups generated in support of their decisions. There was no main effect of frame. We found a marginally significant main effect of prior exposure on reasons related to social goals, $F(1,30) = 3.44$, $p < .10$. Naïve groups provided marginally more written reasons related to social goals ($M = 0.81, SE = 0.19$) than predecided groups ($M = 0.44, SE = 0.12$), consistent with the hypothesis that consideration of a decision for the first time in a group context is more effective in activating consideration of the concerns and needs of a group and/or society in general (Hypothesis 3). However, this effect of decision context was qualified by a significant interaction effect, $F(1,30) = 6.73$, $p < .05$, with naïve groups providing more reasons related to social goals in the gain frame ($M = 1.00, SE = 0.21$) than in the loss frame ($M = 0.50, SE = 0.34$), and predecided groups providing more references to social goals in the loss frame ($M = 0.70, SE = 0.15$) than in the gain frame ($M = 0.13, SE = 0.13$), a similar pattern to that found with the individuals vs. naïve groups comparison.

Relationship between choices and reasons (written and discussion-based)

Individuals. To investigate whether the reasons generated by individuals mediated the relationship between frame and choice, we followed the steps recommended by Baron and Kenny (1986). The choices for this task were dummy coded, with 0 indicating selection of the riskless option and +1 selection of the risky option. Frame was coded 0 for loss and +1 for gain. To use the Baron and Kenny (1986) approach to testing mediation, we had to conduct the analysis with only one mediator. We focused on reasons mentioning certainty because certainty is the critical feature differentiating the two choice options in this task, and the certainty effect was one of the accounts proposed to explain the framing effect commonly found with the Asian disease problem (Kahneman & Tversky, 1979). This analysis allowed us to test Hypothesis 5: individuals or groups that invoke certainty in their decision justifications will be more likely to choose the frame-consistent option. References to certainty included any mention of inevitability, a guarantee, or a sure thing, such as, "I'd rather be 100% certain" or "...at least guaranteed that 200 will be protected".

In the first step of the mediation analysis, we regressed the mediator (references to certainty) onto frame. Frame was a marginally significant predictor of references to certainty, $B = 0.13$, $t(52) = 1.73$, $p < .10$. In step 2, we regressed the dependent variable (choice) onto frame, $B = -1.39$, $SE = 0.61$, Wald's $\chi^2(1, N = 54) = 5.13$, $p < .05$. Finally, we regressed choice onto frame and references to certainty. Frame was no longer a significant predictor of choice ($B = -1.24, SE = 0.76$, Wald's $\chi^2(1, N = 54) = 2.71$, *n.s.*), but references to certainty remained significant, $B = -2.95$, $SE = 0.86$, Wald's $\chi^2(1, N = 54) = 11.89$, $p < .01$. To test whether the mediation was significant, we used the bootstrapping methodology recommended by Shrout and Bolger (2002) for samples smaller than 80. The bootstrapping analysis did not yield a significant mediation effect.

Because we did not want to be restricted to a single reasons category but wanted to see how well the ensemble of reasons predicted choice, above and beyond frame, we conducted a hierarchical logistic regression analysis. A binary logistic regression analysis first used only frame as a predictor, then added the general reasons shown in Appendix A and the specific West Nile Virus reasons in Appendix B as predictors to the model. Frame by itself was a strong predictor of choice, but references to certainty were even stronger ($B = -2.96, SE = 0.82$, Wald's $\chi^2(1, N = 54) = 12.95, p < .001$). In addition to reasons related to certainty, the frequency of written reasons related to illness or death ($B = 1.62, SE = 0.88$, Wald's $\chi^2(1, N = 54) = 3.40, p < .10$) and the frequency of written reasons related to avoiding a sure loss ($B = 2.14, SE = 1.23$, Wald's $\chi^2(1, N = 54) = 3.06, p < .10$) were marginally predictive of choice. When these three predictors, including certainty, were added to the model, frame was no longer a significant predictor of choice ($B = 0.32, SE = 1.05$, Wald's $\chi^2(1, N = 54) = 0.09$, *n.s.*), confirming the second portion of Hypothesis 4 (reasons will be better predictors of choice than frame alone).

Groups. Since the relationship between frame and group choice was not significant, we could not perform a mediation analysis to test the first part of Hypothesis 4. We could and did, however, use the process data to test the second part of Hypothesis 4, namely whether the content of the reasons provided by groups predicted their choices better than frame. We conducted logistic regression analyses first with frame alone as a predictor of choice, and then with frame and written reasons as predictors of choice. Frame by itself was not a significant predictor of choice ($B = -1.24, SE = 0.80$, Wald's $\chi^2(1, N = 34) = 2.43$, *n.s.*). As in the individual choice analysis, the frequency of written reasons related to certainty was a strong predictor of choice ($B = -3.09, SE = 0.97$, Wald's $\chi^2(1, N = 34) = 10.14, p < .01$). Table 3 contains the frequency of groups choosing the riskless and risky options as a function of references to certainty and frame.

