

Overcoming Focusing Failures in Competitive Environments

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ABSTRACT

This paper attacks one of the chief limitations of the field of behavioral decision research—the past inability to use this literature to improve decision making. Building on the work of Thompson, Gentner, Loewenstein and colleagues (Loewenstein, Thompson, & Gentner, 1999; Thompson, Gentner, & Loewenstein, 2000; Gentner & Markman, 1997), the current paper finds that it is possible to reduce bias in one of the most robust problems in the decision literature, the Acquiring a Company Problem (Samuelson & Bazerman, 1985). Past research has shown that individuals make sub-optimal offers as a result of the failure to think about the decisions of others and to incorporate a clear understanding of the rules of the game. In the current study, we find that by allowing study participants to see and understand differences in seemingly unrelated decision problems—versions of the Monty Hall Game (Nalebuff, 1987; Friedman, 1998) and Multiparty Ultimatum Game (Messick, Moore, & Bazerman, 1997; Tor & Bazerman, 2003)—study participants can learn to focus more accurately on the decisions of other parties and the rules of the game, the keys to solving the Acquiring a Company Problem. This research offers a new piece of evidence that comparative and analogical processes may be a successful direction for improving decision making. Copyright © 2004 John Wiley & Sons, Ltd.

KEY WORDS focusing; bounded rationality; rules of the game; cognitions of others; debiasing; comparative and analogical processes; Acquiring a Company; Monty Hall; ultimatums

Beginning with Simon's (1957, March & Simon, 1958) concept of bounded rationality and continuing through Kahneman and Tversky's work on biases and heuristics (Kahneman, Slovic, & Tversky, 1982; Tversky & Kahneman, 1974), researchers have identified a number of systematic judgment and decision-making errors that people make. This work tends to begin with a clear assumption of the information available to the individual and explores errors in how the individual uses that information. More recently,

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researchers have begun to explore errors in focusing, or systematic patterns that lead some relevant information to be out of focus to individuals when they form judgments (Schkade & Kahneman, 1998; Wilson, Wheatley, Meyers, Gilbert, & Axsom, 2000). The current paper argues that in competitive contexts, the decisions of other parties and the rules of the game tend to be out of focus, which leads to systematic errors in judgment.

The most common domain for prior research on focusing concerns predicting life satisfaction. For example, Schkade and Kahneman (1998) found that salient differences between California and the Midwest, such as climate, strongly influenced people's judgments of residents' life satisfaction. Specifically, while Californians and Midwesterners reported the same level of life satisfaction, when both groups were asked to rate the life satisfaction of a similar other living in the other location, both groups rated Californians as having greater life satisfaction than Midwesterners. There is also evidence that this focusing bias produces errors in affective forecasting. Wilson et al. (2000) found that football fans tend to overestimate how long their happiness will be affected by the outcome of a game because they focus only on the event in question. This tendency, however, was significantly reduced if the fans first assessed the approximate amount of time that they would spend on other activities in the days after the game. The effects of the focusing bias can be found in reasoning and decision making as well as in judgment errors. Legrenzi, Girotto, and Johnson-Laird (1993), for example, proposed that people commit errors in reasoning and decision making because they focus only on what is explicitly represented in their mental models.

In competitive settings, focusing is reflected in decision makers' insensitivity to the cognitions of opposing parties as well as the rules of the game. Game theorists regularly provide guidance that the decisions of others and the definition (rules) of the game are critical in developing a rational decision in competitive contexts. However, by paying attention only to their own thoughts and actions and ignoring other key factors that also influence their outcomes, decision makers fail to perform optimally in competitive settings (see, e.g., Carroll, Bazerman, & Maury, 1988; Messick, Moore, & Bazerman, 1997; Tor & Bazerman, 2003). Past research on negotiator bias tends to focus on how people fail in the use of information (Carroll et al., 1988). This paper explores the complementary problems associated with focusing on a definition of the problem in a manner that is too narrow, and missing key elements that are critical to making rational decisions.

This decision error has some similarity to the confirmatory bias (Wason, 1960) in its ignorance of relevant information. But, unlike confirmatory bias errors, focusing failures are not about systematic ignorance of information that would support a particular, possibly unwanted decision. Focusing failures, in competitive contexts, represent a tendency to overweight one's own perspective, and underweight perspectives of others and external forces, resulting in decision errors that may or may not systematically trend towards a particularly more attractive option. In non-literal terms (with no suggestion that this is a deliberate process), confirmatory bias errors are the result of the decision maker closing his/her eyes when presented with certain information, whereas focusing failures are the result of the decision maker not looking up to consider information that is unrelated to his/her own self.

