

## Deep Thoughts and Shallow Frames: On the Susceptibility to Framing Effects

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### ABSTRACT

This paper examines the occurrence of framing effects when more thought is given to problems. In Study 1, participants were presented with one of two frames of several decision problems. Participants' Need for Cognition (NC) scores were obtained, and half the participants were asked to justify their choices. Substantial framing effects were observed, but the amount of thought purportedly given to a problem, whether manipulated by justification elicitation or measured by NC scores, did not reduce the incidence of framing effects. In Study 2, participants responded to both frames of problems in a within-subjects design. Again, NC scores were unrelated to responses on the first frame encountered. However, high-NC, compared to low-NC, participants were more consistent across frames of a problem. More thought, as indexed here, does not reduce the proclivity to be framed, but does promote adherence to normative principles when the applicability of those principles is detectable. Copyright © 2003 John Wiley & Sons, Ltd.

**KEY WORDS** framing effects; decision making; choice; need for cognition; justification-provision

The familiar conundrum of the glass that is either half full or half empty captures a fundamental fact about perception: different mental representations of a stimulus can be formed from different perspectives and in different contexts. Thus, a line appears longer when vertical than when horizontal; the moon looks large on the horizon but small overhead; and the prospects of an operation that appears promising in light of an 80% chance of success seem more bleak given its 20% chance of failure. In decision-making situations, the dependence of mental representation on context entails that choices can sometimes be affected by immaterial changes in perspective. In particular, 'framing effects' are said to occur whenever alternative descriptions of what is essentially the same decision problem give rise to predictably different choices (Tversky & Kahneman, 1981).

Framing effects have been documented in dozens of studies. Because they seem to arise from shallow reactions to superficial cues, and because they violate the assumption of well-ordered preferences, it has been

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suggested that these effects are largely attributable to a lack of attention and would occur less frequently if people thought more carefully about their choices (e.g. Sieck & Yates, 1997; Smith, 1985; Smith & Levin, 1996). This paper attempts a systematic examination of this proposition.

## FRAMING EFFECTS

A framing effect is said to occur whenever different descriptions of the same decision situation lead to different preferences, despite the fact that the 'acts, outcomes, and contingencies' associated with the decision remain invariant across the descriptions, as in the now-classic *Asian Disease* problem (Tversky & Kahneman, 1981, p. 453):

Imagine that the USA is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:

### *Positive Frame*

If Program A is adopted, 200 people will be saved.

If Program B is adopted, there is a one-third probability that 600 people will be saved, and a two-third probability that no people will be saved.

### *Negative Frame*

If Program A is adopted, 400 people will die.

If Program B is adopted, there is a one-third probability that nobody will die, and a two-third probability that 600 people will die.

The positive and negative frames offer equivalent contingencies; nonetheless, respondents presented with the positive frame overwhelmingly choose the 'sure' option, Program A, whereas those presented with the negative frame overwhelmingly choose the 'risky' option, Program B (for some replications, see Maule, 1989; Miller & Fagley, 1991; Takemura, 1994; Wang & Johnston, 1995).

This change in preferences arises due to a shift in the decision makers' reference points. In the positive frame, the two alternatives are evaluated as gains relative to the worst-case scenario of no one surviving; in the negative frame, the alternatives are evaluated as losses relative to the scenario of all surviving. In line with Kahneman and Tversky's (1979) prospect theory, decision makers tend to be risk averse when choosing between perceived gains but risk seeking when facing apparent losses. Since the two frames of the problem above manipulate the perspective to be either one of gains or one of losses, they thereby trigger perspective-consistent risk attitudes and alter the chosen option. Such malleability of preference is normatively problematic; one of the fundamental tenets of the rational theory of choice is that decisions ought to remain invariant across logically equivalent methods of elicitation and across logically equivalent descriptions of the options (Arrow, 1982; Tversky & Kahneman, 1986). Framing effects are thus at the heart of the debate regarding whether the rational theory of choice provides an accurate description of behavior.

Research on framing effects has been plentiful in the years since these effects were first demonstrated (for reviews, see Kühberger, 1998; Levin et al., 1998). Manipulating decision frames has been found to affect choices in domains as varied as medicine (Banks et al., 1995; Levin et al., 1988b; McNeil et al., 1982, 1988), negotiation (Bazerman et al., 1985; Neale & Bazerman, 1985; Neale et al., 1987; Neale & Northcraft, 1986), labor contracts (Shafir et al., 1997), voting (Quattrone & Tversky, 1988), public goods allocation (Andreoni, 1995; McDaniel & Sistrunk, 1991), gambling (Tversky & Kahneman, 1981, 1986), consumer judgment (Levin, 1987; Levin et al., 1985), and persuasion (Maheswaran & Meyers-Levy, 1990; Meyerowitz & Chaiken, 1987; Rothman et al., 1993).

In view of the significance and persistence of framing effects, a natural question is whether they can be avoided. According to one view, problem frames are an integral part of the way people think about decisions. Because people are typically unable to transform a problem into a canonical, frame-independent representation, the argument goes, frames often determine how a problem is perceived, and cannot be independently 'thought out of' any more than visual illusions can be avoided with extra thought (Arkes, 1991; Thaler, 1991). An alternative view posits that framing effects are merely indicative of a shallow approach to decision making. If respondents would only give their choices greater thought, the argument goes, they would detect alternate ways to think about the problem and would make decisions that are less dependent on a particular frame (Smith, 1985).