Analyses of the group discussion transcripts provided additional evidence for the relationship between references to certainty and choice. A logistic regression model with spoken references favoring the riskless option, spoken references to social goals, and spoken analytic arguments as predictors of group choice revealed a negative relationship between spoken references favoring the certain option and selection of the risky option ($B = -0.54, SE = 0.20$, Wald's $\chi^2(1, N = 34) = 7.41, p < .01$), a positive relationship between spoken references to social goals and selection of the risky option ($B = 1.72, SE = 0.80$, Wald's $\chi^2(1, N = 34) = 4.65, p < .05$), and a positive relationship between spoken analytic arguments and selection of the risky option ($B = 0.38, SE = 0.15$, W-

Table 3
Frequency of group choices as a function of written certainty references and frame.

Number of references to certainty	Gain frame		Loss frame	
	Riskless option	Risky option	Riskless option	Risky option
0	2	8	0	12
1	4	2	2	1
2	2	0	1	0

ald's $\chi^2(1, N = 34) = 6.22, p < .05$). The relationship between the desire for certainty and selection of the riskless option supports a certainty effect (Kahneman & Tversky, 1979) explanation of the group choice patterns.

Prize Money task

Analysis of framing effects on choices

The dependent measure for this decision scenario was the discount factor, δ, for which smaller values denote greater discounting. Fig. 1 presents the discount factors for individuals, predecided groups, and naïve groups. There was no effect of frame on individuals' choices, although the observed difference in discount factors was in the direction found in previous studies – increased discounting in the delay condition (Loewenstein, 1988; Weber et al., 2007), with a mean discount factor of .54 ($SE = .07$) in the delay frame and a mean discount factor of .64 ($SE = .08$) in the accelerate frame.

To compare the discount factors of individuals with those of groups, we ran two different analyses, analogous to the two individual vs. group comparisons conducted for the West Nile Virus task, one comparing individuals ($n = 54$) with predecided groups ($n = 18$) and another comparing individuals with naïve groups ($n = 15$). The first analysis, a 2 (frame: accelerate vs. delay) × 2 (decision context: individual vs. predecided group) ANOVA in which decision context was treated as a repeated measure, revealed no main effect of frame but a main effect of decision context, $F(1,52) = 7.10$, $p < .05$, with participants discounting more on average individually ($M = .58, SE = .07$) than they did in the group context ($M = .73, SE = .07$)[2]. There was no interaction effect.

The second analysis, a 2 (frame: accelerate vs. delay) × 2 (decision context: individual vs. naïve group) ANOVA, revealed no main effect of frame. There was a main effect of decision context, $F(1,95) = 6.88$, $p < .05$, with individuals discounting more ($M = .58, SE = .07$) than naïve groups ($M = .75, SE = .08$). There was also a significant Frame × Decision Context interaction, $F(1,95) = 12.37$, $p < .001$ (see also Fig. 1). Naïve groups in the delay frame had a mean discount factor of .94 ($SE = .06$), while naïve groups in the accelerate frame had a mean discount factor of .57 ($SE = .11$).

Direct comparison of the choices of naïve vs. predecided groups revealed a significant Frame × Prior Exposure interaction, $F(1,29) = 4.26$, $p < .05$. For predecided groups there was no difference in the discount factors of groups in the two frames, though the non-significant difference was again in the previously observed direction, with a mean discount factor in the delay condition of .67 ($SE = .08$) and a mean discount factor in the accelerate condition of .79 ($SE = .08$). Interestingly, naïve groups in the delay frame discounted less ($M = .94, SE = .06$) than naïve groups in the accelerate frame ($M = .57, SE = .11$). This finding suggests that a different process may be involved when people make a novel decision in a group context (at least in the intertemporal choice domain), versus when they make a decision in a group context about an issue they have pre-considered individually. For naïve groups, the group context appears to moderate the impatience typically observed in the delay condition. No other effects were found.

Examination of a reduction of framing effects in groups (Hypothesis 1a) was precluded since there was no significant framing effect for this task with individuals. Nonetheless, these findings provide some support for Hypothesis 1b. While we did not find support for the idea that naïve groups are less susceptible to framing than predecided groups, our results suggest that naïve groups may respond differently to intertemporal framing than predecided groups in important ways. The results obtained from the written reasons and group discussions, presented below, shed more light on this finding.