Researchers have found these robust errors consistently in their research on several competitive decision problems, the most well studied of which is the Acquiring a Company Problem (Samuelson & Bazerman, 1985). When presented with this problem, the overwhelming majority of respondents provided solutions that yield negative expected return (e.g., Carroll et al., 1988). In a recent paper by Tor and Bazerman (2003), protocol analysis showed that people performed suboptimally because they ignored the rules of the game and the decisions of the opposing party. In addition, Tor and Bazerman (2003) found that the same errors existed and predicted failure across three seemingly different tasks—the Acquiring a Company Problem, the Monty Hall Problem, and the Multi-party Ultimatum Problem.

The goal of the present research is to devise a way of training participants to reduce focusing failures in competitive settings. We will use performance in the Acquiring a Company Problem as our dependent variable. Since the Acquiring a Company Problem plays a key role in this research, we will begin by presenting it in some detail.

THE ACQUIRING A COMPANY PROBLEM

This problem was adapted from Akerlof's (1970) Lemons Problem (Samuelson & Bazerman, 1985). Responders play the role of a potential acquirer, Company A. The value of its target, Company T, can be anywhere from \$0 to \$100 per share, depending on the outcome of an exploration (all values are considered equally likely). Under Company A's management, Company T will be worth 50% more than under current management. In other words, if, after the exploration, Company T is worth \$100 under the current management, then it will be worth \$150 under the management of Company A. Since Company T will wait until the outcome of the exploration is known before it decides whether to accept or reject Company A's offer, it will know the true value of the company when it makes its decision. Company A, on the other hand, will not know the true value of the company when it makes its offer. Company T is expected to accept any offer that is greater than the value of the company under the current management. The question is, what price should Company A offer?

The correct answer to the problem is zero. The reasoning is as follows: suppose the acquirer offers \$60 and the target accepts. It can be inferred that the company is worth anywhere between \$0 and \$60, or on average \$30, since any value in that range is equally likely. Given that the company is worth 50% more to the acquirer, the acquirer's expected value is $1.5(\$30) = \45 , or 75% of its offer price. The same reasoning can be applied to any positive offer. The company is worth, on average, 25% less than the price the acquirer pays whenever its offer is accepted. Thus, any offer has negative expected value, and the acquirer is better off making no offer, or \$0.

In contrast to this rational logic, across numerous studies, the overwhelming majority of responses fall between \$50 and \$75 (e.g., Samuelson & Bazerman, 1985; Carroll et al., 1988). An explanation commonly offered for a response in that range is that the company will be worth, on average, \$50 under the current management, or \$75 to the acquirer; hence, any transaction between \$50 and \$75 is mutually beneficial. This explanation is illustrative of the general reason that Tor and Bazerman (2003) found (using protocol analyses) for people's failure to solve this problem correctly: they ignore the rules of the game (i.e., the target can await the result of the exploration before either accepting or rejecting the acquirer's offer and has unique information) and the decisions of the target (i.e., it will only accept offers that provide a profit).

The Acquiring a Company Problem is among the more robust problems demonstrating systematic decision errors (Bazerman, 2002). After Samuelson and Bazerman's (1985) early demonstration, the problem has held up against many possible limitations. Many questioned the use of convenient MBA students as study participants, but the problem has replicated easily with extremely intelligent groups, as well as with those with relevant experience including accounting firm partners, CEOs, and investment bankers (Bazerman, 2002). Experimental economics often finds that biases disappear with multiple trials (particularly with feedback). But the Acquiring a Company Problem has held up even when responders were given multiple opportunities to make offers, received negative feedback, and were paid according to their performance (Ball, Bazerman, & Carroll, 1991; Bereby-Meyer & Grosskopf, 2003; Selten, Abbink, & Cox, 2001). Thus, the challenge in this paper is to find a training mechanism that can overcome the severe cognitive limitations to solving this problem.

TRAINING TO OVERCOME FOCUSING FAILURES

The present study examines a method of training participants to pay attention to the rules of the game and the cognitions of others. Part of the inspiration for our training comes from the analogical training research of Loewenstein et al. (1999; Thompson et al., 2000). These researchers show success in training negotiators to create value by having them draw analogies in dyads of related negotiations tasks. But instead of studying training based on *similarities* between tasks, the current research explores the related question of whether participants can learn by understanding *differences* in seemingly similar tasks.

