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Intuitive Confidence: Choosing Between Intuitive and Nonintuitive Alternatives

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People often choose intuitive rather than equally valid nonintuitive alternatives. The authors suggest that these *intuitive biases* arise because intuitions often spring to mind with subjective ease, and the subjective ease leads people to hold their intuitions with high confidence. An investigation of predictions against point spreads found that people predicted intuitive options (favorites) more often than equally valid (or even more valid) nonintuitive alternatives (underdogs). Critically, though, this effect was largely determined by people's confidence in their intuitions (*intuitive confidence*). Across naturalistic, expert, and laboratory samples (Studies 1–3), against personally determined point spreads (Studies 4–11), and even when intuitive confidence was manipulated by altering irrelevant aspects of the decision context (e.g., font; Studies 12 and 13), the authors found that decreasing intuitive confidence reduced or eliminated intuitive biases. These findings indicate that intuitive biases are not inevitable but rather predictably determined by contextual variables that affect intuitive confidence.

Keywords: behavioral economics, dual process, inferential correction and adjustment, decision making in sports gambling, overconfidence

Decisions often require the integration of an intuition—the first answer that springs to mind when one is required to make a decision—with information that invalidates or opposes that intuition. For example, an experimental participant who watches a fellow student give a political speech must integrate the knowledge that the speaker was assigned to give that speech in order to decide the speaker's true attitude toward the speech topic (e.g., Jones & Harris, 1967). A citizen with a favorable intuition about a competent-looking political candidate must integrate negative information about the candidate (e.g., the candidate's views on foreign policy) in order to make a voting decision (e.g., Todorov, Mandisodza, Goren, & Hall, 2005). And a manager who favorably judges a job candidate during a short interview must integrate other unfavorable information about the candidate (e.g., knowledge that the candidate was fired from his or her last job) in order to make a hiring decision.

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In this article, we present research that sheds light on how people make decisions such as these. How do people decide between intuitive and nonintuitive alternatives when they are aware of information that invalidates or opposes their intuitions?

Intuitive Versus Nonintuitive Choosing

People often choose in line with their intuitions even when other information undermines their intuition's validity (e.g., Denes-Raj & Epstein, 1994; Kirkpatrick & Epstein, 1992). This tendency is at the root of a variety of psychological phenomena, including biases in likelihood judgments (Kahneman & Frederick, 2002), the correspondence bias (Gilbert, 2002; Jones & Harris, 1967), the hindsight bias (Fischhoff, 1975), the spotlight effect (Gilovich, Medvec, & Savitsky, 2000), the illusion of transparency (Gilovich, Savitsky, & Medvec, 1998), the above- and below-average effects (Kruger, 1999), belief in explicitly false statements (Gilbert, 1991), the solo comparison effect (Moore & Kim, 2003; Windschitl, Kruger, & Simms, 2003), the ratio-bias phenomenon (Denes-Raj & Epstein, 1994; Denes-Raj, Epstein, & Cole, 1995), perspective-taking failures (Epley, Keysar, Van Boven, & Gilovich, 2004), the use of clinical versus actuarial prediction (e.g., Dawes, Faust, & Meehl, 1989), the popularity of sport utility vehicles (Gladwell, 2004), and more (for reviews, see Chaiken & Trope, 1999; Epstein, 1994; Gilovich, Griffin, & Kahneman, 2002; Kahneman, 2003).

Researchers believe that these *intuitive biases* arise from the interaction of two mental systems—termed System 1 and System 2 (Epstein, 1994; Kahneman, 2003; Sloman, 1996; Stanovich & West, 2002). System 1 is a relatively effortless system that relies on prior knowledge, judgmental heuristics, immediate experience, and affect in order to rapidly and crudely assess the decision alternatives. This assessment is often accomplished by answering an easy question (e.g., How did the candidate perform during the interview?) where a difficult one is required (e.g., How will the candidate perform the job?; Kahneman & Frederick, 2002). The purpose of this intuitive assessment is to quickly suggest which option should be chosen.

System 2 is a slower, effortful, resource-dependent, rule-based system that monitors and updates System 1's assessment in light of information that System 1 neglected to consider. When information opposes System 1's assessment, System 2 is called on to correct that assessment in an effort to improve decision accuracy. Extant theorizing indicates that despite System 2's corrective attempts, final decisions are often biased by initial intuitive assessments, even when decision makers are aware of information that undermines the validity of those assessments. Thus, in the competition between System 1 and System 2, System 1 wins more often than not (e.g., Denes-Raj & Epstein, 1994; Gilbert, 2002; Kahneman, 2003).

Why does System 1 intuition often prevail over System 2 reasoning? The answer depends on the theory. According to some dual-process theories, including the heuristic systematic model (HSM; Chaiken, Liberman, & Eagly, 1989; Chen & Chaiken, 1999) and the elaboration likelihood model (ELM; Petty & Cacioppo, 1986; Petty & Wegener, 1999), invalid System 1 responses pervade judgment and choice because people are often unmotivated (i.e., cognitively lazy; e.g., Cacioppo & Petty, 1982) or unable (i.e., cognitively overloaded; e.g., Gilbert, Pelham, & Krull, 1988) to fully process relevant information in the judgment context. Without either the motivation or ability to process information that opposes the intuition, decision makers must rely on their initial intuitive, or heuristic, evaluations of the decision options. System 1 biases emerge from a cognitive busyness or laziness that fails to fully engage System 2, and the fact that decision makers are often cognitively lazy or busy accounts for the ubiquity of intuitive biases.

Even when neither laziness nor busyness are at stake, a different brand of dual-process model—*anchoring and adjustment*—holds that System 1 biases emerge from intrinsic insufficiencies in System 2 corrections. According to this theory, perceivers start with an intuition (the anchor), and then they serially adjust for information that suggests that the intuition might be invalid. Because perceivers settle on the first answer that seems plausible, their adjustments are insufficient, and they wind up choosing in line with their intuitions (e.g., Epley & Gilovich, 2004, 2006; Epley et al., 2004; Gilbert, 2002; Griffin & Tversky, 1992; Tversky & Kahneman, 1974). According to this model, intuitive biases arise not only when people are too lazy or busy to use System 2 to make corrections. Rather, System 2 itself lacks the capacity to correct enough.