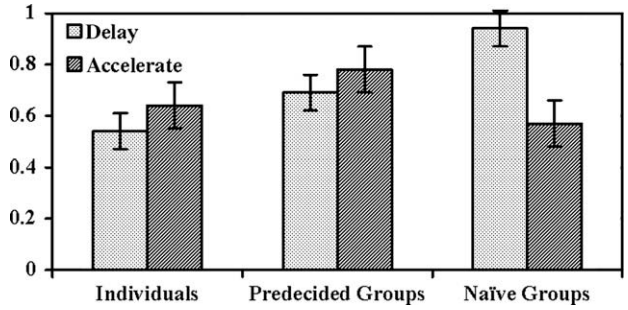

Fig. 1. Mean discount factors by condition.

Analysis of written reasons

To compare the effect of frame on the reasons provided by individuals and groups, we again compared: (1) the effect of frame on the reasons generated by people individually with the effect of frame on the reasons generated in predecided groups (same people in individual and group condition) and (2) the effect of frame on individuals' reasons (same individuals as in the first comparison) with the effect of frame on naïve groups' reasons (different group of people).

Given the unusual pattern of choices made by the naïve groups in this study (very little discounting under the delay frame), we expected that some of the reasons provided by these groups would differ from those provided by individuals and predecided groups. Analyses of written reasons showed that the reasons related to social goals were the ones that differed. For this task, a reason was coded as indicating a social goal if it included reference to the group's or organization's concerns or needs. A 2 (frame: accelerate vs. delay) × 2 (decision context: individual vs. naïve group) ANOVA revealed a main effect of frame, $F(1,95) = 4.16$, $p < .05$, with participants in the delay frame mentioning social goals ($M = 0.53, SE = 0.09$) more than participants in the accelerate frame ($M = 0.29, SE = 0.08$). There was also a main effect of decision context, $F(1,95) = 6.10$, $p < .05$. Naïve groups had more references to social goals on average ($M = 0.55, SE = 0.09$) than individuals ($M = 0.27, SE = 0.08$), supporting Hypothesis 3. These main effects were qualified by an interaction effect, $F(1,95) = 10.16$, $p < .01$. Naïve groups in the delay frame provided more reasons related to social goals ($M = 0.86, SE = 0.26$) than naïve groups in the accelerate frame ($M = 0.25, SE = 0.16$), individuals in the delay frame ($M = 0.20, SE = 0.09$), and individuals in the accelerate frame ($M = 0.33, SE = 0.14$). The very groups (naïve groups in the delay frame) that showed the most surprising pattern of choices were the groups who most often referred to their group's concerns and needs in justifying their choices. The relationship between this pattern of reasons and the choice data will be explored in a mediation analysis below.

A 2 (frame: accelerate vs. delay) × 2 (decision context: individual vs. predecided group) ANOVA with context treated as a repeated measure was conducted to test whether groups invoked more social goals than individuals. There was a marginal main effect of decision context, $F(1,52) = 3.07$, $p < .10$, with participants invoking social goals more in the group decision ($M = 0.44$, $SE = 0.11$) than in their individual decisions ($M = 0.27, SE = 0.11$). The results of both the individual vs. naïve group and individual vs. predecided group comparisons support Hypothesis 3 that social

[2] An alternative analysis was conducted where the individual, pregroup scores for each group were averaged into a composite "pregroup average" discount factor. A paired t-test of the pregroup average discount factors and group discount factors yielded similar results, $t(17) = -2.15$, $p < .05$.

goals will appear more frequently in the reasons provided by groups as compared to the reasons provided by individuals.

Differences in written reasons provided by predecided and naïve groups. A 2 (frame: accelerate vs. delay) × 2 (prior exposure: predecided vs. naïve) ANOVA revealed no main effect of frame on number of patient reasons provided but a marginal effect of prior exposure, with naïve groups providing more written reasons favoring waiting ($M = 1.20, SE = 0.17$) than predecided groups ($M = 0.72, SE = 0.16$), $F(1,30) = -3.93$, $p < .10$. There was no Frame × Prior Exposure interaction. These results suggest that naïve groups may be less myopic in their intertemporal tradeoffs than individuals and predecided groups.

Relationship between choices and reasons (written and discussion-based)

Individuals. Because we did not find evidence for a framing effect on choice, we could not test for mediation of framing by reasons (Hypothesis 4) following the process suggested by Baron and Kenny (1986). As we did for the West Nile Virus task, we could, however, use the process data to test the second part of Hypothesis 4, whether the content of the reasons provided by groups predicted their choices better than frame. We conducted a hierarchical linear regression analysis first with frame alone as a predictor of choice, and then with frame and written reasons as predictors of choice. Frame was coded 0 for accelerate and +1 for delay. The dependent measure was the discount factor, with smaller values indicating more discounting. The predictors were: written patient reasons (favoring waiting), written impatient reasons (favoring immediate receipt), written references to the group, and written references to the broader organizations from which the groups were drawn. Table 4 contains the results of a hierarchical regression analysis performed for the individual decision with frame as the only predictor in Step 1 and with the addition of written reasons as predictors in Step 2.