Prior research has demonstrated that using contrasts, or highlighting differences, can facilitate perceptual learning (Bransford, Franks, Vye, & Sherwood, 1989), the learning of problem-solving principles (VanderStoep & Seifert, 1993), and concept acquisition (Tennyson, 1973). Especially relevant to the present study is the finding in the analogical reasoning literature that a “near-miss” contrast (Winston, 1975), or a contrasting example that differs in one important respect from the study problem, is effective in helping people abstract a solution schema and subsequently apply it to an analogous test problem (Gick & Paterson, 1992; Ross & Kilbane, 1997). As Gentner and Markman (1997) noted, differences that map on to a common structure, or “alignable differences,” are particularly salient. In Gick and Paterson (1992), for example, participants first read a story about a general who conquered a fortress by sending small forces simultaneously from different roads. Those who then compared it to a near-miss contrasting story, which described a sequential instead of a simultaneous attack, were more likely to come up with an analogous solution to the “radiation problem” (Duncker, 1945; Gick & Holyoak, 1980)—direct multiple low-intensity rays (*small forces*) simultaneously toward the tumor (*fortress*) from different directions.

In line with the above findings, we predict that the highlighting of rules of the game and cognitions of others in contrasting problems will focus participants’ attention on these key features and lead them to consider how changes in any of these features, e.g., from a conjunctive to a disjunctive rule, might alter the solution to a problem (Ross & Kilbane, 1997). In our work, we borrow two versions of the Monty Hall Problem and two versions of the Multi-Party Ultimatum Problem (also sometimes referred to as the Dividing the Pie Problem) from Tor and Bazerman (2003). Subtle differences between the two versions of each problem in the rules of the game and the cognitions of other parties create massive differences in the expected value-maximizing strategies (differences that Tor and Bazerman’s, 2004, study participants tended to ignore). We use these two pairs of problems to train individuals on the Acquiring a Company Problem. Before describing the logic of our training, we will describe the training problems.

Monty Hall

The Monty Hall Problem was inspired by the game show, in which host Monty Hall asked contestants to pick one of three doors, knowing that one of the doors hid the prize. Typically, after the contestant picked a door, Monty Hall would open one of the other two doors to reveal that it did not have the prize, and then offer the contestant the chance to trade their chosen door for the remaining unchosen and unopened door. Most contestants opted to hold on to the door they originally chose. Years later, statisticians, economists, and journalists (Selvin, 1975; Nalebuff, 1987; von Savant, 1990; Friedman, 1998) noted that the common decision not to switch was a mistake. When the contestant first chose their door, they had a one-third chance of winning the prize. When Monty opened an unchosen door to reveal that it did not have the prize, which he could always do, this probability did not change; there was still a one-third chance that the contestant had originally chosen the winning door, and a two-thirds chance that the big prize was behind one of the other two doors. With one door revealed, the two-thirds chance was now carried by the unopened, unchosen door. The contestant should therefore always switch doors, to increase the odds of winning from one-third to two-thirds. In an experimental version of this problem, Friedman (1998) showed substantial failure to switch and only limited learning through multiple trials.

Tor and Bazerman (2004) noted the assumption that Monty always opened an unchosen door that did not contain the prize was a critical element in this analysis. Under that assumption, the correct response was to switch doors. However, by making a minor change in Monty’s behavior, and assuming a “mean Monty”—one who knows where the prize is located and who wants to minimize the contestant’s chance of winning, the analysis changes dramatically. Now, once the contestant picks a door, “mean Monty” has the option to declare the game over or open one door and offer a switch. If Monty wants to minimize the contestant’s chance of winning, the contestant should never accept an offer from Monty to switch. Since Monty wants

the contestant to lose, the fact that Monty makes the offer indicates that the contestant has already picked the winning door.¹

In the training stage of the current study, we will use minor variations of Tor and Bazerman's (2004) two versions of the Monty Hall Problem as a means of highlighting the rules of the game (that is, whether the game can be ended early without offering the contestant the opportunity to switch) and the decisions of others (that is, whether Monty is trying to maximize the likelihood of the contestant losing).

Multiparty Ultimatum

Inspired by the Ultimatum Problem (Güth, Schmittberger, & Schwarze, 1982; Roth, 1991) and a real-world problem involving making an offer on a house sold by three siblings, Messick et al. (1997) created two versions of a multiple-party ultimatum problem. Six MBA students were assigned to the roles of A, B, C, D, E, and F. Player A was given \$60 to allocate to the six parties. The game required that the offers to B, C, D, E, and F had to be equal and had to be an integer. Players B, C, D, E, and F each recorded the minimum amount that they would accept. Messick et al. (1997) manipulated the decision rule for the game. In one version, if the amount that A offered to B–F was equal to or greater than the smallest amount requested by B, C, D, E, or F, the allocation of A went into effect, and if it was not, all parties received 0 (Multiparty Ultimatum—lowest offer, MPL). In the other version, if the amount that A offered to B–F was equal to or greater than the largest amount requested by B, C, D, E, or F, the allocation of A went into effect, and if it was not, all parties received 0 (Multiparty Ultimatum—highest offer, MPH).

