Abstract

When making decisions, people sometimes deviate from normative standards. While such deviations may appear to be alarmingly common, examining individual differences may reveal a more nuanced picture. Specifically, the personality factor of *need for cognition* (i.e., the extent to which people engage in and enjoy effortful cognitive activities; Cacioppo & Petty, 1982) may moderate decision makers' susceptibility to bias, as could personality factors associated with being a leader. As part of a large-scale assessment of high-level leaders, participants completed a battery of decision-making competence and personality scales. Leaders who scored higher on need for cognition performed better on two of four components of a decision-making competence measure: framing and honoring sunk costs. In addition, the leader sample performed better than published controls. Thus, both individual differences in need for cognition and leadership experience moderate susceptibility to decision biases. Implications for broader theories of individual differences and bias are discussed.

Keywords: leadership; need for cognition; decision-making

Individual Differences in Need for Cognition and Decision-making Competence Among Leaders

Traditional economic theories of behavior have assumed that people integrate all available information to rationally determine the utility of decision outcomes (Nash, 1950; Simon, 1954; von Neumann & Morgenstern, 1944). However, half a century of research in psychology, economics, and related fields has shown that real decision makers often deviate systematically and predictably from normative standards of rational decision-making (Edwards, 1953; Kahneman & Tversky, 1979; Simon, 1957; Camerer & Thaler, 1995). For example, people tend to be risk-seeking when a decision problem is described as a choice between two losses but risk-averse when the same problem is described as a choice between two gains (Kahneman & Tversky, 1979). Instead of attending solely to future risks and rewards, people tend to be affected by their past investments (that is, by "sunk costs") when allocating resources (Arkes & Blumer, 1985; Staw, 1976). Despite these biases, people are often overconfident of their decision-making abilities (Camerer & Lovallo, 1999).

On the surface, such deviations from rational decision-making appear alarmingly common. Yet examining individual differences may reveal a more nuanced picture. Specifically, such personality factors as *need for cognition,* or the extent to which people engage in and enjoy effortful cognitive activities (Cacioppo & Petty, 1982), may moderate susceptibility to decision biases (Smith & Levin, 1996; Stanovich & West, 1999).

Need for Cognition

Need for cognition (NC) is conceptualized as the tendency to engage in and enjoy effortful cognitive activities (Cacioppo & Petty, 1982). Those high in NC engage in cognitively challenging activities without external motivation, whereas those low in NC prefer to engage in cognitive tasks only when they have a good reason to do so. Those low in NC are more likely to rely on simple cues (Haugtvedt, Petty, & Cacioppo, 1992) and stereotypes when making judgments, whereas those high in NC are more likely to fully consider all relevant information.

Notably, higher NC does not *necessarily* lead to better decisions. NC leads to increased thinking, so if thoughts are biased to begin with, increased NC does not guarantee better decisions (for a broader review of depth of thought and susceptibility to bias, see Lerner & Tetlock, 1999). In fact, biases caused by effortful thinking, such as explicit priming, can be exacerbated by higher NC (Petty & Jarvis, 1996) because increased thinking about the prime creates additional opportunities for bias (Petty, et al., 2008). In sum, NC is not expected to eliminate all biases, but rather certain biases that arise from overreliance on cognitive shortcuts (e.g., framing biases; Smith & Levin, 1996, Petty & Jarvis, 1996).

Decision-making Competence

The present research examined four domains of decision-making competence: resistance to framing, confidence calibration, consistency in risk perception, and sensitivity to sunk costs. Resistance to framing and consistency in risk perception assess a criterion of consistency, whereas sensitivity to sunk costs and confidence calibration assess an accuracy criterion (Bruine de Bruin, Parker, & Fischhoff, 2007).

Susceptibility to framing. Framing effects, identified by Tversky and Kahneman (1981), occur when two choice problems that are logically equivalent elicit different choices due to subtle changes in language. A classic example is the "Asian disease problem," which asks participants to choose between two programs of medical treatment for a disease outbreak expected to kill 600 people (Tversky & Kahneman, 1981). When the two treatments are presented in terms of lives lost, subjects tend to be risk seeking, preferring the treatment that has a 1/3 probability of no lives lost (but a 2/3 probability of 600 lives lost) over a treatment that will definitely cause the loss of 400 lives. However, when these treatments are presented in terms of lives saved, preferences reverse: saving 200 lives with certainty is preferred over the risky treatment, which may save either 600 lives or none.