Frame alone was not a significant predictor of individual choice. We included the written reasons in the regression analysis to see if they would account for additional variability in discount factors and potentially allow the effect of frame on discount factor to emerge. As shown in Table 4, this was in fact the case. When written reasons were included in the model, frame became a significant predictor of discount factor (such that the delay frame was associated with greater discounting).

Groups. Because a framing effect was found only with the naïve groups, a mediation analysis was performed only with naïve groups and not with predecided groups. We first examined references to the group as a mediator. We tested and found that group references significantly predicted discount factor, $B = 0.26$, $SE = 0.12$, $t(13) = 2.26$, $p < .05$. Next we tested and found that frame also significantly predicted discount factor, $B = 0.19$, $SE = 0.07$, $t(13) = 2.77$, $p < .05$. However, when we regressed discount factor on both group references and frame, we did not find an effect of references to the group and thus did not establish mediation. We similarly found no support for a mediating role of patient or impatient reasons (first part of Hypothesis 4).

We created separate regression models to examine the predictors of discount factors for naïve and predecided groups (second part of Hypothesis 4). Table 5 presents the results of a hierarchical regression analysis for the naïve groups. For the naïve groups, although frame became only marginally significant when references to the group were included in the model and the frequency of written references to the group became a non-significant predictor, the inclusion of group references led to a better overall model fit ($R^2 = .44$ for the expanded model, as compared to .37 for the compact model).

Table 6 presents the results of a hierarchical regression analysis for the predecided groups. Frame was not a significant predictor of discount factor for the predecided groups. The addition of written impatient reasons as predictors improved the model fit, but frame was still non-significant. For the predecided groups, 42% of the variability in discount factor was accounted for by frequency of written impatient reasons alone, $\beta = -0.68$, $t(16) = -3.68$, $p < .01$. As expected, more impatient reasons were related to greater discounting. Frequency of written patient reasons was not a significant predictor of discounting.

For the group discussions, a linear regression analysis was conducted to examine the influence of proportion of total spoken thought-units (Gottman, 1979; Weldon et al., 1991) coded as patient, proportion of total thought-units coded as impatient, and frame on discount factors. For naïve groups, a model with the proportion of total thought-units that were coded as impatient (favoring immediate receipt of the money), $\beta = -0.52$, $p < .05$, and frame, $\beta = 0.41$, $p < .10$, as predictors explained 50% of the variance in discount factors. Analysis of the discussion transcripts of the predecided groups revealed that the proportion of spoken thought-units coded as impatient ($\beta = -0.33, p = .10$) and the

Table 4
Summary of hierarchical regression analysis for variables predicting individuals' discount factors ($n = 54$).

Variable	*B*	*SE B*	β	*t*
Step 1				
Frame	−0.05	0.05	−0.13	−0.96
Step 2				
Frame	−0.13	0.04	−0.34	−3.41**
Patient reasons	0.19	0.04	0.55	5.33***
Impatient reasons	−0.16	0.05	−0.34	−3.35**
Group reasons	−0.16	0.06	−0.25	−2.65*
Organization reasons	−0.20	0.10	−0.19	−2.05*

Note: Frame was coded 0 = *accelerate;* +1 = *delay*.
$R^2 = .02$ for Step 1; $\Delta R^2 = .57$ for Step 2 ($p < .001$).
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 5
Summary of hierarchical regression analysis for variables predicting naïve groups' discount factors ($n = 15$).

Variable	*B*	*SE B*	β	*t*
Step 1				
Frame	0.19	0.07	0.61	2.77*
Step 2				
Frame	0.14	0.08	0.46	1.86
Group reasons	0.15	0.12	0.31	1.24

Note: Frame was coded 0 = *accelerate;* +1 = *delay*.
$R^2 = .37$ for Step 1; $\Delta R^2 = .07$ for Step 2 (*p*s for each model < .05).
* $p < .05$.

Table 6
Summary of hierarchical regression analysis for variables predicting predecided groups' discount factors ($n = 18$).

Variable	*B*	*SE B*	β	*t*
Step 1				
Frame	−0.04	0.09	−0.13	−0.52
Step 2				
Frame	−0.06	0.06	−0.18	−0.96
Impatient reasons	−0.34	0.09	−0.69	−3.73**

Note: Frame was coded 0 = *accelerate;* +1 = *delay*.
$R^2 = .02$ for Step 1; $\Delta R^2 = .47$ for Step 2 ($p < .01$).
** $p < .01$.

proportion coded as patient ($\beta = 0.55, p < .05$) significantly predicted discount factors, $R^2 = .49$, $p < .01$.