Both of these perspectives offer empirically powerful and highly compelling explanations for why a potentially invalid intuition might win out to influence judgment and choice. It is important to note, however, that these explanations do not, either in isolation or in combination, provide a satisfying account for some varieties of intuitive biases. First, although the HSM and ELM can easily explain why cognitively lazy or busy decision makers often rely on their intuitions, they cannot explain why cognitively motivated and able decision makers often rely on their intuitions as well (e.g., Denes-Raj & Epstein, 1994; Gilbert & Jones, 1986; Pelham & Neter, 1995). For all of their strengths in predicting when perceivers will process relevant information, the HSM and ELM fail to predict the perseverance of intuitive biases when all relevant information has been processed.

Second, the distinction between judgment and choice limits the application of anchoring and adjustment models. These models provide a compelling account of how people make continuous judgments (e.g., frequency and percentage estimates; Epley & Gilovich, 2006; Epley et al., 2004, Study 5; Gilovich et al., 2000), but the contention that people serially adjust for counterintuitive information along a continuous dimension means that these models offer a poor account of choices (Denes-Raj & Epstein, 1994; Epley et al., 2004, Studies 1 and 2). For people to serially adjust judgments along a continuous dimension, there must first be a continuous dimension along which adjustment can take place. Thus, to apply anchoring and adjustment theories to dichotomous choice tasks, one must assume that decision makers spontaneously convert choice tasks into judgments along a continuous scale (see Epley et al., 2004, p. 337). Contrary to this assumption, however, people treat choice and judgment tasks quite differently, as they rely on distinct mental processes to handle them (e.g., Simonson, 1989; Simonson & Tversky, 1992). Indeed, the parsimonious hypothesis that people treat choices as choices rather than as continuous judgments has not been disconfirmed. As a result, anchoring and adjustment models cannot easily account for choice phenomena.

An additional limitation of anchoring and adjustment theories is their inability to predict when intuitive biases will emerge and when they will not. One version of anchoring and adjustment holds that intuitive biases are inevitable because adjustments are always insufficient, whereas a weaker version holds that the biases are nearly guaranteed because adjustments are mostly insufficient (Epley & Gilovich, 2004). Neither version offers a general account that predicts when adjustments will be sufficient. Indeed, the mechanisms that are posited to account for sufficiencies in adjustment tend to be idiosyncratically linked to particular items and to define sufficiency with respect to accuracy rather than, as we do, with respect to the intuition or anchor.

In sum, intuitive biases exist even when people fully process information suggesting that their intuitions are invalid and even when they are making choices. Neither the HSM, ELM, or anchoring and adjustment model can explain why this is so. In this article, we propose a unique dual-process model of choice that addresses both of these issues. In so doing, we forward a theory that not only explains why intuitive biases arise in motivated choice contexts, but also makes novel predictions about when they will fail to arise. Thus, contrary to anchoring and adjustment theories, our theory suggests that intuitive biases are predictably nonuniversal: They arise because people feel very confident in their intuitions, so that seemingly robust intuitive biases will fail to arise when confidence in the intuition is undermined.

Choosing Between Intuitive and Nonintuitive Alternatives: The Integral Role of Intuitive Confidence

Our description of how people choose between intuitive and nonintuitive alternatives begins with standard dual-process assumptions. We assume that people conduct a cursory assessment of the decision options, and we refer to the output of this assessment as an *intuition*. We further assume that this intuition serves as a decision default (Epstein, 1994) and that the decision default is chosen when people are either unmotivated or unable to engage in further processing (e.g., Chaiken et al., 1989; Petty & Cacioppo, 1986). These basic assumptions are consistent with a wide variety of dual-process models (e.g., Chaiken & Trope, 1999; Gilovich et al., 2002) and are relatively uncontroversial.

Our account is designed to explain how motivated and able decision makers integrate their intuitions with information that opposes their intuitions in order to arrive at a decision. We begin by suggesting that because intuitions serve as decision defaults, decision makers' primary task is to determine whether they should switch from the intuitive option to a nonintuitive alternative. In order to make this *stay–switch decision*, people consider two kinds of information.

For one thing, people consider *constraint information*, a term that includes any available information that constrains the intuition's validity, that opposes the intuition, or that supports a nonintuitive alternative. For example, a manager's positive intuition about an interviewee is constrained by any negative information about the interviewee that the manager has available (e.g., knowledge that the candidate has a hankering for midafternoon naps). As with many models of judgment, we predict that strong constraint information will cause people to switch away from their intuitions more often than weak constraint information.[1] Although this hypothesis seems remarkably obvious, we will demonstrate that this effect occurs even when constraint magnitude has no informative value.

The second piece of information that people consider—and the piece most critical to our theory—is *intuitive confidence*. Generating an intuition often feels easy, but sometimes it can feel quite difficult. The more easily intuitions are generated, the more confidently people hold them. Thus, easily generated intuitions are held with high confidence, and those generated with difficulty are held with low confidence (e.g., Epley & Norwick, 2006; C. M. Kelley & Lindsay, 1993; Reber & Schwarz, 1999; Tormala, Petty, & Briñol, 2002; Wänke & Bless, 2000). In line with a large body of research demonstrating that people rely on metacognitive feelings as information when they make decisions (e.g., Haddock, Rothman, Reber, & Schwarz, 1999; Loewenstein & Lerner, 2003; Loewenstein, Weber, Hsee, & Welch, 2001; Nelson & Morrison, 2005; Schwarz, 2004; Schwarz & Clore, 1996), we suggest that people use intuitive confidence to decide whether to cling to an intuition when confronted with constraint information. High intuitive confidence signals intuitive accuracy and that the intuitive option should be chosen. In contrast, low intuitive confidence signals intuitive inaccuracy and that the nonintuitive option should perhaps be chosen. As a result, people will choose intuitive options with greater frequency as intuitive confidence increases.

Although intuitive confidence varies across decision contexts, it is also true that people typically have great confidence in their intuitions. Because intuitions spring to mind quickly, intuitions often feel easily generated, and this feeling increases intuitive confidence. On this basis, we suggest two additional hypotheses. First, because people are often confident in their intuitions, even invalidated intuitions will be chosen more often than nonintuitive alternatives. Unlike existing theories, then, our theory assumes that the ubiquity of intuitive biases derives from the ubiquity of intuitive confidence, so that removing confidence will remove the bias. Second, because intuitions are more easily considered and more confidently held than nonintuitive alternatives, we suggest that people who do choose nonintuitive alternatives will feel less confident in their choices. Thus, because intuitions feel so compelling, people will either choose them or find themselves stuck with an option that feels less compelling.

In summary, we make four general predictions about how people choose between intuitive and nonintuitive alternatives. The first three hypotheses focus on aspects of making the decision, and the fourth focuses on consequences of the decision:

1. *Intuitive bias hypothesis:* Because intuitions are often held with high confidence, people will choose intuitive options more frequently than equally valid nonintuitive options.