The latter view has generated research attempting to show a lower occurrence of framing effects among more thoughtful decision makers (e.g. Smith & Levin, 1996; Stanovich, 1999). Some studies, for example, asked participants to provide justification for their choices (cf. Tetlock, 1992). This manipulation presumably 'leads to greater thought about the choice, and hence less contamination by biasing factors such as framing' (Smith & Levin, 1996, p. 284). Justification provision, it has been suggested, may facilitate the recognition of multiple valid reference points from which to consider the choice (Sieck & Yates, 1997), thereby yielding choices that are less biased by the initial frame.

An alternative approach has examined whether framing effects are moderated by respondents' proclivities to give decisions greater thought. This approach has focused on an individual difference variable, the Need for Cognition (NC), which identifies 'differences among individuals in their tendency to engage in and enjoy thinking' (Cacioppo & Petty, 1982, p. 116). The NC variable separates those who find fulfillment in intricate thought from those who do not seek out situations that require effortful processing (Cacioppo & Petty, 1982). People who are high in NC have been found to generate more thoughtful analyses of written messages (Cacioppo et al., 1983), engage in greater information search (Verplanken et al., 1992), and pay less attention to surface cues (Heppner et al., 1983) than those low in NC. It has thus been suggested that NC may separate those who readily accept a given decision frame from those who might discount surface cues, elaborate on the problem, and thus escape the influence of a given frame (Smith & Levin, 1996).

Studies that have examined these issues have been limited in scope and have yielded mixed results. Miller and Fagley (1991) presented participants with one of two frames of the Asian Disease problem and with choices between monetary gambles framed as involving either gains or losses. Half of the participants were asked to provide rationales for their choices. Miller and Fagley found that frame exerted a significant impact on choice only when no rationale was requested. At the same time, however, they failed to replicate several well-documented framing effects even in the no-rationale condition (we return to this point in the General Discussion). Sieck and Yates (1997) also found reduced framing effects for the Asian Disease problem when participants were asked to justify their choices, but the reduction was observed only after participants were forced to spend 50 minutes contemplating a problem before making a choice. Smith and Levin (1996) divided participants into low- and high-NC groups on the basis of a median split of NC scores, and presented them with a single frame of one of two decision problems. High-NC participants did not show framing effects, whereas low-NC participants did, although ensuing research by Levin et al. (2002) modifies these findings in ways we discuss later.

Takemura (1993, 1994) reports further studies that yield divergent results. In one study (1994), participants who provided justification did not show the framing effect, but in another study (1993) a framing effect persisted even when justification was elicited.<sup>1</sup> Fagley and Miller (1987) and Levin and Chapman (1990,

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<sup>1</sup>In Takemura's (1993) justification condition, the risky option was chosen by 54% and 81% of respondents in the gain and loss frames, respectively. Because the same option was preferred by a majority of respondents in both frames, Takemura does not consider this a framing effect. We disagree. A framing manipulation's efficacy is gauged by the change in the percentage of people who choose each option. Whether the change straddles the 50% mark is beside the point. In fact, altering preference from an overwhelming 81% to a mere 54% could be argued to be more impressive than changing it around a point of near-indifference from, say, 45% to 55%.

Study 1) requested justification from all participants, yet framing effects remained. These latter studies used no control groups against which the exact effects of justification could be gauged, but they clearly observed that providing justification did not suffice to eliminate the effects of framing.

Despite this very limited and decidedly mixed evidence, the field has tended to accept some of the findings. Many researchers have interpreted the results as supporting the notion that devoting more thought to a problem reduces the likelihood of exhibiting framing effects, and some have even pursued other studies based on this assumption. Stanovich and West (1998, p. 293; see also Stanovich, 1999; Stanovich & West, 1999), for example, conclude that it 'has already been demonstrated that being forced to . . . provide a rationale for selections reduces framing effects'. Similarly, Chatterjee et al. (2000, p. 64) depart from the observation that 'NC has been found to moderate susceptibility to framing effects', and Hodgkinson et al. (1999, p. 983; see also Kivetz & Simonson, 2000) rely on 'a growing body of opinion that effortful thought can attenuate or eliminate the framing bias'. Given the dearth of evidence, however, it is not clear that such faith in the 'more thought less framing' hypothesis is warranted, particularly without a clearer understanding of the circumstances in which this hypothesis might, and might not, hold.

In this paper, we employ a wide variety of (between-subjects) framing problems to systematically examine the effects of justification and to investigate whether those high and low in NC differentially manifest framing effects on such problems. Next, motivated by the assumption that adherence to normative principles should be greater when the applicability of those principles can be detected, we examine the relationship between NC and framing in within-subjects contexts. In such contexts, the equivalence of two otherwise identical frames (and the need to respond in a consistent fashion) might be more frequently noted by participants who typically exert more effortful thought.

## STUDY 1

The studies reviewed above focused only on one or two framing problems, and explored either justification or NC. The discrepancies in the data may thus be due to, among other things, differences between problems, possible partial interactions of justification and NC levels, or variance in methodology. Furthermore, past studies have not examined the impact of justification provision on those who are low versus high in NC. One could imagine high-NC participants responding more forcefully to justification provision than their low-NC counterparts; alternatively, low-NC participants might exhibit a greater change from baseline than high-NC participants following exhortations to justify their choices.