Confidence calibration. Overconfidence, a highly prevalent bias, has contributed to catastrophic decisions, such as the Challenger explosion and the Chernobyl accident (Plous, 1993, p. 217). *Confidence calibration* is defined as the extent to which confidence matches accuracy when measured across many judgments (Fischhoff, Slovic, & Lichtenstein, 1977). People typically report confidence levels nearly 20 percent higher than their accuracy levels (Lichtenstein & Fischhoff, 1977), but calibration can be better among experts—such as weather forecasters and expert bridge players—who know a great deal about the relevant domain and who receive timely feedback about their judgments (Ronis & Yates, 1987).

Consistency in risk perception. People's perceptions of risk are often inaccurate (Lichtenstein et al., 1978; Slovic, 1987; Johnson & Tversky, 1983). Inaccuracies can arise from lack of facility with probabilities (Peters, 2008) or from risk assessments based

on salient exemplars (Tversky & Kahneman, 1973) or affective cues (Slovic, et al., 2002). We define consistency in risk perception as the logical consistency of risk judgments in three areas: temporal (for example, judgments of risk for the next year vs. the next five years), set/superset (for example, the risk of dying from a terrorist attack vs. the risk of death from any cause), and complementarity (for example, probability of having a car accident vs. probability of having an accident-free driving record).

Sensitivity to sunk costs. Decision makers often show greater willingness to continue with an endeavor once resources have already been invested, though objectively such prior investments should not influence future investment decisions. This tendency has been called *escalation of commitment* (Staw, 1976), or the *sunk-cost bias* (Arkes & Blumer, 1985). Often, people honor sunk costs to avoid the aversive event of admitting that resources were squandered as a result of their decisions (Arkes & Blumer, 1985). For example, Arkes and Blumer (1985) showed that patrons who paid full price ($15) for season tickets to a theater series attended more performances than did those who received a $2 or $7 discount.

Need for Cognition and Decision-making Competence

Those high in need for cognition are less likely to rely on superficial cues such as question wording when making decisions and are therefore less susceptible to framing biases, as when choosing between two cancer treatment options presented in terms of gains or losses (Smith & Levin, 1996). Similarly, high-NC subjects correctly ignored whether changes in monetary value were presented as percentages or dollar amounts, while those low in NC were influenced by presentation (Chatterjee et al., 2000). Higher

NC is therefore expected to correlate with increased resistance to framing effects in the present study.

Need for cognition has also been found to moderate the tendency to honor sunk costs. Participants who honored sunk costs (by saying they would continue to watch a terrible movie only if they had paid to rent it but not if the movie was free) had lower NC than participants who responded normatively by ignoring sunk costs (Stanovich & West, 1999). Higher NC is therefore expected to correlate with increased resistance to sunk costs.

The literature is mixed on the relationship between need for cognition and confidence calibration. While some previous studies have failed to find a relationship between the two (Allwood & Bjorhag, 1990), others have found that higher NC is associated with poorer confidence calibration in crystallized knowledge domains, such as word recognition (Jonsson & Allwood, 2003). Given these mixed findings, we did not have an a priori prediction of the relationship between NC and performance on the confidence calibration task in the present study. There is also little evidence in the literature on the relationship between NC and consistency in risk perception, though research in the public health domain has shown that NC moderates the impact of messages about the risks of cigarette smoking, with those higher in NC more influenced by factual messages and those low in NC more influenced by emotional messages (Vidrine, Simmons, & Brandon, 2007). Given the scant literature, we did not have an a priori prediction of the relationship between NC and consistency in risk perception.

Need for Cognition in High-level Leaders

In addition to testing our hypotheses about the relationship between NC and decision-making competence, the present study pursues the equally important objective of testing these processes in a sample of high-level leaders. None of the previously documented associations between NC and decision-making performance have been examined in a mature, experienced population, nor in a population of leaders who are held accountable for decision outcomes. It is therefore unknown whether a sample of high-level decision-makers will show a relationship between NC and decision-making competence or whether leaders, regardless of their NC, have learned to avoid decision errors through years of practice, thus forestalling such a relationship.