In both versions, a bimodal response pattern emerges from the demands of players B–F (Messick et al., 1997; Tor & Bazerman, 2004). Many B–F players take \$1, since \$1 is better than the \$0 that they get by turning the offer down. At the same time, many of them demand \$10—they want their “fair” share. Tversky and Kahneman (1974) have shown that individuals underestimate disjunctive events and overestimate conjunctive events. Thus, Messick et al. (1997) found that player As underestimate the likelihood of at least one out of five people accepting \$1 and overestimate the likelihood of all five individuals accepting anything less than \$10.

Specifically, Messick et al. (1997) found that the expected value-maximizing strategy for player A would be to divide the money 55–1–1–1–1–1 in the MPL condition and 10–10–10–10–10–10 in the MPH condition. But despite the vast differences in the expected value-maximizing strategies for player A, the actual behavior of player As was much closer across the two conditions. On average, player As allocated \$8.15 to the other players in the MPL condition and \$8.47 to the other players in the MPH condition (Messick et al., 1997). While this result can be explained by the confounding of thinking through the optimal strategy with concerns for fairness, Tor and Bazerman (2004) ruled out fairness as an explanation by rewarding study participants for diagnosing the expected value-maximizing strategy.

We will again use minor variations on Tor and Bazerman's (2004) two versions of the Multiparty Ultimatum problem in the training stage of the experiment in order to highlight the rules of the game (that is, the siblings' decision rule) and the decisions of others (that is, the minimal amount specified by each sibling). The training stage thus consists of two versions of the Monty Hall and two versions of the Multiparty Ultimatum problems. Monty Hall and the Multiparty Ultimatum take place in different contexts and have virtually no surface similarity to each other, thus appearing very different from each other. However, within each problem, there are two versions, which differ from each other in the same critical ways: the rules of the game and the decisions of others. The key empirical question is whether exposure to pairs of problems (Monty Hall, Multiparty Ultimatum) that only differ in subtle ways can lead to performance improvement in

¹This analysis assumes that Monty is using a separating strategy, in which he opens when the contestant was correct, and does not open when the contestant was incorrect. In contrast, Monty could use a pooling strategy, in which he never opens and always declares the game over. The contestant's best response to a separating strategy is to stay, whereas the contestant is indifferent between staying and switching if Monty uses a pooling strategy. In both equilibria (the separating one and the pooling one) the contestant wins 1/3 of the time.

the Acquiring a Company Problem, a problem that has been remarkably resistant to training and experience. We believe that the three problems studied in this paper (Monty Hall, the Multiparty Ultimatum, and Acquiring a Company) had never been mentioned in the same paper before Tor and Bazerman (2004).

The current study has two training conditions. In the *implicit* training condition, participants are presented with the two versions of each problem sequentially. Given how similar the two versions are, it is plausible that participants would spontaneously compare and contrast the problems, leading them to conclude, correctly, that the solution probably changes as a result of the differences between them. As a result, they will focus their attention on the salient differences between the problems—differences that highlight information often ignored in competitive settings, namely rules of the game and decisions of all parties involved.

Hypothesis 1: Participants in the implicit training condition will perform better than the control group on the Acquiring a Company Problem.

However, the training may be more effective if explicit instructions to compare and contrast are given. In the *explicit* training condition, participants are presented with the two versions of each problem in a two-column, side-by-side format. They are asked explicitly to compare and contrast the problems, think about how the differences should affect the solutions, and are given the correct solutions afterward. Explicit instructions to draw comparisons have been found to help people abstract principles for later application (Loewenstein et al., 1999; Thompson et al., 2000).

Hypothesis 2: Participants in the explicit training condition will perform better than the control group on the Acquiring a Company Problem.

Hypothesis 3: Participants in the explicit training condition will perform better than those in the implicit training condition on the Acquiring a Company Problem.

METHOD

Participants

One hundred forty-six students from Harvard University and MIT were recruited through Web-based advertisements offering payment for participation in a decision-making study. Participants had the opportunity to earn between \$10 and \$25, in the form of a base fee of \$10 for participation, a \$5 early show-up incentive, and an additional \$10 for providing a correct answer to the Acquiring a Company (AAC) Problem. No payment was offered for the training tasks.

Procedure

The study was held at a computer lab and all participants were seated at a computer for the duration of the study. Participants were randomly placed in one of three conditions: control, implicit training, or explicit training. The study was administered through a combination of paper-based instructions and computer-based data collection. In all three conditions, participants referred to paper-based instructions for details about the problems and entered their responses into the computer. None of the problems were titled with the descriptors used purely for presentation purposes in this paper (e.g. Monty Hall); they were simply presented as Problem 1, Problem 2, and so on. Typically, participants alternated between reading the instructions on paper and providing responses on the computer.² The z-Tree software (Fischbacher, 1999) was used to program the

²The participants were required to enter a code from the paper instructions before entering their responses on the computer; this mechanism ensured that participants were correctly tracking both sets of materials.

experiment tasks. All tasks were self-paced. When participants arrived at the AAC problem, they were told that if they provided the correct response to the problem they would receive an additional payment of \$10.