In Study 1 we investigated a variety of framing problems and both measured NC and manipulated justification to explore whether more thought reduces framing effects. If this hypothesis holds true, we would expect the following results: (1) framing effects would be observed; (2) these effects would be strongest for respondents not asked to provide justification and for those low in NC; and (3) framing effects would be reduced or eliminated for those asked to justify their responses and those high in NC. If, on the other hand, framing effects persist regardless of justification provision and of participants' NC levels, then we should see no interactions between those variables and the effects of a problem's frame.

### **Method**

#### *Participants*

Three hundred and sixty-five Princeton University undergraduates participated in this study, either for payment or for course credit.

*Framing problems*

Seven different problems were chosen to be representative of those used in previous research. These problems are summarized below<sup>2</sup> (with the exception of the Asian Disease problem, discussed above).

*\$400 versus \$300/\$500* Participants choose between a certain \$400 and an equal chance at \$500 or \$300. Their initial endowment is manipulated so that these outcomes are seen as involving losses in one case and gains in the other (Tversky & Kahneman, 1986, p. 258).

*Lost ticket versus lost money* Participants' willingness to buy a \$20 theater ticket is assessed following the loss of a \$20 bill or of a similar \$20 ticket (Tversky & Kahneman, 1981, p. 457).

*Frank versus Carl* Participants vote for one of two political candidates. The candidates' proposed policies remain the same between frames but the candidate representing the status quo changes (Quattrone & Tversky, 1988, p. 725).

*Surgery versus radiation* Participants choose between cancer treatments. One frame presents the treatments' survival rates; the other presents mortality rates (McNeil et al., 1982, p. 1260).

*Nominal cut versus raise* Participants assess the fairness of a cut in workers' real wages which, in nominal terms, appears as a loss in one frame and as a gain in the other (Kahneman et al., 1986, p. 731).

*Tax surcharge versus tax benefit* Participants assess the fairness of a tax proposal that appears as a tax surcharge in one frame and as a tax benefit in the other (adapted from Schelling, 1981, pp. 53–54).

*Amount of thought*

*Need for cognition scale* All participants completed the 18-statement Need for Cognition scale developed by Cacioppo et al. (1984). Participants rated their level of agreement with each statement on a scale ranging from -4 (very strongly disagree) to +4 (very strongly agree). Participants were divided into high- and low-NC groups based on a median split of their total NC scores.

*Justification manipulation* Upon presentation of each choice problem, participants in the justification condition read 'Given the facts above, please tell us which option you prefer, and briefly tell us the rationale behind your choice'. The remaining participants read only 'Given the facts above, please tell us which option you prefer', whereupon they checked their preferred option. This is similar to a manipulation followed by Miller and Fagley (1991), Levin and Chapman (1990), and Takemura (1993, 1994), among others.

*Procedure*

The choice problems were presented among other, unrelated tasks as part of a one-hour questionnaire packet. Problem order was counterbalanced and frame was manipulated between subjects. Justification was also manipulated between subjects, so that each subject provided justification either for all problems or for none.

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<sup>2</sup>Some of these are not pure framing problems because they alter more than merely the description. Thus, the status quo is changed in alternate frames of the Frank versus Carl problem and the carriers of value are different in the two frames of the Lost Ticket versus Lost Money problem (see LeBoeuf & Shafir, in preparation, for discussion). These, however, are considered normatively to be relatively immaterial changes. We included these problems because they figure prominently in work on framing, and because the issues under investigation are also applicable to these 'impure' framing problems.

The number of problems presented to respondents varied among questionnaire packets, which were randomly assigned. The NC questionnaire was administered following all choice problems.

### *Design*

This study had a 2 (frame)  $\times$  2 (justification: required or not required)  $\times$  2 (NC: high or low) between-subjects design.

### **Results and discussion**

Possible NC scores range from  $-72$  to  $+72$ . Scores obtained by our sample ranged from  $-57$  to  $+71$  ( $M = 25.1$ ,  $SD = 20.8$ ), with a median score of 27, or 69% of the possible 145-point range. Smith and Levin (1996) found a similar median score of 72%. (Other college samples have yielded comparable median scores ranging from 67% to 77%; S. M. Smith, personal communication, 20 January 1999.) The NC scores were neither influenced by justification, framing condition, nor an interaction of the two (all  $F_s < 1$ ).

The data for each problem, displayed in Figure 1, were analyzed using a three-factor ANOVA, with frame, NC, and justification as the three independent variables.<sup>3</sup> In addition, the relationship between a participant's NC score and his or her tendency to make choices consistent with the provided frames was investigated.