2. *Constraint magnitude hypothesis:* People will choose intuitive options less frequently when constraint information seems to more strongly favor a nonintuitive option.

3. *Intuitive confidence hypothesis:* People will choose intuitive options more frequently when they are more confident in their intuitions.

4. *Intuitive betrayal hypothesis:* People who betray their intuitions will feel less confident in their choices than people who choose in line with their intuitions.

In the research described below, we tested these four hypotheses by investigating how people make predictions of sporting events. This choice domain offered many advantages. First, as described below, these predictions have all of the critical features of choice tasks to which we intend to generalize, including an intuitive option and an important constraint on the intuition's validity. Second, these choices present decision makers with naturally varying constraint magnitude and intuitive confidence, allowing us to test our hypotheses in richly naturalistic settings as well as strictly controlled laboratory settings. Third, this domain presents decision makers with constraint information that is easy to understand and to process, allowing us to investigate intuitive choosing when it is clear that the constraint information has been processed. Fourth, decision makers in this domain often have money or pride at stake, enabling us to investigate how people make predictions when they are motivated to conduct extensive mental processing and to be accurate. Finally, these decisions have objective win–loss outcomes, allowing us to assess the accuracy of people's decisions.

Making Predictions Against Point Spreads

Imagine that a perennially dominant team (the Baltimore Ravens) is about to play a comically weaker team (the Washington Redskins) in a National Football League (NFL) contest and that you want to wager some money on the game. Your bookmaker informs you that the Ravens are favored by a point spread of 14 points. This means that a bet on the Ravens pays out if the Ravens win by more than 14 points, whereas a bet on the Redskins pays

[1] This prediction hinges on whether the magnitude of the constraint information is evaluable (Hsee, 2000). If people cannot properly evaluate the magnitude of the constraint information, then its magnitude should have little or no effect on choice.

out if the Ravens win by less than 14 points or if the Redskins win the game. (If the Ravens win by exactly 14 points, no bet wins, and no money changes hands.) As a sophisticated gambler, you know that point spreads are designed to be accurate (i.e., that they in fact represent the median of all possible game outcomes),[2] but you are nevertheless determined to make a wager. Faced with the choice between two equally likely alternatives, you have to decide which one to choose. Which team would you put your money on?

This scenario captures a decision that tens of thousands of people make each week when they gamble on sporting events. These gambles require a prediction between two alternatives that are equated by a point spread, which adds points to the expected losing team (the underdog) to even the probability of a winning bet on the underdog and the expected winner (the favorite). A bet on the favorite pays out if the favorite wins the game by more than the point spread. A bet on the underdog pays out if the favorite wins by less than the point spread or if the underdog wins the game.

How do people make these predictions? Consistent with Kahneman and Frederick (2002) and with the decision-making account that we developed above, we assume that people begin to answer such a difficult question (i.e., "Which team will win against the point spread?") by first quickly answering an easier one instead ("Which team will win the game?"). Because the favorite is often the better team (that is why it is favored, after all), people are often quick to identify it as such, and the favorite serves as the intuitive option. With this as a starting point, people subsequently consider the point spread (the constraint information). Specifically, they consider whether they should stay with the favorite or switch to choosing the underdog in light of the point spread's magnitude.

Because it is often very easy for people to determine that the favorite is superior, people will often be quite confident in this initial, intuitive assessment. This strong feeling of intuitive confidence will convince people to stay with their intuitions in the face of constraint information, causing them to predict favorites more frequently than underdogs against point spreads. Nevertheless, although the tendency to predict favorites should be common, it should also be predictably nonuniversal. When constraint magnitude is low (i.e., a low point spread) or intuitive confidence is high (i.e., when it is easy to identify the favorite as the superior team), people will tend to predict favorites. But when the point spread is high and/or intuitive confidence is low, people's predictions should be much more balanced: Large point spreads and uncertain intuitions will result in relatively more underdog predictions than low point spreads and confident intuitions.

In sum, in terms of the four general hypotheses proposed previously, we can expect the following about predictions of sporting events against point spreads:

1. *Intuitive bias hypothesis:* The favorite will often serve as a confidently held intuitive option, and people will predict favorites more frequently than they predict underdogs against the point spread.

2. *Constraint magnitude hypothesis:* People will predict favorites less frequently as point spread magnitude increases.

3. *Intuitive confidence hypothesis:* People will predict favorites less frequently as confidence in the favorite's relative superiority decreases.

4. *Intuitive betrayal hypothesis:* People who predict favorites against the spread will have greater confidence in this prediction than people who predict underdogs against the spread.

These specific hypotheses are interesting not only because of what they generally imply about how people make decisions in the face of invalid intuitions, but also because they are at odds with what one might expect from accuracy-motivated decision makers in this context. Because bets on favorites and underdogs are about equally likely to pay out (with underdogs winning slightly—but significantly—more often; Golec & Tamarkin, 1991), then, normatively speaking, people should be either equally likely to bet on favorites and underdogs or even more likely to bet on underdogs than favorites. Moreover, they should also have either equal confidence in their predictions of underdogs and favorites, or they should be more confident, overall, in underdog predictions. In addition, because the official point spread essentially equates the two teams, point spread magnitude and intuitive confidence are irrelevant with respect to accuracy. The probability of either team winning against the spread is the same no matter the point spread or one's level of intuitive confidence.[3]

In what follows, we describe a program of research that tested these hypotheses in ecologically valid gambling situations and in more contrived tasks requiring people to predict against point spreads that they set themselves. Although we tested each hypothesis in the studies described below, each study did not necessarily investigate all four hypotheses. We focused primarily on investigating whether people predict favorites more often than underdogs and on whether intuitive uncertainty reduces this effect. Additionally, Studies 3–13 investigated whether people are less confident in their nonintuitive choices (underdogs) than in their intuitive choices (favorites).

Study 1: A National Online Sample

Every week of the football season, thousands of people log onto Yahoo.com's fantasy sports Web site (http://fantasysports.yahoo.com) to register their predictions about upcoming NFL and college (National Collegiate Athletic Association [NCAA]) football games. Some fantasy leagues require players to predict game

[2] Only a very sophisticated gambler knows this, it turns out. Readers familiar with gambling against point spreads may be surprised to learn that, contrary to popular belief, point spreads do not equate the amount of money bet on favorites and underdogs (Roxborough & Rhoden, 1998). Rather, point spreads are determined by casinos in Las Vegas, who rely on expert firms to set spreads that are designed to be accurate. (These firms also decide which team will serve as the favorite.) In fact, point spreads are remarkably effective (though not perfect) at equaling the probability of a favorite versus an underdog winning against the spread but, as we show, hopelessly far from equating the money bet on the favorite and underdog.