In the *control* condition, participants completed the AAC problem without any exposure to the training problems, Monty Hall and Multiparty Ultimatum (see Appendix A for the AAC problem).

In the *implicit* training condition, participants completed the Monty Hall and Multiparty Ultimatum problems, presented in sequential fashion, before proceeding to the AAC problem.

The two versions of the Monty Hall (MH) Problem were “Monty Always Opens” (MAO) and “Mean Monty” (MM). The text for both problems appears below, with the MAO text appearing in [*bracketed italics*] and the MM text appearing in [**bracketed bold**]:

In a recent study, college students were given the following question:

You are participating in a game in which you are given a choice between boxes 1, 2, and 3. One of these three boxes has a valuable prize in it. The other two boxes are empty. After you pick one of the boxes, the game host [*will definitely*] [**may**] open one of the other two boxes (never a box that in fact has the prize in it), show you that this unchosen box does not have the prize, and offer you to trade the box you originally chose for the other unopened box. [**The host will make his decision whether or not to open a box and offer you a switch with the goal of minimizing the likelihood that you get the prize.**]

For example, if you were to choose box 1, the host [*would*] [**might decide to**] open one of the two other boxes (e.g., box 2), [*and show you it's empty. The host would then*] [**show you it's empty and**] offer you the opportunity to switch your choice from 1 to 3.

A student who participated in the study picked a box. The host then opened one of the other boxes, showed the student it was empty, and offered the student to switch his original choice to the remaining unopened box.

In order to have the best chance of winning the prize, should the student switch his choice?

Answer: Yes ____ No ____

Based on the logic presented above, the correct response to the MAO version of the problem is “Yes” (to switch), and the correct answer to MM is “No” (not to switch).

The two versions of the Multiparty Ultimatum Problem were the “Multiparty Ultimatum—Lowest” (MPL) version and the “Multiparty Ultimatum—Highest” (MPH) version. The text for both problems appears below, with the MPL text appearing in [*bracketed italics*] and the MPH text appearing in [**bracketed bold**].

In a recent study, college students were given the following problem:

Six people will be randomly assigned to the roles A, B, C, D, E, and F. A will be randomly selected, and given \$60 to allot among A, B, C, D, E, and F. The amounts given to B, C, D, E, and F must be equal, but this amount may be different from the amount that A allocates to A (herself/himself). B, C, D, E, and F will be asked to specify the minimum amount that they would accept. If the amount offered by A to each of B, C, D, E, and F is equal to or greater than the [*smallest*][**largest**] amount specified by B, C, D, E, or F, the \$60 will be divided as specified by A. If, however, [*all*][**any**] of the amounts specified by B, C, D, E, and F are larger than the amount offered by A, all six parties will receive \$0.

What amounts should A allocate to each person in order to maximize his/her average dollar payoff?

A: \$____ B: \$____ C: \$____ D: \$____ E: \$____ F: \$____

As noted above, the correct response to the MPL version of the problem is “55–1–1–1–1–1” and the correct answer to MPH is “10–10–10–10–10–10”.

Half of the participants in the implicit training condition were presented with the MH problems first (i.e., MAO, MM, MPL, MPH), and the other half the MP problems first (i.e., MPL, MPH, MAO, MM). No order effects were found.

In the *explicit* training condition, the two versions of the MH problem (i.e., MAO, MM) and the two versions of the MP problems (i.e., MPL, MPH) were displayed in a two-column, side-by-side format. As before, half of the participants completed the MH problems before the MP problems, and the other half completed the pairs in reverse order. There were no order effects. After reading each pair of problems, participants wrote out responses to the following questions: "What is the key difference between the two versions of the problem?" and "Should this difference affect the advice you give in each version? If so, how?" They then submitted their answers to the problems on the computer and received a computer message describing their answers as either correct or incorrect. They were also instructed to raise their hands so that the experimenter could provide them with a detailed written explanation of the correct solutions (see Appendices B and C). After participants completed both pairs of problems, they answered the following question: "Now, please think about the two problems that you just completed. What are the similarities and differences between Problem 1 and Problem 2?" They then proceeded to the AAC problem.

In summary, *implicit* training participants saw the problems one at a time without instructions to compare or relate them, and without receiving the solutions. *Explicit* training participants saw related problems side-by-side, were explicitly asked to compare the problems, and were given detailed solutions.