### *ANOVAs*

All problems yielded substantial framing effects in the predicted directions. In the Asian Disease problem ( $N = 234$ ), 28% of respondents chose the risky option in the gain frame whereas 68% chose it in the loss frame,  $F(1, \infty) = 44.0$ ,  $p < 0.0001$ . In the \$400 versus \$300/\$500 problem ( $N = 333$ ), the risky option was chosen 28% of the time in the gain frame and 57% of the time in the loss frame,  $F(1, \infty) = 30.9$ ,  $p < 0.0001$ . In the Lost Ticket versus Lost Money problem ( $N = 230$ ), more respondents elected to buy a ticket when presented with the 'lost money' than the 'lost ticket' frame (83% versus 63%, respectively),  $F(1, \infty) = 12.3$ ,  $p < 0.0005$ . In the Frank versus Carl problem ( $N = 363$ ), participants were more likely to vote for Carl when Carl represented the status quo (57%) than when Frank did (39%),  $F(1, \infty) = 11.9$ ,  $p < 0.0006$ . In the Surgery versus Radiation problem ( $N = 331$ ), radiation therapy was chosen more often in the mortality (51%) than in the survival frame (27%),  $F(1, \infty) = 20.0$ ,  $p < 0.0001$ . In the Nominal Cut versus Raise problem ( $N = 360$ ), the nominal cut was rated as less fair than the nominal raise ( $M_s = 2.35$  and 2.79, respectively, on a 4-point scale),  $F(1, 352) = 23.4$ ,  $p < 0.0001$ . Finally, in the Tax Surcharge versus Tax Benefit problem ( $N = 173$ ), participants had to decide whether a per-child allowance for the poor (framed as either a benefit for more children or a surcharge in the case of fewer) should be greater than, less than, or equal to the per-child allowance of the rich (coded as 1,  $-1$ , and 0, respectively). A higher per-child allowance for the poor was significantly more popular in the 'benefit' frame than in the 'surcharge' frame ( $M_s = 0.45$  and  $-0.90$ , respectively),  $F(1, 165) = 251.9$ ,  $p < 0.0001$ .

Apart from the persistent and significant effects of frame, few other main effects were found, and those found were of little theoretical interest. In the Asian Disease problem, slightly fewer high-NC than low-NC respondents chose the risky option (44% versus 50%),  $F(1, \infty)$ ,  $p < 0.02$ , and more tended to choose the risky option when justification was requested (51%) than when it was not (46%),  $F(1, \infty) = 5.82$ ,  $p < 0.08$ . In the Frank versus Carl problem, participants in the justification condition were less likely to vote

<sup>3</sup>For problems in which choices were distributed as binomial proportions, an arc-sine transformation (Fienberg, 1980) was implemented to remove heteroscedasticity. Note that this transformation results in the variance being a known parameter; thus, the degrees of freedom in the denominator are infinite.

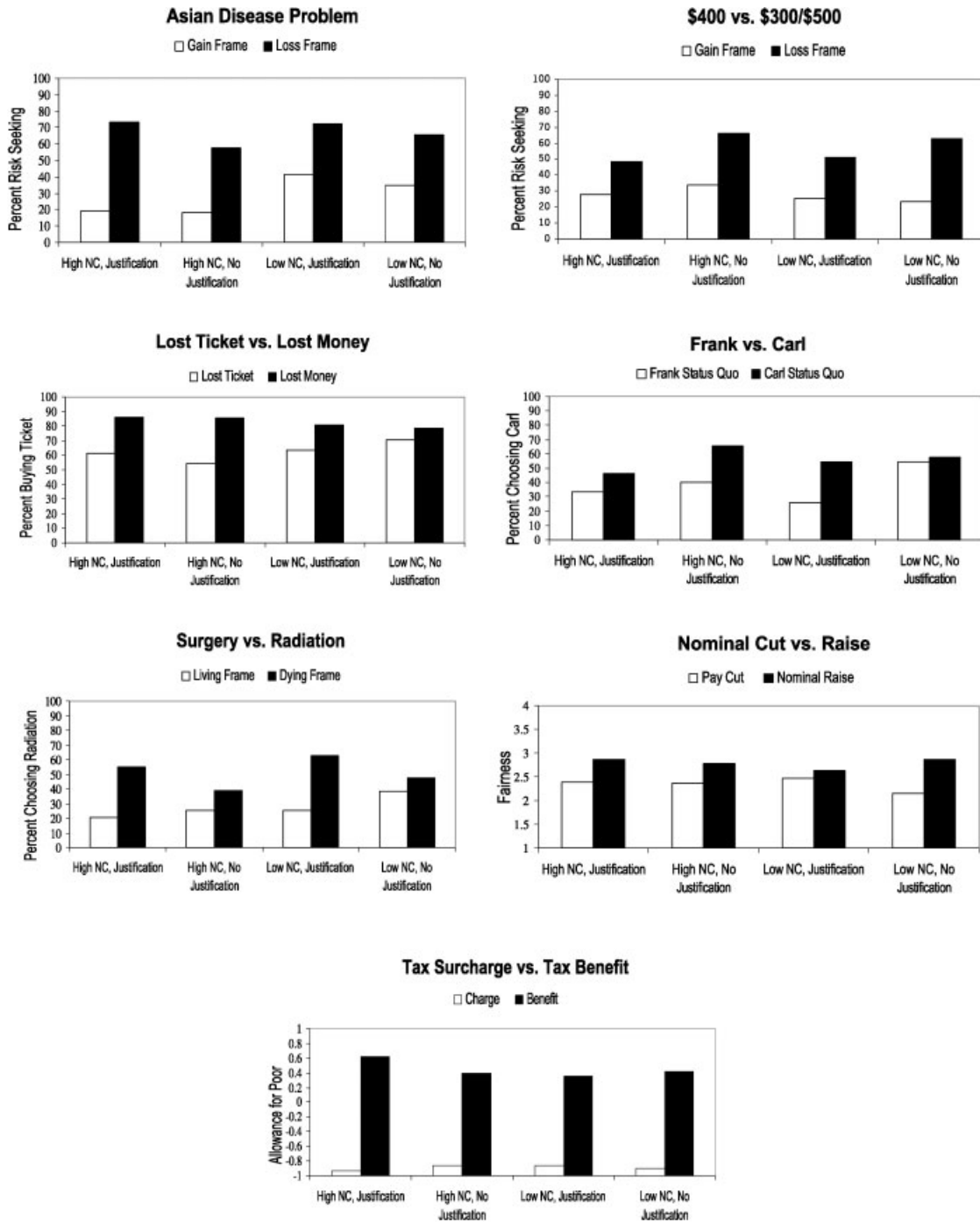


Figure 1. Choices for each problem in Study 1, by frame, NC level, and justification condition.

for Carl than those in the no-justification condition (40% versus 56%),  $F(1, \infty) = 7.95, p < 0.005$ . Additionally, in the Surgery versus Radiation problem, slightly fewer low-NC than high-NC participants preferred radiation (44% versus 48%),  $F(1, \infty) = 2.71, p < 0.10$ .