[3] In an analysis of 2,190 NFL games, we found a correlation of $-.01$ ($p = .63$) between point spread magnitude and whether the favorite beat the spread. Moreover, data from Study 1 indicate no relationship between intuitive confidence and whether the favorite beat the spread ($r = -.02$; $p = .57$).

Table 1
Study 1: Against-the-Spread Predictions in the Yahoo.com Samples

Sample	n	Mean % predicting favorites	% games majority predicted favorites	% games favorite won against spread	Effect of point spread magnitude			Effect of intuitive confidence		
					B	SE	$p <$	B	SE	$p <$
NFL 2003	212	66.9	90.6	52.9	−3.47	.17	10^{-52}	1.01	.04	10^{-73}
NFL 2004	214	64.3	93.0	47.8	−3.30	.19	10^{-42}	0.98	.04	10^{-58}
NCAA 2003	219	74.8	94.5	50.5	−0.71	.07	10^{-18}	1.09	.06	10^{-47}
NCAA 2004	205	73.8	96.6	48.3	−0.69	.08	10^{-15}	1.05	.07	10^{-32}
Total	850	70.0	93.6	49.9	−0.41	.05	10^{-18}	0.81	.03	10^{-112}

Note. NFL = National Football League; NCAA = National Collegiate Athletic Association.

outcomes against the point spread, whereas others require only the prediction of the game's winner. For each of these leagues, Yahoo.com publishes the percentage of people who predicted each team for each game, thereby providing us with a wealth of game-level data that enabled us to test the first three hypotheses described above.

Method

For each game listed on the Yahoo.com Web site during the 2003 and 2004 NFL and NCAA football regular seasons, we recorded (a) the point spread, (b) the percentage of people who predicted that the favorite would win against the spread, and (c) the percentage of people who predicted that the favorite would simply win the game. We used this last measure as an indication of game-level intuitive confidence, reasoning, for example, that a game featuring a favorite that is expected to win by 95% of the sample is associated with greater intuitive confidence than a game that features a favorite that is expected to win by 85% of the sample.

We eliminated games from the analyses if the majority of people (i.e., more than 50%) predicted that the underdog would simply win the game (2003 NCAA = 6.8%; 2004 NCAA = 6.3%; 2003 NFL = 13.3%; 2004 NFL = 15.2%) because in these cases the point spread bolstered rather than constrained the majority's intuition. We also eliminated games when the spread was zero or off the board (2003 NCAA = 0.4%; 2004 NCAA = 1.8%; 2003 NFL = 4.3%; 2004 NFL = 4.3%) because there is no favorite in these games.[4] In total, we analyzed predictions of 850 games.

Results

According to the intuitive bias hypothesis, people should predict favorites more often than underdogs against the point spread. Consistent with this hypothesis, Table 1 reveals that the average percentage of people predicting favorites exceeded the chance expectation of 50% in all four samples, averaging 70% across all 850 games ($ts > 20$, $ps < 10^{-52}$). Table 1 also displays the percentage of games in each sample that featured the majority of people predicting the favorite to win against the spread. Consistent with our hypothesis, favorites were chosen by the majority in more than 90% of the games in each of the four samples.

Predicting more favorites was not a winning strategy. Across all four samples of games, the favorite won against the spread 49.9% of the time (in 413 out of 828 games; there were 22 ties). This level of (in)effectiveness was not significantly different from 50%, $\chi^2(1, N = 828) = 0.004$, $p = .94$, and the tendency to predict favorites against the spread was wholly unrelated to any tendency for the favorite to actually beat the spread, $r(826) = -.0002$, $p = .99$. Table 1 shows that the tendency to predict favorites was equally strong in samples in which the favorite lost the majority of the time as in samples in which the favorite won the majority of the time.

We are not the first to discover that people predict favorites more than underdogs against point spreads. Steven Levitt (2004), in his economic analysis of bookmaking markets, observed a similar betting asymmetry with a smaller group of gamblers. As he pointed out, this finding is at odds not only with conventional wisdom but also with a seemingly rational description of bookmaking markets. He further argued that the asymmetry may offer profit opportunities for the craftiest bookmakers, a point that we elaborate on in Study 3b. But perhaps the most notable feature of Levitt's argument is what it misses rather than what it finds: It does not offer any explanation for why people are so predisposed toward favorites, opting instead for merely observing that people "exhibit a systematic bias toward favorites" (Levitt, 2004, p. 226). Our psychological account and our data allow us to move past the behavioral agnosticism of the economic approach. Accordingly, the bulk of our analyses peer within the black box of the "bias toward favorites" to learn where this and similar biases come from.

Thus, we made two additional predictions that we were able to test in Study 1. First, in line with the constraint magnitude hypothesis, we predicted that fewer people would choose favorites as point spreads increased. Second, the intuitive confidence hypothesis predicted that increased consensus about whether the favorite would win the game (our game-level measure of intuitive confidence) would be associated with an increased tendency to predict favorites against the point spread. To test these hypotheses, we regressed the percentage of people who predicted the favorite to win against the spread on (a) the point spread and (b) intuitive confidence. The results are displayed in the rightmost columns of Table 1 and are consistent across samples. In support of the constraint magnitude hypothesis, people were less likely to predict the favorite if the game featured a larger point spread. In support of the intuitive confidence hypothesis, people were more likely to predict the favorite against the spread if they were more likely to think the favorite would simply win the game.

Because intuitive confidence and point spread magnitude are positively correlated (i.e., high confidence games tend to feature

[4] It is routine for casinos to refuse to take bets on (and set spreads for) upcoming games when there is uncertainty about a major aspect of the game (e.g., whether a mildly injured star player will be able to play).

Table 2
Study 2: Against-the-Spread Predictions in the Pro Football Weekly *Samples*

Sample	*n*	% predictions of favorites	% games favorite won against spread	Effect of point spread magnitude			Effect of intuitive confidence		
				B	*SE*	*p* <	*B*	*SE*	*p* <
NFL 2003	216	82.4	52.3	−0.29	.10	.004	0.07	.02	.001
NFL 2004	215	74.4	45.9	−0.36	.09	.001	0.07	.02	.001
Total	431	78.4	49.2	−0.33	.07	10^{-6}	0.07	.01	10^{-6}

Note. NFL = National Football League.

higher point spreads; *r*s ranging from .59 to .74 across the four Yahoo.com samples) and because we expected the effects of intuitive confidence and point spread magnitude to run in opposite directions (i.e., high constraint magnitude = fewer favorite predictions; high confidence = more favorite predictions), we entered these variables simultaneously in the above regression to reveal their unique effects. However, to assess the robustness of these effects, we also analyzed the separate, nonunique effects of each of these variables as well. When analyzed separately, point spread magnitude exerted no consistent effect on against-the-spread predictions, with *r*s ranging from −.15 to .16 across the four samples. However, attesting to the robustness of the effect, intuitive confidence remained a highly significant predictor of against-the-spread predictions even in the absence of point spread magnitude, with *r*s ranging from .54 to .69 (all $ps < 10^{-16}$) across the four samples. This indicates that, no matter the magnitude of the point spread, people predicted favorites against the spread more often as intuitive confidence increased.