Group discussion length

Because the group choice data for the Prize Money task were surprising, we looked more closely at the relevant discussion transcripts. In addition to examining discussion content, we investigated length of discussion. Because the discussion times for the Prize Money scenario were not normally distributed, we performed a natural log transformation on the discussion times in minutes. There was a marginally significant 2 (frame: accelerate vs. delay) × 2 (prior exposure: naïve vs. predecided) interaction effect on the transformed length of time spent discussing the Prize Money decision, $F(1,30) = 4.02$, $p < .10$. All groups were given unlimited time to reach a decision. Naïve groups in the delay frame spent the most time (all times are in minutes, non-transformed) ($M = 7.08, SE = 2.18$) discussing the decision, compared with naïve groups in the accelerate frame ($M = 2.59, SE = 0.40$), predecided groups in the accelerate frame ($M = 3.53, SE = 0.65$), and predecided groups in the delay frame ($M = 3.01, SE = 0.53$). This may be due to greater information processing for this decision[3], and we return to this in the Discussion.

Discussion

The findings of this study confirm the importance of examining the effects of emergent group processes and prior individual consideration on group sensitivity to framing effects. The results suggest that consideration of group and individual decision outcomes alone allows for only a partial understanding of how groups and individuals differ in response to framing. Analyses of the written reasons provided by individuals and groups and of the group discussions leading up to the decisions revealed the ways in which groups and individuals mentally represent decisions under different frames and how such differences lead to different choices.

This study provides strong support for the influence of context on the decision process and choice. In particular, the results highlight the impact of prior, individual decision consideration on group processes and group choice and extend the work by Moon et al. (2003) and Greitemeyer and Schulz-Hardt (2003) to the domains of framing and intertemporal choice. Despite conventional wisdom that individual-level preparation should lead to more informed group discussions and group decisions, our data suggest that in some situations groups may be better off considering a decision for the first time as a group. This consideration is non-trivial for any group or organization that makes decisions by committee. As we have shown, some types of goals (e.g., social goals for naïve groups) and some types of arguments (e.g., arguments favoring delay of consumption) become more focal in the group decision process depending on whether or not the decision has been previously considered. While there are clear advantages to prior individual consideration of decisions, such as time savings, our results suggest that organizations would benefit from considering how such advantages might be outweighed by disadvantages, and how this tradeoff might be influenced by the way decision options are framed.

Susceptibility to framing – decision outcomes for groups and individuals

For the West Nile Virus scenario, we did not find evidence for a significantly reduced framing effect in group choice, compared to individual choice. Because we failed to find a framing effect among individuals in the Prize Money task, we could not directly test whether groups were less sensitive to framing. Although we initially predicted that groups would be less sensitive to framing (Hypothesis 1a), our findings suggest that groups are *differentially* sensitive to framing. Groups do not respond in the same way as individuals to the framing of choice options, but exactly how groups respond depends on a constellation of factors such as prior consideration of the decision and features of the decision itself. This finding makes sense in light of earlier research comparing group vs. individual vulnerability to framing effects. Taking the results of Neale et al. (1986) and Paese et al. (1993) together, sometimes groups are less sensitive to framing effects than individuals, and sometimes they are more sensitive. The current paper provides evidence for some concrete, process-level factors that influence that sensitivity.

The results from the Prize Money scenario indicated an important distinction between naïve groups and predecided groups. We did not find simple support for Hypothesis 1b (predecided groups being more susceptible to framing effects than naïve groups) in the West Nile Virus task. However, in the Prize Money task we found that naïve groups showed a framing effect in the opposite direction previously found with individuals, while predecided groups showed no framing effect. In fact, naïve groups exhibited much greater patience in the delay condition than both naïve and predecided groups in the accelerate condition and more than individuals in the delay condition typically demonstrate. The results from the Prize Money decision suggest that the group context can not only ameliorate the typical framing effect but actually reverse it. These findings have important implications for a range of decisions that involve tradeoffs between costs and benefits that vary in their temporal delay, e.g., voluntary sacrifices in immediate consumption for the sake of greater retirement benefits (Thaler & Benartzi, 2004; Weber, 2004) and environmental decisions that consider immediate sacrifices in quality of life for the benefit of a reduction in climate change risks for future generations (Weber, 2006).