Crucial to the ‘more thought less framing’ hypothesis are the interactions showing moderation of framing effects by justification or by NC level. However, strikingly few such interactions were observed. A marginally significant frame  $\times$  NC  $\times$  justification interaction was obtained in the Frank versus Carl problem,  $F(1, \infty) = 3.41, p < 0.06$ . Inspection of Figure 1 suggests that justification provision in that problem exacerbated the framing effect for low-NC respondents, but weakened the effect for high-NC respondents. Indeed, those low in NC exhibited a non-significant effect of frame in the no-justification condition,  $F(1, \infty) < 1, ns$ , but a strong effect in the justification condition,  $F(1, \infty) = 8.18, p < 0.004$ . The opposite was true for those high in NC, who showed a significant effect of frame in the no-justification condition,  $F(1, \infty) = 6.05, p < 0.01$ , but a non-significant effect when justification was required,  $F(1, \infty) = 1.61, p < 0.20$ . A justification  $\times$  frame interaction was also observed for the Surgery versus Radiation problem,  $F(1, \infty) = 5.48, p < 0.02$ . This interaction, however, was in the direction opposite of that predicted by the ‘more thought less framing’ hypothesis: there was no effect of frame in the no-justification condition,  $F(1, \infty) = 1.11, p < 0.29$ , but a significant effect for those who provided justification,  $F(1, \infty) = 11.5, p < 0.0007$ .

#### *Personal framing score*

We computed for each participant a ‘personal framing score’, which captured the participant’s tendency to provide frame-biased responses. The score ranges from 0 (if none of the participant’s answers were consistent with the predicted choices, given the provided frames) to 1 (if all answers were consistent with framing predictions). Since alternative frames of a problem offer the same outcomes and were presented arbitrarily such that each respondent received one frame of each problem, an average personal score of 0.50 would be expected if participants were uninfluenced by problem frame. Instead, the observed mean score was 0.63, reliably greater than 0.50,  $t(364) = 11.3, p < 0.0001$ , indicating that choices were consistent with the provided frames more often than can be attributed to chance. Nonetheless, personal framing scores were uncorrelated with NC,  $r = 0.02, p = 0.76$ , suggesting no systematic relationship between NC level and the tendency to be affected by problem frame.

#### *Summary*

The main results are depicted in Table 1. For each problem, the predicted framing effect was replicated and was highly statistically reliable (all at  $p < 0.001$ ). Other main effects, for NC and for justification, were

Table 1. Consolidated results from frame  $\times$  NC  $\times$  justification ANOVAs, Study 1

	Framing problem						
	Pay cut	Disease	Ticket	Tax	Frank/Carl	\$400	Surgery
<i>Main effects</i>							
Frame	$p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.001$
NC	<i>ns</i>	$p < 0.02$	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	$p < 0.10$
Justification	<i>ns</i>	$p < 0.08$	<i>ns</i>	<i>ns</i>	$p < 0.005$	<i>ns</i>	<i>ns</i>
<i>Interactions</i>							
Frame $\times$ NC	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>
Frame $\times$ justification	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	$p < 0.02$
Justification $\times$ NC	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>
Frame $\times$ NC $\times$ justification	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	$p < 0.06$	<i>ns</i>	<i>ns</i>



sporadic and mostly unreliable. A natural prediction of the 'more thought less framing' hypothesis would be a significant interaction between frame and NC, between frame and justification, or among all three factors. However, only one of 28 potential such interactions proved significant, and that was in a direction contrary to that predicted. Naturally, one significant interaction (at  $p < 0.05$ ) out of 28 is of little consequence. Effortful thinking as measured and manipulated in Study 1 did not reduce framing effects.

## STUDY 2

Negative findings leave an unsettled closure. It may be that more effortful thinking indeed has no impact on the tendency to be framed, or else thought may simply have been unsuccessfully gauged or manipulated. To help settle this issue, the following study employed a different, within-subjects, methodology. As long as a person is presented with and adopts the perspective of one particular frame, additional thinking seems unlikely to fundamentally alter that perspective or the ensuing preference (Tversky & Kahneman, 1986). On the other hand, when presented with two frames, the possibility for inconsistency becomes salient. A person might notice the conflicting preferences triggered by the frames and might alter her second response so as to maintain consistency, in line with the requirement of invariance (Tversky & Kahneman, 1986). Given this, when both frames are seen, it is plausible that those who naturally dedicate more thought to problems will be more likely to notice the potential for inconsistency than those who devote less thought. In the following study, we presented participants with both frames of problems with the expectation that those higher in NC would be more likely to notice the potential for, and hence manage to avoid decision patterns that exhibit, framing effects.