The effects of constraint magnitude and intuitive confidence arose despite the fact that these variables were unrelated to prediction accuracy. Neither point spread magnitude nor intuitive confidence correlated with whether the favorite beat the spread, whether these analyses controlled for the other variable or not (all *r*s between −.025 and .015; $ps > .51$).

Study 2: A Panel of Experts

Study 1 provided very strong evidence that people predict favorites more often than underdogs against the point spread. The majority predicted the favorite against the spread in more than 90% of the games, though the favorite won slightly less than 50% of the time. The results of this study strongly supported the intuitive confidence and constraint magnitude hypotheses as well. The percentage of people predicting favorites against the spread was positively related to the percentage who believed that the favorite would simply win the game and negatively related to the size of the point spread. In Study 2, we sought to replicate these effects in a different, nominally more skilled online sample.

Method

We searched for a Web site that (a) publicly predicted the outcome of football games against the spread and (b) archived those predictions so that their prediction histories were available. We found one. In the week prior to each NFL game, *Pro Football Weekly* (PFW; http://www.cappersaccess.com/pfw.html) has 11 experts make predictions against the spread. The 11 predictions are combined to yield a single consensus prediction for each game, which is posted on the Web site at the beginning of each week.

We analyzed the predictions of the PFW staff members for 2003 and 2004 NFL games. As in Study 1, we excluded games when the majority of the Yahoo.com sample believed that the underdog would simply win those games (2003 NFL = 13.7%; 2004 NFL = 14.8%) and games with spreads of zero (2003 NFL = 2.7%; 2004 NFL = 2.3%).[5] Overall, we analyzed PFW's predictions of 431 NFL games.

Results

Table 2 displays the results for each season. Consistent with Study 1, PFW predictions were strongly biased, as they predicted favorites against the spread in 78.4% of the games, $\chi^2(1, N = 431) = 139.27$, $p < 10^{-31}$. Despite PFW's advertised expertise, the bias did not reflect any special insight, as favorites won against the spread in only 49.2% of the games included in this sample. Excluding ties, PFW correctly predicted 50.1% of the games, a winning percentage that bears a striking resemblance to random chance ($p = .89$).

We tested the constraint magnitude and intuitive confidence hypotheses in logistic regression analyses. We regressed PFW's predictions (coded 1 and 0 for favorite and underdog predictions, respectively) on (a) the point spread and (b) intuitive confidence operationalized (as in Study 1) as the percentage of people in the Yahoo.com sample who predicted that the favorite would simply win the game. The results are displayed in the rightmost columns of Table 2.[6] Consistent with Study 1, the point spread negatively predicted and intuitive confidence positively predicted PFW's preference for favorites. Both of these effects held when the variables were analyzed separately as well: $r(429) = -.11$, $p < .03$, for constraint magnitude; $r(429) = .12$, $p < .02$, for intuitive confidence. The effects of intuitive confidence arose even though the intuitive confidence measure was based on predictions made by an altogether different sample.

[5] The number of excluded games in Study 2 differs from the number of NFL games excluded in Study 1 because PFW occasionally listed a different favorite than the Yahoo.com Web site and often listed slightly different point spreads.

[6] The slopes of the regressions are much different in Study 1 and Study 2 because the slopes represent outputs from different types of regressions—linear regression in Study 1 and logistic regression in Study 2—and not because the effects were of a vastly different magnitude across the two studies.

Study 3a: Real Wagers Against Real Point Spreads

Our first two studies suggest that novices and experts predict favorites more often than underdogs against the spread. Although we favor our own interpretation of this bias (i.e., that intuitions are confidently held), there is a mundane alternative for our findings, and indeed for the findings of past researchers (i.e., Levitt, 2004). Study 1 participants were rewarded for their relative standing at the end of the season. One potentially effective strategy in competitions of this type is to predict idiosyncratically, thereby maximizing the likelihood that a personal win is accompanied by a competitor's loss. If contestants believe that there is actually an underdog bias, then predicting favorites may appear to be strategically wise. This strategy would lead to the bias observed in Study 1. Study 2's PFW sample may have similar motives as well, as they may believe that an idiosyncratic but accurate prediction may bring them the prestige of besting their Internet competitors.

In Study 3a, we attempted to rule out this explanation by giving participants a financial stake in each prediction without any explicit reward for outperforming other gamblers. Investigating real wagers also enabled us to examine the intuitive betrayal hypothesis for the first time. Do people, as our account predicts, wager more money on (and express more confidence in) predicted favorites than predicted underdogs?

Method

Twenty self-identified undergraduate NFL football fans participated for \$5.00 and a chance to win up to an additional \$10.00. During the 2003 NFL season, we invited these students to predict the outcomes of 13 upcoming games in an online survey.

Participants first predicted the outcome of each game against the point spread. Next, they were informed that they had \$10.00 to wager, in 50-cent increments, on any of the games, with the restriction that they could not wager more than \$5.00 on any one game. This ensured that they wagered on at least two games. We further informed participants that they had to wager their money in order to have a chance to receive it (i.e., they would not get to keep any of the \$10 that they did not wager). At the end of the survey, participants indicated their overall confidence in their predictions on a 9-point scale ranging from 1 (*not at all*) to 9 (*extremely*).

We eliminated data from two games before conducting the analyses because the majority of people in the Yahoo.com sample expected the underdogs to simply win those games. In total, the analyses described below include predictions of the 11 remaining games.

Results

As shown in Table 3, participants predicted more favorites than underdogs against the spread, $t(19) = 6.12, p < 10^{-5}$. In fact, only 2 of 20 participants predicted more underdogs than favorites, and both of them favored underdogs by only one prediction (i.e., six underdogs vs. five favorites). Participants also wagered significantly more money on favorites than on underdogs, $t(19) = 5.25, p < 10^{-4}$.