It should be noted that individuals and groups in this study exhibited less discounting than is typically seen in intertemporal choice paradigms. A critical feature in this study was that the group decision was binding, of which individuals were aware in the individual choice condition. The collective nature of the outcome also may have affected individual decisions, since even in the individual part of the study, participants were aware of group goals. Alternatively, the group context may have activated awareness of the support the group could provide. Since all groups were preexisting groups of colleagues, friends, or teammates, with ongoing relationships and shared interests, this explanation seems plausible. It is important to note that we consider comparison of individual decisions regarding a group outcome with a group decision about a group outcome more realistic than comparison of an individual decision about an individual outcome with a group decision about a group outcome, since committees that prepare individually generally make decisions about group-level outcomes, not individual ones.

Susceptibility to framing – process variables for groups and individuals

We found additional, and stronger, evidence for groups' differential susceptibility to framing in the written reasons provided by individuals and groups in support of their decisions. Of particular interest is the observation that there were fewer framing effects on reason generation for groups, compared to individuals. In the group context, the framing of decision options had less influence on decision processes and often also on the less sensitive measure of decision outcomes. For the West Nile Virus decision, the groups showed fewer framing effects on the types of reasons provided, rel-

[3] We thank an anonymous reviewer for this suggestion.

ative to individuals. For the Prize Money decision, the groups showed less myopia than is commonly found with individuals, and the process measures supported our prediction that awareness of the group played a critical role in this decision.

The written reasons data suggest that anticipation of the group decision may have affected individuals' choices. Individual references to the group were associated with greater discounting, suggesting that at least some individuals were aware that the group decision would follow and may have anticipated fellow group members' preferences. This explanation would be in line with the findings of Davis, Stasson, Ono, and Zimmerman (1988) that knowledge of future public expression of opinions led to a shift in mock jurors to more "socially acceptable" positions, although it is at odds with the findings of Gaskell et al. (1973) that anticipation of group interaction had no effect on pregroup decisions for hypothetical risky choices. It would be worthwhile to disentangle the relative contributions of task features, social context, and collective outcome on individual and group intertemporal tradeoffs in future studies.

In addition, the reversal of the framing effect for naïve groups was supported by the content of the groups' written reasons. For naïve groups, written references to the group's goals or concerns were positively correlated with less discounting. Interestingly, this relationship between group goals and discounting was the opposite of what occurred with individuals, suggesting that consideration of intertemporal decisions in group contexts could reduce the discounting that is seen so often in individual decisions and attributed to cognitive myopia (Thaler & Benartzi, 2004). Individuals tend to prefer smaller, immediate gains over larger, delayed gains (Loewenstein, 1988; Weber et al., 2007). However, our results indicate that something about the group context leads to greater valuation of the larger, delayed gain. Indeed, the fact that naïve groups produced more patient reasons suggests that it is advantageous to make decisions about intertemporal tradeoffs in groups, particularly in naïve groups.

The data from the discussion transcripts illustrated that naïve groups in the delay frame spent much more time discussing this decision. This suggests that the process of group discussion, particularly when it involves a choice that is unfamiliar to the group at the start of deliberations, can be instrumental in overcoming the tendency to discount future outcomes. An alternative explanation is that, despite random assignment to condition, the naïve groups in the delay frame tended to be more patient in general, making them more likely to wait for a larger prize and more likely to take more time to discuss any decision. However, these naïve, delay-frame groups did not differ from the other kinds of groups in their discussion lengths for the West Nile Virus task. This discrepancy in discussion length corresponds to the one choice data point that deviated most from the typical decisions of individuals – the large (i.e., very patient) mean discount factor of naïve groups in the delay frame. The observation that these groups took the most time to discuss the decision suggests that group members may have been engaging in deeper information processing as they considered their options. The increased discussion time may also indicate the presence of some conflict, either intrapersonal or interpersonal. These groups may have needed additional time to convince themselves and their fellow group members to overcome the tendency to discount more that is typically seen in individuals in the delay condition. Again, this finding draws attention to the value of process data. The length of discussion provides converging evidence that the choices made by these groups were not aberrations but rather the products of real deliberation.

The increased patience demonstrated by the naïve-delay frame groups may be partially attributed to the nature of the groups participating in this study (actual colleagues, teammates, etc.). In addition to sharing a past and a future, these groups were all recruited from broader organizations and thus were bound by common interests (such as softball, anime, or debate) and often shared goals. One of the reasons we chose to use real groups in this study instead of a more convenient sample of ad hoc groups was because we believed these groups would provide a more realistic (although still imperfect) representation of how actual groups respond to different frames and reach consensus. We also wanted group members to feel comfortable sharing their ideas and felt that the familiarity of these groups would facilitate that. Since these were real groups and the decision had real consequences, considering the decision for the first time as a group may have led to an awareness of the social and financial support the group could provide. The analyses of the content of the reasons these groups provided support this conclusion. The naïve groups in the delay frame were the groups that most often referred to their group in justifying their choices. Although our use of real groups may have led to the divergent findings seen with the naïve groups in the delay frame, we view their inclusion as a strength of our study.