RESULTS

Performance on the training problems

In the implicit training condition ($N=46$), 45.6% of the participants answered MAO correctly, 78.3% answered MM correctly, 54.4% answered MPH correctly, and 15.2% answered MPL correctly. In the explicit training condition ($N=49$), the percentages were 46.9%, 93.9%, 65.3%, and 14.3%, respectively. Besides the significantly better performance on MM in the explicit training condition (93.9% vs. 78.3%, $\chi^2(1)=4.90$, $p<0.05$), all figures were consistent with prior research (Tor & Bazerman, 2004).

Performance on the AAC problem

Only 13.7% of the participants in the control condition ($N=51$) gave the correct response of zero. In contrast, 32.6% of the participants in the implicit training condition and 38.8% of those in the explicit training condition gave the correct response, over twice the percentage found in the control condition and numerous prior studies (Ball et al., 1991; Bereby-Meyer & Grosskopf, 2003; Carroll et al., 1988; Tor & Bazerman, 2004). The significantly better performance in the training conditions (32.6% vs. 13.7%, $\chi^2(1)=4.92$, $p<0.05$ and 38.8% vs. 13.7%, $\chi^2(1)=8.15$, $p<0.01$) confirms Hypotheses 1 and 2 and is supportive of the conclusion that learning occurred. Contrary to Hypothesis 3, no difference in performance was found between the two training conditions, implicit versus explicit ($\chi^2(1)=0.39$, n.s.), suggesting that learning occurred independent of whether participants were explicitly asked to compare and contrast the problems.³

To provide further insight into the performance of participants in the two training conditions, we classified them into those who answered both versions of MH correctly versus those who answered at least one of them incorrectly, and examined how each group performed on the AAC problem. Overall, 35.8% of the participants answered both versions of MH correctly and 64.2% answered at least one of them incorrectly. Among the former group, 50.0% provided the correct response to the AAC problem, compared to only 27.9% of

³It is likely that in the Loewenstein et al. (1999) and Thompson et al. (2000) studies cited above, explicit instructions to draw comparisons were necessary because the two study cases presented to participants did not share any surface features and were different in many respects.

those in the latter group. This difference was statistically significant, $\chi^2(1) = 4.65$, $p < 0.05$. We similarly examined the relationship between participants' performance on the MP pair and the AAC problem. Of the participants, 7.4% answered both versions of MP correctly and 92.6% answered at least one of them incorrectly. Among the former group, 57.1% provided the correct response to AAC, compared to only 34.1% of those in the latter group. This difference was in the predicted direction, although it was not significant because of insufficient statistical power stemming from the low percentage of participants who answered both versions of MP correctly.

We also generated an index of participants' performance on the two training problems. This index has a value of 2 if participants answered both versions of MH and both versions of MP correctly. It has a value of 1 if participants answered both versions of MH correctly and at least one version of MP incorrectly or if they answered both versions of MP correctly and at least one version of MH incorrectly. For participants who answered at least one version of MH incorrectly and at least one version of MP incorrectly, the index has a value of 0. When a probit regression of participants' response to the AAC problem (coded 0 for incorrect and 1 for correct) was performed on this index, the coefficient was significant, $\beta = 0.51$, $p = 0.01$. Of course, the above analyses cannot be taken as evidence for causality, but it is indicative of a consistent cognitive pattern that is associated with better performance on all problems.

We next examined directly whether the performance of participants in the two training conditions improved as result of the training. To that end, participants' performance (success/failure) on each of the trials (i.e., the training trials and the final test trial) was regressed on the trial number. If participants' performance improved over time, we should find a significant positive effect.⁴ Since training comes from working through both versions of MH and also both versions of MP, a participant's performance on a training trial is coded as success (equal to 1) only if both versions of the problem were solved correctly; it is coded as 0 otherwise. Participants' performance on the test trial, i.e., AAC, is coded as success (equal to 1) if they answered AAC correctly and 0 otherwise. The independent variable is a categorical variable that takes on values from 1 to 3, representing the number, or order, of the trials. A random-effects probit regression revealed a significant positive coefficient, $\beta = 0.29$, $p < 0.01$, showing that learning occurred across trials.

DISCUSSION

The debiasing and training literature in decision-making research has created a frustrating paradox to many professors who teach behavioral decision research to professional students. On the one hand, many professors believe that it is useful to teach this area of research to pragmatic students who want to make better decisions. Yet the literature questions this effort, since the field has a long history of failures in debiasing judgment (Fischhoff, 1982; Bazerman, 2002). As early as Fischhoff's (1975) work on the hindsight bias, we have known that even when the bias is explicitly described to participants and they are instructed to avoid it, the bias remains.