Consistent with the intuitive betrayal hypothesis, this effect was not due solely to the fact that they predicted more favorites, because, per prediction, participants placed more money on favorites than on underdogs as well, $t(19) = 3.59, p = .003$. Thus, participants wagered more money on a predicted favorite than on a predicted underdog, suggesting not only that they were more likely to predict favorites, but that they were also more confident that a wager on favorites would pay out. Consistent with this finding, participants reported more overall confidence in their predictions when they predicted more favorites, $r(18) = .45$, and when they put more money on favorites, $r(18) = .46$, ps $< .05$. This relationship was once again not indicative of any predictive insight, as this subset of games was particularly hard on favorites, with underdogs winning 7 of the 11 games against the spread, with one tie.[7] Not surprisingly, then, confidence was unrelated to the number of successful predictions, $r(18) = -.031$, and to the amount of money earned, $r(18) = 0$.[8]

Study 3a extended the previous studies in two ways. First, we replicated the key findings from the first two studies in a sample that was highly motivated to wager their money wisely and not trying to outperform others when making their predictions.[9] Second, we discovered evidence consistent with the intuitive betrayal hypothesis: Participants not only predicted more favorites, but they also wagered more money on predicted favorites than on predicted underdogs. However, increased confidence did not come with increased accuracy, as favorites did not win more than underdogs against the spread.

Table 3
Study 3a: Prediction and Wager Means and Standard Deviations

Measure	Favorites *M*	Favorites *SD*	Underdogs *M*	Underdogs *SD*	Difference
No. of predictions	7.60	1.54	3.40	1.54	4.20****
Money wagered	\$7.20	3.10	\$1.30	2.12	\$5.90****
Money per prediction	\$0.93	0.38	\$0.30	0.48	\$0.63***

*** $p < .01$. **** $p < .001$.

Study 3b: Real Wagers Against Biased Point Spreads

In Study 3b, we attempted to demonstrate how the intuitive bias and intuitive betrayal effects obtained in Study 3a could be exploited to reduce gamblers' accuracy (and profits). To accomplish this, we asked football fans to make predictions of upcoming football games against increased point spreads. Because official point spreads roughly equate favorites and underdogs, increasing spreads disadvantages favorites, so that wagers on favorites are more likely to lose. Do people still bet on favorites—and have more confidence in those bets—even when favorites are more likely to lose?

[7] Participants were informed ahead of time that they would not receive money wagered on games ending in ties.

[8] Even though similar overconfidence effects have been documented many times (e.g., Kruger & Dunning, 1999), we still think it interesting to point out that participants' confidence ratings were significantly above the midpoint of the scale ($M = 6.40$), $t(19) = 6.29, p < 10^{-4}$, even though, across all 13 games, participants won significantly less than half of the money that they wagered ($M = 36.0\%$), $t(19) = 2.10, p = .05$.

[9] Despite the small sample of games, game-level analyses of the results of Studies 3a and 3b replicated the intuitive bias, intuitive confidence, and constraint magnitude effects documented in the first two studies. A full description of these results is available from the authors.

Method

Thirty-seven self-identified undergraduate NFL football fans participated for a chance to win up to \$50.00. During the 2004 NFL season, we invited participants to predict the outcomes of 10 upcoming football games in an online survey. For each of the 10 games, participants made their predictions against the point spreads that we provided, and they wagered a constant amount of \$5.00 on each game. Thus, unlike in Study 3a, wager amounts were held constant in this study. Although this feature of the method had the disadvantage of eliminating wager amounts as a dependent variable, it had the advantage of ensuring that participants had an equal financial stake in each game, thereby encouraging them to take each prediction very seriously. After participants made their predictions, we assessed participants' confidence in those predictions with two measures. The first asked participants to rate their confidence in their predictions on a 9-point scale ranging from 1 (*not at all*) to 9 (*extremely*). The second asked participants to estimate how many of their predictions (out of 10) they had made correctly. Because these two measures were highly correlated with each other, $r(35) = .57$, $p < .001$, we z scored and averaged them to yield a composite measure of prediction confidence.

The critical difference between Studies 3a and 3b was that in Study 3b, unbeknownst to the participants, the point spreads were all increased by two points in order to decrease the probability of favorites winning against the spread.

Results

Increasing the point spreads altered the results of 3 of the 10 games, and predicting favorites was consequently a losing strategy: The more favorites participants predicted, the less money they earned, $r(35) = -.43$, $p < .01$. Participants nevertheless predicted more favorites ($M = 7.30$, $SD = 1.71$) than underdogs ($M = 2.70$, $SD = 1.71$), $t(36) = 8.15$, $p < 10^{-8}$, as only 1 of the 37 participants predicted more underdogs than favorites. They subsequently lost ($M = 5.41$, $SD = 1.24$) more games than they won ($M = 4.59$, $SD = 1.24$), $t(35) = 2.00$, $p = .054$, and they won fewer games than they predicted they would win ($M = 6.38$, $SD = 1.40$), $t(35) = 5.11$, $p < 10^{-4}$.

Consistent with the intuitive betrayal hypothesis, participants reported more overall confidence in their predictions when they predicted more favorites, $r(35) = .28$, $p < .05$ (one-tailed). Moreover, because predicting favorites boosted confidence despite being a losing strategy, confidence was negatively correlated with money earned in this study, $r(35) = -.34$, $p < .05$. Thus, the more confident people were in their predictions, the more money they lost.

The results of Study 3b extended the findings of Study 3a by demonstrating that the intuitive bias and intuitive betrayal hypotheses are robust to decision contexts that make intuitive choosing a losing strategy. Thus, as our account predicts, increasing point spreads increased not only the number of losing predictions but also the amount of confidence felt toward losers relative to winners.

Studies 4–11: Setting Your Own Spread

Is it possible that people predict more favorites than underdogs either because they do not understand what the point spreads represent or because they have not fully processed the point spread information? Perhaps if people were explicitly aware of the point spread's meaning and fully attentive to it, they would no longer show a bias toward favorites. Though there are many ways to clarify the meaning of the point spread, the strongest possible clarification is to simply ask participants to generate the point spreads themselves. We conducted a series of studies in which participants first set the point spread and then predicted the winner against their own spread.

In each of these set-your-own-spread studies (in the domains of sports or politics), we assessed (a) which team or candidate participants believed would win, (b) how confident they were in that belief (this measure was excluded from Studies 4 and 11),[10] (c) their predicted point or vote-percentage differential, (d) which team or candidate would win against that predicted differential, and (e) how confident they were in their against-the-spread prediction. In designing these studies, we ensured that some involved a clear favorite whereas others involved a more difficult determination of which team or candidate would win. In this way, we manipulated intuitive confidence across studies.