There are a few reasons why we may have found an effect of prior exposure on choice in response to the framing of the Prize Money task but not the West Nile Virus task. In addition to varying in terms of risk and time course, these two tasks also differed in the nature of their consequences. Whereas the Prize Money task involved a real (probabilistic) outcome, the West Nile Virus task was entirely hypothetical. Although we adapted Tversky and Kahneman's (1981) original Asian disease problem specifically to make it more relevant to members of the New York community, there was no question that participants knew their decisions would have no real ramifications. And while groups appeared to engage with the West Nile Virus task and take their decisions seriously, we cannot rule out that this hypothetical aspect may have suppressed some of the differences that emerged when naïve vs. predecided groups grappled with a decision with real, personal consequences. In addition, the decisions varied in domain, with one focusing on health and the other on financial rewards, and this distinction may also have contributed to the observed pattern of results. A potentially fruitful area of future research lies in exploring how prior consideration of a decision affects different kinds of group decisions that vary in risk, temporal delay, and magnitude and relevance of consequences.

The relationship between frame and reasons

We found support for Hypothesis 2 that written reasons would differ reliably by frame, and that these differences in the balance of support would result in a stronger preference for the frame-emphasized option. The West Nile Virus findings provided additional support for Kahneman and Tversky's (1979) explanation of risky choice framing effects in terms of the certainty effect, the psychological tendency to overweigh certainty. The analyses from the discussion transcripts confirmed this explanation, with arguments related to certainty predicting selection of the riskless option (Hypothesis 5).

For the Prize Money task, we found an effect of framing on individual written references to patience. The greater number of patient reasons provided by participants in the delay frame versus the accelerate frame, which is somewhat counterintuitive and in contrast to prior research (Loewenstein, 1988; Weber et al., 2007), is likely related to the fact that the individuals in the current study discounted less than participants in delay frames in earlier studies.

The data on references to social goals support the explanation of the group facilitating the adoption of a more long-term view in considering the timing and size of a financial reward. For the Prize Money task, naïve groups and predecided groups invoked social goals more often than individuals, supporting Hypothesis 3. For

the West Nile Virus scenario, the social goals data suggest that naïve groups may adopt a broader social view, considering which option will serve the greater good, than predecided groups. Taken together, these findings point to an advantage of group decision making and an important effect of prior consideration. Depending on the consequences of the decision, it may be advisable to forego preparation when groups consider choice options, particularly if one wants the group to take a broader temporal and social perspective.

The relationship between reasons and choice

We did not find evidence that a single kind of reason mediated the effect of frame on choice. However, we were limited in having to use a single mediator variable in our analyses when our hypothesis was more about the impact of multiple kinds of reasons. One way to circumvent this issue is to create a compound variable using factor analysis (e.g., Weber et al., 2007), but that was not a feasible option for this study, since a factor analysis of the different reasons categories did not yield a single factor. We were able to use hierarchical regression analyses to observe how well multiple reasons in concert predicted choice above and beyond the effect of frame. In the West Nile Virus task we observed a strong relationship between individuals' written references to certainty and choice. The ability of these process measures to predict choice when frame was not able to significantly do so highlights the importance of attending to the decision making process. The reasons people provide for their decisions can yield more insight into why people make the choices they do than can examination of situational factors alone. In particular, our process measures allowed us to test Kahneman and Tversky's (1979) intuition that the overweighting of certainty drives the framing effect in the Asian disease problem. Although we expected reasons to predict choice better than frame, we were surprised at how well references to certainty were able to account for individuals' decisions. For groups as well, the number of reasons related to certainty was a better predictor of choice than frame. Thus we found mixed support for Hypothesis 4 (no support for a mediating role of reasons but strong support for the ability of reasons to predict choice better than frame) and strong support for Hypothesis 5 (people who invoke certainty in their decision justifications will be more likely to choose the frame-consistent option).

The relationship between reasons and choice was also demonstrated in the Prize Money decision. For individuals, patient reasons were associated with less discounting (greater willingness to wait) and impatient reasons were associated with greater discounting. In addition, references indicating patience and impatience during group discussion reliably predicted discount factors for group decisions. For naïve groups, spoken impatient reasons were correlated with greater discounting; for predecided groups, both spoken patient and spoken impatient reasons were related to discount factors in the expected directions.