On the positive side, there have been hints that debiasing may be possible. Research on the overconfidence bias has found that intensive, personalized feedback is moderately effective in improving judgment (Bazerman & Neale, 1983; Lichtenstein & Fischhoff, 1980). More important, in the competitive domain, the process of making comparisons across related problems may lead to a breakthrough in debiasing. The current research shows that when participants view parallel problems, in which the only differences highlight aspects that are out-of-focus, specifically rules of the game and decisions of others, these categories

⁴We thank an anonymous referee for the suggestion.

of information may be brought into focus in a subsequent problem. This finding is broadly compatible with the analogical reasoning work of Loewenstein et al. (1999; Thompson et al., 2000) and the cognitive work on alignable differences of Gentner and Markman (1997). Overall, a pattern suggests that reasoning that results from comparing related problems may be a key to debiasing judgment—at least in competitive contexts.

One potential objection to our study is that, rather than learning to pay attention to the rules of the game and decisions of others, participants learned by solving the Monty Hall and Multiparty Ultimatum problems to think creatively and consider counterintuitive solutions. If participants are given practice with problems that require creative and counterintuitive thinking, the argument goes, they will perform better on the AAC problem as well.

To test for this interesting possibility, an additional 46 participants were recruited.⁵ They were given four problems to solve in one of four different orders: (1) Duncker's (1945) Candle Problem; (2) the Wason (1968) Task; (3) a problem constructed from Gick and Paterson's (1992) story, "The Attack"; and (4) the Jar Problem used by Tor and Bazerman (2004). No order effects were found. As in the explicit training condition, after completing each problem, participants raised their hands and were provided with a detailed explanation of the correct solution. After completing all four problems, participants proceeded to the AAC problem. 21.7% of them provided the correct response, which was not significantly different from the 13.7% found in the control condition, $\chi^2(1) = 1.07$, n.s. Furthermore, their performance was poorer than that in the two training conditions combined (35.8% vs. 21.7%, $\chi^2(1) = 2.85$, $p = 0.09$, marginally significant). Together, these results suggest that training in reasoning and creative problem solving was not a sufficient explanation for why we found better performance on the AAC problem in our training conditions. The possibility remains that the Monty Hall and Multiparty Ultimatum tasks may induce counterintuitive and creative thinking, particularly thinking that overrides the tendency to ignore the rules of the game and decisions of others. But these findings suggest that counterintuitive and creative thinking in general is not a sufficient explanation. One would have to propose a specific kind of counterintuitive thinking, one that overcomes the tendency to focus on oneself.

The findings also suggest that simply involving the participants in a series of mentally engaging tasks is not sufficient to generate improved performance on later tasks. The training tasks are serving as more than a mental warm-up. In order for participants to learn to broaden their focus to include information they would otherwise ignore, such as the rules of the game and decisions of others, the training tasks have to be crafted in such a way as to highlight these key elements.

This paper is an early step in developing research strategies that have implications for training humans to be less biased in their decision making. Our research builds on the mechanisms suggested in the work of Loewenstein et al. (1999; Thompson et al., 2000) on analogical reasoning. However, any one training effort can cause effects for many alternative reasons. Future research has the potential to further confirm the ideas of Loewenstein et al. (1999) and/or identify alternative mechanisms.

This research is part of a stream that addresses a fundamental tension between descriptive behavioral decision research and the desire to improve judgment and decision making. Many believe that behavioral decision research should be useful. However, if debiasing is impossible, training human judgment is a waste of time for educators and students. This paper provides some hope of a reconciliation that can encourage decision researchers to continue to help decision makers to improve the quality of their decisions.

⁵This condition was a helpful suggestion from George Loewenstein.

APPENDIX A: ACQUIRING A COMPANY

In a recent study, college students were given the following problem:

You will represent Company A (the potential acquirer), which is currently considering acquiring Company T (the target) by means of a tender offer. The main complication is this: the value of Company T depends directly on the outcome of a major oil exploration project that is currently undertaking. Indeed, the very viability of Company T depends on the exploration outcome. If the project fails, the company under current management will be worth nothing (0 points per share). But if the project succeeds, the value of the company under current management could be as high as 100 points per share. All share values between 0 points and 100 points are considered equally likely.

By all estimates, Company T will be worth considerably more in the hands of Company A than under current management. In fact, the company will be worth 50 percent more under the management of A than under the management of Company T. If the project fails, the company will be worth 0 points/share under either management. If the exploration project generates a 50 points/share value under current management, the value under Company A will be 75 points/share. Similarly, a 100 points/share value under Company T implies a 150 points/share value under Company A, and so on.

It should be noted that the only possible option to be considered is paying in cash for acquiring 100 percent of Company T's shares. This means that if you acquire Company T, its current management will no longer have any shares in the company, and therefore will not benefit in any way from the increase in its value under your management.