Below, we describe the methods of Studies 4–11, and then we present the results.

Method

Study 4: Lakers versus Knicks (high confidence). During a mass questionnaire session a few weeks into the 2003–2004 National Basketball Association (NBA) season, we administered a one-page questionnaire to 136 Princeton undergraduates who were paid \$8.00 to complete a packet of unrelated questionnaires. This questionnaire described an upcoming NBA game between the Los Angeles Lakers and the New York Knicks. Because participants were not necessarily knowledgeable basketball fans, we provided them with relevant statistics about each team. The questionnaire began as follows:

> In less than a week, the Los Angeles Lakers will play against the New York Knicks at Madison Square Garden in New York. As of this past Monday, the Lakers have won 5 games, and lost 1. On the road, they are 3–1. The Lakers have scored an average of 104.5 points per game. They have allowed an average of 100.3 points per game. The Knicks have won 2 games and lost 4. At home, they are 1–2. The Knicks have scored an average of 87.2 points per game. They have allowed an average of 91 points per game.

As evident in the description, we chose this matchup so as to ensure that there was a clear and unambiguous favorite (i.e., the Lakers).

After reading this description, participants predicted the game's winner and the margin of victory. Then, on the bottom half of the same page, they answered the following question:

> Now again consider the Lakers vs. the Knicks, but this time assume that the underdog team (i.e., the team that you predict will lose) will receive as many points as you've indicated the winning team will win by. So, if you think the Lakers will win by five, then assume that at the end of the game the Knicks get five extra points. Now, who you do think will win, the Lakers or the Knicks?

Finally, participants reported how confident they were in this prediction on a 9-point scale ranging from 1 (*not at all*) to 9 (*extremely*).

Study 5: Team A versus Team B (high confidence). To ensure that our effects were not due to prior preferences for one of the teams, participants

[10] This exclusion was accidental but fortuitous, as it allowed us to document that the effects of intuitive confidence on against-your-own-spread predictions hold even when the questionnaire does not make intuitive confidence salient by asking participants to report it.

($N = 20$) in Study 5 predicted between two anonymous basketball teams: Team A and Team B. In the opening paragraph, Team A was described as superior to Team B on every relevant metric of team competence. After reading this paragraph, participants predicted which team would win, rated their prediction confidence on a 9-point scale, predicted the point differential of the game, predicted the winning team against their self-generated spread, and reported their against-the-spread prediction confidence, again on a 9-point scale.

Study 6: Team B versus Team A (median; high confidence). Study 6 was identical to Study 5, with three exceptions. First, 49 Princeton undergraduates read a scenario that described Team B as being superior to Team A, thus ensuring that the effects of Study 5 were not due to any prior preference for Team A over Team B. Second, the scenario involved football rather than basketball. Third, and most important, rather than predicting the exact point differential of the game before predicting against that differential, participants predicted the median point differential of the game. Specifically, this instruction read:

> Now assume that Team A and Team B played each other 100 times. Now, how many points do you think would separate Team A and Team B, such that half the time the better team would win by more than that amount and half the time it would fail to win by more than that amount?

Just below their answer to this question, participants were then asked to

> again consider the upcoming matchup between Team A vs. Team B, but this time assume that Team A will receive as many points as you've indicated in the above question. So, if you indicated five points, then assume that at the end of the game that Team A gets five extra points. Assuming your answer does not successfully predict the point differential of this upcoming game exactly, now who do you think will win—Team B, or Team A plus your predicted point differential?

Finally, they rated their confidence in this prediction on a 9-point scale.

Study 7: Hornets versus Magic (high confidence). In Study 7, we sought stimuli that would be familiar (i.e., real teams) but that our participants were unlikely to have strong feelings about. Otherwise identical to Study 5, the one-page questionnaire provided 56 Princeton and New York University undergraduates with information about two real teams that were unlikely to have local support—the New Orleans Hornets and the Orlando Magic. This information correctly described the Hornets as a much better team than the Magic, implicating a strong favorite.

Study 8: Hornets versus Supersonics (low confidence). This study was identical to Study 7, except that 57 Princeton and New York University undergraduates predicted a game that featured two teams that were closely matched—the New Orleans Hornets and the Seattle Supersonics. This information correctly described the Hornets as being only mildly superior to the Supersonics at the time of the study. Because the teams were closely matched, we expected participants to have more difficulty predicting the game's winner than in previous studies and to have decreased intuitive confidence.

Study 9: Bush versus Sharpton (high confidence). To eliminate the possibility that our results were emerging from some idiosyncratic feature of sports predictions, Studies 9–11 looked instead at predictions in the political realm. In November 2003, 45 New York University undergraduates predicted the winner of a hypothetical presidential election between George W. Bush and Al Sharpton before indicating their confidence in that prediction by using a 9-point scale. Participants then predicted the vote differential (in percentage of votes) between the two candidates, added that vote percentage to the predicted loser, and then predicted which candidate would win the highest percentage of the popular vote. Finally, they rated on a 9-point scale how confident they were in their against-the-spread prediction. Al Sharpton's radical political position and marginal political status made him a massive underdog against the incumbent George W. Bush, and so we expected participants to be highly confident that Bush would win the election.

Study 10: Bush versus Dean (New York University; low confidence). This study was identical to Study 9, except that 45 New York University undergraduates were asked to predict a hypothetical presidential election between George W. Bush and Howard Dean. Because Dean was the Democratic front-runner at the time, we expected participants to have a more difficult time deciding which candidate would win this election and to be less confident in their predicted winner.

Study 11: Bush versus Dean (Princeton; low confidence). We replicated the Bush-versus-Dean study with a sample of 135 Princeton undergraduates. However, in this study, we did not ask participants how confident they were in who would win the election. If Studies 10 and 11 produce the same effects, then this would suggest that having participants explicitly rate their confidence in the winner is not necessary to produce the results.

Results

Each study produced (at least theoretically) two groups of participants—those who believed that one team or candidate would win and those who believed that the other team or candidate would win. Because these two groups were almost always different in terms of how confident they were in their initial prediction, we treated these groups separately (i.e., as different samples). In addition, for the sake of brevity and clarity, we eliminated extremely small groups before conducting the analyses described below. Specifically, if fewer than 15 of a study's participants believed that a particular team or candidate would simply win the game or election, we eliminated that subset of participants from the analyses. For example, we eliminated 7 participants who believed that Al Sharpton would defeat George W. Bush in a presidential election. It should be noted that in all cases the inclusion of these participants does not affect the reliability of any findings but merely obscures the presentation of the results. Table 4 summarizes the results of the remaining 11 samples.