### Method

#### *Participants*

Two hundred and ninety-two Princeton University undergraduates participated in this study for payment.

#### *Materials*

Because participants were to be presented with both frames of each problem, only two framing problems were used. Participants responded to the Asian Disease problem, which has figured extensively in earlier research, including within-subjects research (e.g. Frisch, 1993; Levin et al., 2002; Stanovich & West, 1998), and the Frank versus Carl problem, in which the perceived status quo is altered, making for what is arguably a less transparent manipulation. The names of the alternatives were modified between frames so that, in this within-subjects design, the equivalence of the two frames would not be detected merely due to a repetition of those names.<sup>4</sup> The NC scale used in Study 1 was used in the present study.

#### *Procedure*

Participants received both frames of each problem, separated by a number of unrelated simple cognitive and social judgment tasks, as part of a one-hour questionnaire. Because the two frames of the Asian Disease problem were easier to recognize as extensionally identical, these were kept further apart from each other (approximately 50 minutes apart), with the two frames of the Frank versus Carl problem occurring in

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<sup>4</sup>In the Asian Disease problem, the programs were named 'A' and 'B' in one frame and 'Omega' and 'Gamma' in the other; in the Frank versus Carl problem, the protagonists were 'Frank' and 'Carl' in one frame and 'Bill' and 'Steve' in the other (cf. Stanovich & West, 1998).

between (approximately 25 minutes apart). The separation between frames was intended to be long enough so as not to render the recurrence of the problems immediately apparent to all respondents. The order of frames for each problem was counterbalanced and randomly assigned. The NC scale was completed after all choices had been made.

### Results and discussion

Scores on the NC scale ranged from  $-68$  to  $+69$  ( $M = 19.1$ ,  $SD = 22.3$ ). As before, participants were classified as high- or low-NC based on a median split of NC scores. The median NC score in this study was 20. Seven participants who scored 20 were not classified into either high- or low-NC groups during analyses relying on the median split. Three participants did not complete the NC scale and were discarded from further analyses; for each problem, two participants did not respond to both frames and were excluded from the within-subjects analyses.

Consistency in a within-subjects manipulation requires that a respondent choose the same option in both frames of a problem. Inconsistency entails that one option is chosen in one frame and another in the other. Seventy-two and 62 percent of respondents were consistent in the Asian Disease and the Frank versus Carl problems, respectively. Of the remaining inconsistent responses, a majority—75% and 57%, respectively—were inconsistent in the direction predicted by the framing manipulations. (The proportions of consistent and inconsistent responses observed in the Asian Disease problem are similar to those found by Frisch, 1993, and by Stanovich & West, 1998.)

When responses are examined separately for low- and high-NC participants, significant differences emerge. In the Asian Disease problem, 65% of the low-NC group were consistent, whereas a full 79% of the high-NC group gave consistent responses,  $\chi^2(1, N = 280) = 6.75$ ,  $p < 0.009$ . Similarly, in the Frank versus Carl problem, 68% of the high-NC group gave consistent responses compared to only 56% of the low-NC participants,  $\chi^2(1, N = 280) = 4.37$ ,  $p < 0.04$ . (Among those who provided inconsistent responses, the proportion of 'classic' versus 'reverse' framing effects did not differ as a function of NC level for either problem,  $ps > 0.45$ .) Forty-three percent of the respondents were consistent on both problems, 48% were inconsistent on one problem, and 9% were inconsistent on both problems. Separated by NC levels, 33% of low-NC respondents but 52% of high-NC respondents were consistent on both problems,  $\chi^2(1, N = 278) = 10.7$ ,  $p < 0.001$ .

Whereas the preceding analysis examines consistency as a function of NC scores, we can also measure NC scores as a function of consistency. For the Asian Disease problem, consistent respondents had an average NC score of 21.7 ( $SD = 21.0$ ), whereas inconsistent respondents averaged an NC score of 12.6 ( $SD = 24.6$ ),  $F(1, 285) = 9.87$ ,  $p < 0.001$ . A similar, though non-significant, pattern was observed in the Frank versus Carl problem, with the consistent group showing a mean NC score of 19.7 ( $SD = 23.1$ ) and the inconsistent group having a mean NC score of 18.2 ( $SD = 21.0$ ),  $F(1, 285) < 1$ , *ns*. Altogether, these analyses support the thesis that more consistent respondents are likely to have higher NC scores than respondents who are less consistent. Indeed, respondents who were consistent on both framing problems had a mean NC score of 23.1 ( $SD = 20.9$ ), those who were consistent on one problem had a mean score of 16.7 ( $SD = 23.4$ ), and those inconsistent on both problems had a mean score of 14.5 ( $SD = 20.5$ ). A one-way ANOVA indicates these scores differ reliably,  $F(2, 282) = 3.39$ ,  $p < 0.04$ . Combining the last two groups to yield a simple comparison between respondents who gave fully consistent responses and those who did not reveals a significant difference in mean NC levels (23.1 versus 16.4),  $F(1, 283) = 6.60$ ,  $p < 0.01$ .

In summary, it appears that in a within-subjects context, respondents who are higher in NC are more likely than their low-NC counterparts to respond to a second framing of a problem in a manner consistent with an earlier response to an alternative frame. This does not conflict with Study 1 in which we concluded that, upon presentation of a single frame, those high and low in NC are equally likely to be impacted by that frame. In fact, as confirmed below, the present study also replicates Study 1's results.