The board of directors of Company A has asked you to determine whether or not to submit an offer for acquiring Company T's shares and, if so, what price they should offer for these shares. This offer must be made now, before the outcome of the drilling project is known. Company T will accept any offer from Company A, provided it is at a profitable price for them. It is also clear that Company T will delay its decision to accept or reject your bid until the results of the drilling project are in. Thus you (Company A) will not know the results of the exploration project when submitting your price offer, but Company T will know the results when deciding on your offer. As already explained, Company T is expected to accept any offer by Company A that is greater than the (per share) value of the company under current management, and to reject any offers that are below or equal to this value. Thus, if you offer 60 points/share, for example, Company T will accept if the value under current management is anything less than 60 points.

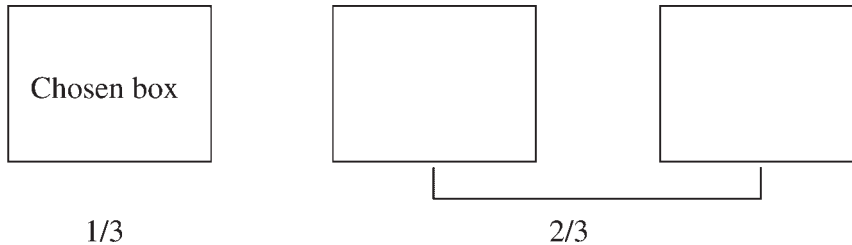
You are now requested to give advice to the representative of Company A who is deliberating over whether or not to submit an offer for acquiring Company T's shares, and if so, what price he/she should offer for these shares. If your advice is that he/she should not to acquire Company T's shares, advise him/her to offer 0 points/share. If you think that he/she should try to acquire company T's shares, advise him/her to offer anything between 1 to 150 points/share.

What is the offer that he/she should make? In other words, what is the optimal offer?

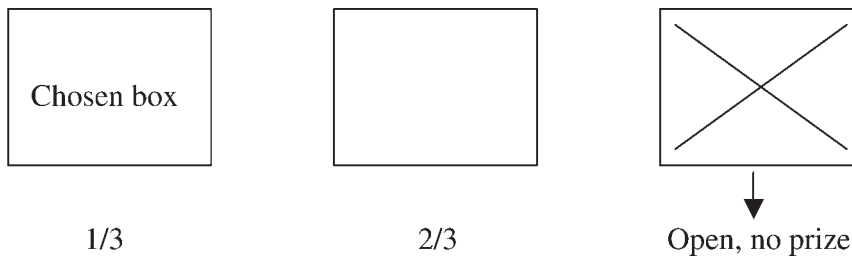
APPENDIX B: SOLUTIONS TO THE MONTY HALL PROBLEMS

When the host always opens an empty box and gives the student an opportunity to switch, the student should always switch. The reasoning is as follows:

When the student initially chose a box, there was a $1/3$ chance that the prize was in that box, and a $2/3$ chance that it was in one of the two unchosen boxes.



We know that the host always opens an empty box. Therefore, when s/he opens a box, there is still a $1/3$ chance that the prize is in the initially chosen box, making the chance that it is in the remaining unchosen box (the box the student was offered a switch to) now $2/3$. Thus, the student should switch.



On the other hand, when the host selectively decides whether or not to open a box and give the student an opportunity to switch, the student should never switch. The reasoning is as follows: Since the host makes his decision with the goal of minimizing the likelihood that the student wins the prize, the student will only be offered a switch when he correctly chose the box with the prize in it. Therefore, in this case, the probability of the prize being in the unchosen unopened box is 0.

It is important to note that different rules are guiding the host's behavior in these two versions, and they affect the outcome of your decision. Therefore, the optimal decision in the two versions is different.

More generally, this demonstrates that it is important to consider the rules and the behavior of other people that may affect the outcome of your decision.

APPENDIX C: SOLUTIONS TO THE MULTIPARTY ULTIMATUM PROBLEMS

When A's offer to each of B, C, D, E, and F is accepted only when it is equal to or greater than the largest amount specified by them (i.e., when A needs all five to accept), A should offer each person $1/6$, or \$10, and keep the remaining \$10. This is because if A does not give everyone $1/6$, s/he is very likely to get turned down by at least one of the recipients.

When A's offer to each of B, C, D, E, and F is accepted only when it is equal to or greater than the smallest amount specified by them (i.e., A only needs one acceptance), A should offer each person \$1, and keep the remaining \$55. This is because there is a very high likelihood of getting at least one person to accept \$1 over nothing—so giving \$1 makes sense to maximize the average payoff to the person making the allocation.

It is important to note that different rules are guiding the acceptance or rejection of A's offer in these two versions. Therefore, the optimal offer in the two versions is different.

More generally, this demonstrates that it is important to consider the rules and the behavior of other people that may affect the outcome of your decision.

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