Despite these qualifications, due to the far-reaching and well-documented effects of NC across many domains and populations (Cacioppo et al., 1996) we hypothesized that individual differences in NC would, in fact, be pervasive and powerful enough to show relationships with decision-making competence, even among highly experienced decision makers.

Method

Participants

One hundred seventy-eight high-level leaders who were visiting the Harvard Kennedy School of Government to take part in executive education programs were recruited as participants. Participants came mainly from U.S. state, local, and federal government or the U.S. military. Complete responses were obtained from 161 participants (49 female); this sample was used for all analyses. Participants reported a mean age of 46 (SD = 7.73), with a mean of 14 years (SD = 7.64) spent in a leadership

position. Seven percent had a high school diploma or some college, 18% had a bachelor's degree, and 75% had a post-graduate degree.

Materials

The two primary scales of interest were the 18-item version of the Need for Cognition Scale (Cacioppo, Petty, & Kao 1984) and the Adult Decision-making Competence Scale (A-DMC; Bruine de Bruin, Parker, & Fischhoff, 2007). The Need for Cognition scale asks participants to rate the extent to which each of 18 items describes them on a nine-point Likert scale anchored by "strongly disagree" and "strongly agree". Sample items are "The notion of thinking abstractly is appealing to me" and "Thinking is not my idea of fun" (reverse coded).

The A-DMC, developed by Bruine de Bruin, Parker, & Fischhoff (2007), assesses decision-making competence across several domains, including *resistance to framing*, *resistance to sunk costs*, *consistency in risk perception*, and *confidence calibration*. The *resistance to framing* and *consistency in risk perception* components evaluate performance based on participants' consistency between related judgments. In the *resistance to framing* component, participants are asked to indicate preferences for pairs of problems that are equivalent in value but described differently (loss or gain frame). Scores are calculated by the mean absolute difference ratings for the two problems. *Consistency in risk perception* is measured as the consistency of risk assessments across time frames.

The *resistance to sunk costs* and *confidence calibration* components assess accuracy relative to an external criterion. *Confidence calibration* is scored as the absolute difference between confidence and accuracy across 14 true/false questions (such as "A

venture capital fund invests in new businesses by providing startup capital"). The confidence calibration score is the absolute difference between average confidence (on a 100-point percentage scale) and percentage correct across the 14 items. *Resistance to sunk costs* measures participants' ability to ignore past expenditures when considering future options by asking them to choose between an option that represents the normatively correct choice versus one that honors sunk costs. Scores are calculated by the average rating across items.

Procedure

Participants, who came to the lab in groups of 10-36, were tested in individual cubicles. They first completed the Need for Cognition scale, then the resistance to framing, resistance to sunk costs, consistency in risk perception, and confidence calibration components of the Adult Decision-Making Competence Scale in a fixed order.[1] Finally, participants provided demographic information, including information about their leadership experience. Participants received individualized feedback on their decision-making performance as an incentive to participate.

Results

Preliminary analyses: Validity Checks

To verify that our sample actually consisted of high-level leaders, we asked participants to report how many subordinates they managed (both directly and indirectly) and how many years they had spent in a management role. The mean number of direct

[1] Participants also completed other measures for the purposes of another project not discussed here. More information on these measures can be obtained from the corresponding author.

reports was 68.20 (*Mdn* = 9); the mean number of indirect reports was 304.85 (*Mdn* = 38). Participants reported having spent a mean of 14 years in a management role. We also asked participants to rate the following statements on a seven-point Likert scale (anchored by "Not at all true about me" and "Very much true about me"): "I can punish or reward subordinates," "I can promote or demote subordinates," "My opinion is accorded considerable respect and attention," "I am expected to motivate my subordinates," and "I supervise subordinates and evaluate or correct their work as necessary." Responses to these items demonstrated acceptable reliability ($\alpha = .77$), so we averaged them to create a composite measure of subjective workplace status. The modal score on this composite was 7, and the mean was 5.8, well above the scale midpoint of 3.5, $t\,(160) = 25.89$, $p < .001$.