Although we found that reasons were strong predictors of choice, from the written reasons data alone we cannot infer whether the reasons led to the choice, or whether the reasons were generated as post hoc justifications for choices. However, analysis of the group discussion transcripts, which showed that references to certainty, social goals, and analytic arguments predicted selection of the risky option in the West Nile Virus task, and that references to patience and impatience predicted discounting in the Prize Money task, enables us to infer that these reasons are in fact driving the decisions, and not the other way around.

It bears noting that a design consideration in our study – asking participants to provide reasons for their decisions – may have actually reduced the size of framing effects we otherwise might have observed. Miller and Fagley (1991) found that when participants were asked to provide a rationale for their choices, no framing effect was observed. They pointed out, however, that providing a rationale for one's decision has external validity, as often people feel a need to justify (even if informally) their decisions. Sieck and Yates (1997) also found reduced framing effects when participants were asked to provide reasons for their decisions, although the reductions were relatively small. These results are consistent with the findings of Huber and Seiser (2001), in which having to justify one's decision led to greater use of available information. In Lerner and Tetlock's (1999) review, they noted several studies showing that accountability reduces cognitive biases, such as sunk-cost effects, anchoring, and groupthink, although sometimes accountability had the opposite effect.

In light of the demonstrated effects on decision quality of having to justify one's decision, our having observed significant framing effects (in the individual West Nile Virus task and in the group Prize Money task) suggests that the effect of frame on choice in those cases is quite strong. The combination of using real groups of participants, whose relationships would continue beyond the conclusion of the study, and requiring reasons for decisions, which likely stimulated more careful and systematic information processing (Scholten, van Knippenberg, Nijstad, & De Dreu, 2007), may explain why we found less discounting in the Prize Money task than previous researchers (e.g., Weber et al., 2007). Importantly, these design features added external validity to our study.

Concluding thoughts

Comparing the choices and decision processes of individuals and groups may seem like a simple proposition. However, the findings presented in this paper show that even when only a single phenomenon, such as option-framing, is investigated, different patterns emerge as a function of group preparation and task. We believe our work contributes to a more nuanced understanding of the factors affecting group sensitivity to framing and hope that this research highlights the importance of examining how social features and other design considerations can impact group processes and outcomes (cf. Kerr et al., 1996; Kühberger, 1998).

In particular, our study underscores the importance of understanding the different processes by which groups represent decision options and formulate preferences as a function of prior consideration and activation of different goals. We have shown that prior consideration affects group decision making in meaningful ways. We provided evidence that naïve groups differ from predecided groups in their reasoning and goals, and that this may lead to different decision outcomes. The common practice in organizations of preparing before meetings may in fact be counterproductive for some decisions (for instance when social goals are of prime importance). Depending on the goals of the organization and the type of decision, it may be beneficial to take these findings into account when deciding whether individual preparation should occur.

In addition, process data can yield insights into the ways in which framing and prior consideration affect choice over and above the understanding gained from the more crude measure of option selection. Even though some of our manipulations did not result in differential choices, they were associated with differences in reasoning. Such discrepancies in information processing are obscured by examination of choice data alone. Despite the challenges of studying group decision making, this study points to the value of continuing to examine the underlying processes by which groups make decisions and the value of using real, naturalistic groups. Our findings suggest the possibility of developing better recommendations for decision making processes that are advantageous for both decision makers and those directly affected by their decisions.

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Appendix A. Scenario-independent codes (used for all scenarios)

1. Focus
   a. Self.
   b. Group.
   c. Larger organization.

2. Decision goal
   a. Material benefits (e.g., money, products).
   b. Ethical/moral (e.g., doing the "right thing").
   c. Social (e.g., concern with needs of group, consideration of the "greater good").
   d. Affective (e.g., avoidance of guilt).

3. Argument type
   a. Analytic (reflects effort to apply objective reasoning).
   b. Experiential (reasoning in a more subjective manner; drawing on experience or anecdotes as support for a position).

Appendix B. Scenario-specific codes

West. Nile Virus

1. Focus (main content of statement)
   a. Illness/death/infection.
   b. Chance/probability.
   c. Certainty/guarantee/inevitability.
   d. Numbers/statistics.

2. Goals
   a. Help/save/protect.
   b. Avoid sure loss.
   c. Fairness.
   d. Hope/optimism.

3. Options
   a. Argues for riskless option.
   b. Argues against risky option.
   c. Argues for risky option.
   d. Argues against riskless option.

Prize. Money

1. Focus
   a. Patient reason.
   b. Impatient reason.
   c. Need for immediate money.
   d. No need for immediate money.
   e. Need money for future.
   f. No need for future money.
   g. Instant gratification.
   h. Extra money is important.
   i. Extra money is not important.

2. Options
   a. Argues for waiting.
   b. Argues against waiting.
   c. Argues for immediate payoff.
   d. Argues against immediate payoff.

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