*Between-subjects framing*

Although participants responded to both frames of each problem, we can limit our attention to just the first responses, equally distributed between the two frames. As in Study 1, for each problem we conducted an ANOVA with frame and NC (high or low, based on a median split) as between-subjects factors (again, we applied an arc-sine transformation; see Footnote 3). In the Asian Disease problem the risky option was chosen by 25% of respondents who first saw the lives-saved frame and by 57% of those first exposed to the lives-lost frame. The framing effect was significant,  $F(1, \infty) = 32.4, p < 0.0001$ , but there was no main effect of NC level,  $F(1, \infty) < 1, ns$ , and no frame  $\times$  NC interaction,  $F(1, \infty) < 1, ns$ . In the Frank versus Carl problem, 63% of respondents voted for Carl when they first encountered Carl as the status quo candidate, compared to 47% who chose Carl when they first encountered the alternate frame. Again, this framing effect was significant,  $F(1, \infty) = 7.5, p < 0.006$ , but there was no main effect of NC level,  $F(1, \infty) < 1, ns$ , and no frame  $\times$  NC interaction,  $F(1, \infty) < 1, ns$ .

In both problems, we again observe that effortful thinking, as indexed by NC, does not diminish the proclivity to respond in line with the initially available frame. On the other hand, the within-subjects analyses suggest that once a second frame is presented, those higher in NC are more likely to make choices consistent with their earlier responses than those with lower NC. It appears that NC is indeed a consequential variable, and that the null effects observed in the earlier, between-subjects framing manipulations cannot be attributed to a mere lack of meaningful variation of NC in our student population.

## GENERAL DISCUSSION

In Study 1, framing effects were not moderated by the amount of thought purportedly given to a problem. Of course, null findings often leave open the possibility that the attempted instantiations (in this case, thought as encouraged through justification provision or as gauged via NC scores) were ineffective. The justification manipulation, however, is virtually identical to others used in the literature (e.g. Levin & Chapman, 1990; Miller & Fagley, 1991), and Study 2 replicated the results of Study 1 while, at the same time, demonstrating that NC scores do predict important response differences. Interestingly, those differences come into play in the form of a differential ability to maintain consistency across frames—not in the likelihood of avoiding a frame's initial influence.

Whereas greater thinking increases the likelihood that responses will remain consistent across frames, it has no impact on the preferences exhibited in the context of a solitary frame, where consistency has no role to play. This is consistent with the fact that normative principles, such as dominance, cancellation, and consistency, are adhered to when their applicability is detected, but often violated when it is not (e.g. Fiedler, 1988; Tversky & Kahneman, 1986; Tversky & Shafir, 1992). Tversky and Kahneman (1986) point out that factors such as the 'sophistication and experience of the decision maker' will make the use of normative considerations more likely in certain contexts. We propose that decision makers high in NC show an increased 'sophistication' in within-subjects contexts, where they are more likely to notice the potential for violating the principle of invariance, and thus to respond consistently across frames.

Interestingly, however, what high NC respondents are successful at avoiding is inconsistency—not framing *per se*. Their responses to a second occurrence of a decision problem are likely to be in line with their responses to the first. But the responses of both high- and low-NC participants to the first occurrence of a choice problem are heavily, and equally, influenced by the provided frame. In this sense, the within-subjects consistency of high-NC respondents is an artifact of sorts. High-NC respondents are just as likely to be 'framed' as anyone else. It is only upon repeated presentation of a problem (in the guise of an alternative frame) that the characteristics signalled by a high NC score (e.g. effortful thinking, Cacioppo & Petty, 1982) will help one avoid the emergence of actual inconsistency (see Kahneman & Tversky, 2000, p. xv, for a related distinction between 'framing effects' and the 'activity of framing').

**Relation to earlier research**

As noted earlier, past research on the effects of thought on framing has yielded mixed results, and is thus worth considering in light of the current findings. Study 1 was more systematic and conducted on a larger scale, in terms of participants, variables, and problems, than any of the studies discussed above. Substantial framing effects were observed in all problems, and neither high-NC participants nor those asked to provide a rationale for their decisions were able to break free of the effects of frame when a single frame was presented.

Some apparent tension in earlier research can be traced to a failure fully to distinguish within- from between-subjects designs. Stanovich and West (1998), for example, report that respondents who avoided framing effects had greater cognitive abilities than those who exhibited such effects. They concluded that greater cognitive ability led to greater adherence to normative principles. However, these authors examined within-subjects framing, or the tendency to be consistent across two frames of a problem, and did not report whether cognitive ability was associated with a tendency to escape the influence of the *initially* presented frame. Their findings therefore do not inform us about the moderating role of cognitive ability in between-subjects contexts, in which the applicability of the relevant normative principles is obscured.

In fact, not even all within-subjects contexts allow for the avoidance of framing effects among high-NC participants. If the respective frames are separated by a substantial length of time, or are otherwise exceedingly opaque, the applicability of the relevant principles may again go unnoted, regardless of the amount of thought one typically devotes to problems. For example, Levin et al. (2002) separated the respective frames of several choice problems by a week, and found NC levels to be unrelated to the tendency to exhibit within-subjects framing effects.