Inferential Analyses: Need for Cognition and Decision-making Competence Among Leaders

To examine the hypothesis that those higher in NC show greater decision-making competence, we examined the correlations between NC and each of the four dimensions of decision-making competence. Consistent with hypotheses, the results revealed a significant correlation between NC and two of the four decision-making dimensions: *resistance to framing effects* and *resistance to sunk costs*. Participants with higher NC were more resistant to task framing when making choices than were those with lower NC, $r(161) = .16$, $p = .04$. Participants with higher NC also displayed greater resistance to sunk costs, $r(161) = .17$, $p = .03$; the higher their NC, the more participants were willing to write off sunk costs. There was no significant correlation between NC and confidence

calibration, $r(161) = .09$, $p = .26$; or NC and consistency in risk perception $r(161) = -.13$, $p = .11$.

To examine the hypothesis that the leader sample would show less susceptibility to decision biases than would the published control sample from Bruine de Bruin, Parker, & Fischhoff (2007), we compared scores from the two samples on each of the four dimensions of decision-making competence. The control sample consisted of 360 residents of the Pittsburgh area. Women made up 73.8% of respondents. Educational demographics included 2.8% reporting no degree, 44.6% a high school diploma, 13.0% reporting an associate's degree, 29.1% a bachelor's degree, 9.5% a master's degree and 0.9% a doctorate degree (Bruine de Bruine, Parker, & Fischhoff, 2007). Results revealed that the leaders outperformed the control group on three out of the four dimensions: resistance to framing effects, consistency in risk perception, and resistance to sunk costs (see Table 1). Thus, we conclude that individual differences in leadership experience and NC moderate susceptibility to decision biases.

(Insert Table 1 about here)

General Discussion

In a sample of high-level leaders, as predicted, those high in need for cognition were less affected by task framing and less swayed by sunk costs than were those low in NC. However, NC was not correlated with better confidence calibration or more consistent risk perceptions.

Why might higher NC correlate with reduced sensitivity to framing effects and sunk costs, but not with greater confidence calibration or consistency in risk perceptions? The answer likely lies in the types of cognitive processes tapped by the different tasks. In

his taxonomy of judgment biases, Arkes (1991) divides systematic errors in judgment into three types: *strategy-based*, *association-based*, and *psychophysical*. *Strategy-based* errors result from the use of simplifying strategies that do not use all the available data. Although such strategies often give "good enough" solutions and conserve scarce cognitive resources (c.f. Gigerenzer, Todd, & the ABC Research Group, 1999), they also lead to predictable judgment errors. *Association-based* errors are the result of automatic semantic associations influencing judgment. For example, my confidence in the belief that Istanbul is the capital of Turkey may be high due to the automatic activation of evidence consistent with it (for example, the fact that Istanbul is Turkey's largest city). (In fact, the capital of Turkey is Ankara). Finally, *psychophysical* judgment errors result from non-linear responses to different levels of gains and losses. If I have already invested $1000 in repairing my 1988 Camaro, another $500 repair seems less onerous than if I had not already taken the $1000 loss.

In terms of Arkes' (1991) framework, the two biases reduced in individuals high in NC—framing effects and the sunk-cost bias—are both considered psychophysical judgment errors because they result from differential sensitivity to gains and losses (framing effects) and in differential sensitivity to losses depending on one's reference point (sunk-cost bias). While it may seem odd that psychophysical judgment errors can be overcome by additional thinking, in both cases, a clear decision rule can be applied to overcome the "perceptual illusion." Just as a scale provides a clear answer about an item's actual weight, expected value calculations can be applied regardless of framing to determine the correct response (and many of our participants reported doing just that).

Similarly, following the rule "consider only future costs and benefits" will eliminate the perceptual illusion underlying the sunk-cost bias.

In contrast, confidence calibration is classified as an association-based judgment error in the Arkes (1991) framework. Such errors are very difficult, perhaps impossible, to "undo" by exerting mental effort. No clear rule can counteract the effect of spreading semantic activation on judgment, and even with awareness of bias, it is difficult to determine how much one should adjust one's judgments. In fact, thinking harder about reasons supporting one's choices may make one even *more* confident that one has reached the right answer.

Consistency in risk perception is more difficult to classify. While the judgment errors that lead to inaccurate risk descriptions may be association-based, internal inconsistencies are likely due to strategy-based judgment errors. For example, air travel may be evaluated as riskier than automobile travel due to vivid media reports of plane crashes. However, inconsistency in risk perceptions (such as ascribing a higher likelihood of dying in a plane crash in the next year than in the next five years) is likely due to a faulty decision strategy that glosses over probability rules. According to the Arkes (1991) framework, raising the costs of using a suboptimal decision strategy (e.g., incentives or accountability) may reduce such strategy-based errors. Future work should explore the relationship between NC, costs and benefits of different decision strategies, and strategy-based errors.

Comparing the Decision-making Performance of Leaders to Other Groups

Comparing the decision-making competence of leaders to a sample of Pittsburgh residents reported by Bruine de Bruin, Parker, & Fischhoff (2007) showed that the leader

sample outperformed the community sample on resistance to framing effects, consistency in risk perception, and resistance to sunk costs (regardless of NC level). One reason for this may be that leaders were, on average, higher in NC than the control samples—in other words, in addition to explaining variance in decision-making ability within the sample of leaders, NC might also explain the group-level differences in decision-making ability between leaders and controls. It is unlikely that this is the whole story, however, because leaders outperformed controls on consistency in risk perception, which we did not find to be related to NC. There are, of course, many other possible reasons for the between-group differences we observed: Leaders might learn to make better decisions as part of their formal or informal training. Differences in education between our sample and the less-educated community sample could be responsible, as could underlying differences in cognitive ability. Ongoing research in our laboratory, and in others, is currently examining which, if any, of these explanations are correct.

Why Use Non-undergraduate Samples?

Many findings on biased patterns of responding in decision-making are based on college samples, and understandably so: Undergraduates are cheap and readily available, and the inferences researchers wish to draw often are not sample-dependent (c.f. Mook, 1983). In some cases, however, inferences *are* sample-dependent. In particular, when one wishes to argue that a pattern of biased responding is generally prevalent, or that an individual difference generally moderates bias, it is important to turn to use non-student samples. Indeed, much prior work suggests that at least some decision-making biases may be mitigated in experts (Ronis & Yates, 1987; Shanteau, 1988; Spence & Brucks, 1997). In addition, using high-level leaders as research participants may also affect how

seriously non-psychologists take one's findings; unless leaders are studied, those in leadership positions may believe that the typical findings of decision-making research do not apply to them (Sears, 1986). For debiasing prescriptions to have an effect, the work must be able to reach leaders, and leaders must be open to the advice.

Future Research

Arkes' (1991) framework provides a framework for understanding why increased need for cognition reduces some biases but not others. The present research indicates that those with leadership experience can overcome psychophysically based errors with increased processing. Though it should in principle be possible to overcome strategy-based errors in the same way, further research is needed to determine when this will be the case among those with a chronic tendency to think deeply. Our research is continuing to investigate decision making among executive leaders, both to extend generalizability and to explore individual differences in decision making. Further research should also directly compare the decision-making competence of leaders to that of non-leaders. Because decisions made by leaders have such great potential for far-reaching consequences, it is important to understand how such decisions are made and how they can be improved.

Summary

The present findings add to the literature on need for cognition and cognitive bias by demonstrating that the relationships between NC and decision-making ability initially demonstrated in college students hold in a sample of high-level leaders. Moreover, by considering multiple decision tasks within one study, we were able to make inferences about the mechanisms underlying bias reduction. The present paper also conceptually

connects these mechanisms to Arkes' theory-based taxonomy of error and bias, thus facilitating the formation of future hypotheses.

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Table 1
Leaders' Decision-Making Competence Compared to Control Group

Component	Control *M (SD) N*	Leader *M (SD) N*	Cohen's *d*	*t*	*p*
Resistance to Framing	3.72 (.61), 360	4.03 (.59), 161	0.517	5.414	< .0001
Confidence Calibration	.91 (.08), 360	.92 (.07), 161	0.133	1.369	= 0.1717
Consistency in Risk Perception	.70 (.16), 360	.84 (.10), 161	0.919	10.241	< .0001
Resistance to Sunk Costs	4.40 (.77), 360	4.94 (.87), 161	0.657	7.100	<.0001