Other studies have had some success with presenting respondents with scenarios combining information from alternative frames (McNeil et al., 1988) or with extended scenarios that render framing manipulations less effective (Jou et al., 1996). Although such methodologies present interesting ways of avoiding framing effects, they do not directly address the impact of participants devoting more or less thought to a problem. Of most relevance are those studies that examined justification provision or NC as moderators of between-subjects framing. Among these studies, Fagley and Miller (1987) and Levin and Chapman (1990) obtained results compatible with ours. On the other hand, Miller and Fagley (1991), Sieck and Yates (1997), and Smith and Levin (1996) attribute some reduction in (between-subjects) framing effects to increases in thinking.

Miller and Fagley's (1991) data are not decisive on this dimension. Among the several problems they ran, framing effects were observed in two problems when a rationale was not requested, and in one problem when it was. This latter problem failed to show a framing effect in the no-rationale condition, and no framing effects were observed in either condition in a number of other problems. Smith and Levin (1996), using fewer subjects than the current Study 1, found that high-NC participants still showed a trend, albeit non-significant, towards framing. Similarly, the interpretation of Sieck and Yates' (1997) results is not clear cut: participants in the justification condition were left to contemplate the problem for 50 minutes before being asked to make a choice. It is possible that such extended forced delay yields problem elaboration, or simply distraction from the original presentation, and an eventual weakening of the effect of problem frame. In fact, even under those rather extreme circumstances, justification's moderating effects were not found uniformly, and even when they were found, a pattern—though weakened—of responses consistent with framing persisted.<sup>5</sup>

Converging evidence for the current conclusions comes from the observation that other factors assumed to increase decision makers' involvement have been found not to diminish between-subjects framing effects. For example, experts are as likely as novices to be biased by problem frame (Loke & Lau, 1992; Loke & Tan, 1992; McNeil et al., 1982; Neale & Northcraft, 1986; Redelmeier & Tversky, 1990; Roszkowski & Snelbacker, 1990; Schurr, 1987; Sebora & Cornwall, 1995; see also Shafir & LeBoeuf, 2002, for a review), and decision makers

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<sup>5</sup>For example, for the Asian Disease problem, even when a rationale was requested, there was an 18-percentage-point difference, in the direction predicted by prospect theory, between the gain and loss frames in the preference for the certain option. Sieck and Yates do not report whether this 18% amounted to a reliable effect of frame on choice.

motivated by incentives are as susceptible to the effects of problem frame as are the less motivated (Levin et al., 1988a; Tversky & Kahneman, 1981). These findings are consistent with other studies showing that incentives often fail to improve decision making (Grether & Plott, 1979; Kachelmeier & Shehata, 1992; Lichtenstein & Slovic, 1973; see Camerer & Hogarth, 1999, for a review) and at times may hurt it (Arkes et al., 1986).

Interestingly, research on persuasion suggests that high-NC participants may sometimes be more affected by framing than their low-NC counterparts. For example, high-NC, but not low-NC, participants find arguments framed to match their moods more persuasive than arguments not so framed (Wegener et al., 1994). Similarly, negative frames are more persuasive than positive frames in encouraging detection-related health behaviors among those high, but not those low, in NC (Rothman et al., 1999). Note also that verbalization during decision making can hurt performance (Schooler & Melcher, 1995; Schooler et al., 1993), and that justification provision can lead to the deterioration of decisions relative to experts' standards (Wilson & Schooler, 1991). Taken together, these studies paint a fairly pessimistic view of the power of extra thought to improve the quality of many types of decisions.

### Concluding remarks

People have a remarkable ability, in some domains of cognitive function, effortlessly to transform the surface features of a stimulus into a canonical representation. In language processing, for example, surface utterances are parsed into an underlying representation. In spatial perception, the image projected on the retina tends automatically to be translated into a corrected representation. In decision making, on the other hand, the descriptions of options often are not transformed into a canonical representation; instead, they retain their surface features, thereby influencing the ensuing decisions. In fact, even when aware of multiple frames, people typically are unable to amalgamate these frames into a unified representation, and instead are pulled back and forth between impulses triggered by the alternate frames (Kahneman & Tversky, 1984; Tversky & Kahneman, 1986; see also Ordóñez et al., 2000). This is reminiscent of perceptually ambiguous figures, such as the Necker Cube, where even full awareness of different perspectives is not sufficient to allow one to contemplate the figure from a single, amalgamated point of view (Jackson, 1956; Strueber & Stadler, 1999; cf. Thaler, 1991).

Whereas deeper thinking is likely to prove critical in avoiding some errors, it is unlikely to play a significant role in avoiding others. When a decision requires integrating large amounts of information, those higher in NC or needing to justify their choices are likely to use more information (Huber & Seiser, 2001) and to make objectively 'better' decisions (Levin et al., 2000). Similarly, certain problem descriptions may simply obscure a 'preferred' representation that is more likely to be detected by those who exhibit more effortful thought (e.g. Chatterjee et al., 2000). As observed in our Study 2, more thought may also trigger the realization that a choice one is tempted to make would be inconsistent with an earlier response.

A solitary choice, on the other hand, does not immediately present any consistency concerns, no matter how thoughtful the decision maker might be. When confronted with both formulations, people understand that losing two-thirds of a threatened group amounts to the same as saving one-third. However, when encountered one at a time, and given the absence of a canonical representation, each frame triggers its own compelling set of impulses. Upon immediate presentation of a conflicting frame, those who think more carefully will be able to detect and avoid a potential contradiction. But without such explicit (and rare) multiple presentations, framing effects are likely to persist even among careful thinkers, since they emerge from sincere attitudes rather than careless processing.

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