We organize our discussion of the results in terms of three general questions: (a) Are people more likely to predict favorites than underdogs even against their own spreads? (b) Does this effect decrease when intuitive confidence decreases? and (c) Are people more confident predicting favorites than underdogs against their own spreads?[11]

Intuitive bias hypothesis. Across studies, 60.1% of participants predicted that the favorite would win against their own spread. This percentage was significantly greater than the chance expectation of 50%, $\chi^2(1, N = 524) = 21.44, p < 10^{-5}$, indicating that people predicted favorites more than underdogs, even against their own spreads. It is important to realize, however, that the direction, size, and significance of this effect were determined by the sample of studies that we included in our analysis. As revealed by the results described below, a sample of studies associated with high intuitive confidence will yield a very strong intuitive bias in this paradigm, whereas a sample of studies associated with low intuitive confidence will yield no bias or even a significant reversal. Thus, the 60.1% result that we report here is a mere by-product

[11] Because the set-your-own-spread instructions required participants to set psychologically identical point spreads, there is no meaningful variance in point spreads in these studies, making it impossible to test the constraint magnitude hypothesis. Thus, we focus only on these three questions.

Table 4
Results of the Set-Your-Own-Spread Studies

Study	% of sample	Confidence predicting winner	Mean point spread	No. predicting favorite against own spread	No. predicting underdog against own spread	% predicting favorite against own spread
Study 4: Lakers vs. Knicks (N = 136)						
Predicting Lakers to win	94.9		12.33	100	29	77.5***
Study 5: Team A vs. Team B (N = 20)						
Predicting Team A to win	95.0	7.21	9.42	15	4	78.9**
Study 6: Team B vs. Team A (Median; N = 49)						
Predicting Team B to win	91.8	7.20	14.38	35	10	77.8***
Study 7: Hornets vs. Magic (N = 56)						
Predicting Hornets to win	100	6.48	9.17	40	16	71.4***
Study 8: Hornets vs. Supersonics (N = 57)						
Predicting Hornets to win	66.7	4.45	4.79	19	19	50.0
Predicting Supersonics to win	33.3	4.53	4.32	5	14	26.3**
Study 9: Bush vs. Sharpton (N = 45)						
Predicting Bush to win	84.4	7.18	23.79%	29	9	76.3***
Study 10: Bush vs. Dean (NYU; N = 45)						
Predicting Bush to win	57.8	5.88	9.62%	11	15	42.3
Predicting Dean to win	42.2	5.79	8.21%	5	14	26.3**
Study 11: Bush vs. Dean (Princeton; N = 135)						
Predicting Bush to win	58.5		9.66%	35	44	44.3
Predicting Dean to win	41.5		7.39%	21	35	37.5*

Note. NYU = New York University.
* $p < .10$. ** $p < .05$. *** $p < .01$.

of the composition of our investigated sample, and we could have increased (decreased) this percentage by conducting additional studies associated with high (low) intuitive confidence.

Intuitive confidence hypothesis. Despite a general bias toward favorites, a close look at Table 4 reveals considerable across-sample variance in the tendency to predict favorites against self-generated spreads. Of the 11 groups of participants summarized in Table 4, 5 predicted significantly more favorites than underdogs, 4 were not significantly different from 50%, and, interestingly, 2 samples predicted significantly fewer favorites than underdogs. For example, of the 94.9% of people believing that the Lakers would defeat the Knicks, 77.7% of them believed that the Lakers would win by more than their predicted point differential. However, of the 58.5% predicting Bush to beat Dean in Study 10, only 44.3% of them believed that Bush would win by more than their predicted vote differential.[12] As revealed below, this across-sample variability was systematic and consistent with our expectations.

The more confident people were that the favorite would win the game, the more likely they were to predict that the favorite would beat their own point spreads. This relation between intuitive confidence and against-the-spread predictions of favorites is casually revealed in Table 4 and formally revealed in across-sample correlations. Across samples, the correlation between winner confidence and the percentage of people predicting favorites against their own spreads was $r(6) = .80$, $p < .02$. Similarly, the correlation between (a) the percentage of people in each sample who predicted that the favorite would simply win the contest and (b) the percentage of people predicting the favorite to win against their own spreads approached unity, $r(9) = .97$, $p < 10^{-5}$. These correlations constitute impressive evidence for the intuitive confidence hypothesis. When people were highly confident in the predicted winner, they predicted that the winner would beat their own spreads; however, when they were not very confident in their initial choice, the effect was reduced and even sometimes reversed.

A host of mundane mechanisms can potentially explain why people would predict favorites more often than underdogs against their own point spreads. For example, one could posit that because people choosing against their own spreads are faced with an impossible decision, they rely on a tiebreaking strategy that favors the predicted winner (see Slovic, 1975). Another mundane account might posit that people predict favorites against their own spreads simply because they do not understand the task. People may resolve this misunderstanding by making the same choice that they made at the outset of the task, ultimately choosing in line with their predicted winner.

It is critical to note, then, that these mundane accounts for the favorite bias can neither predict nor explain the meaningful and systematic variability that we observed across samples. Contrary to these explanations, we suggest that the bias toward favorites holds only when confidence in the favorite's superiority is high, and the across-sample data from the set-your-own-spread studies provide unequivocal support for this integral role of intuitive confidence. In high confidence games and elections, people choose favorites against their own spread a large and significant portion of the time. However, in low confidence games and elections, people choose favorites against their own spread with less frequency. Depending on how uncertain they are in their chosen winner, people may appear "rational" and choose the favorite and underdog with equal

[12] Although all of the against-the-spread percentages in the rightmost column of Table 4 are less than the corresponding no-spread percentages in the "% of sample" column, the against-the-spread percentages are not bound by the no-spread percentages, as each one could theoretically range from 0% to 100%.

frequency against the spread (e.g., those predicting that the Hornets would win in Study 8), or, alternatively, they may appear biased in the opposite direction (e.g., Studies 8, 10, and 11). The point here is that biases toward favorites, although prevalent, are not inevitable. Rather, their extent and existence are determined in large part by intuitive confidence.

Intuitive betrayal hypothesis. The intuitive betrayal hypothesis predicts that people will be more confident when predicting favorites rather than underdogs against the spread. Does this effect occur even when people predict against their own point spreads? To investigate this question, we collapsed across samples and analyzed the effect of prediction (favorite vs. underdog) on prediction confidence in an analysis of covariance that controlled for each of the 11 samples by including 10 dummy variables as covariates. The results were consistent with the intuitive betrayal hypothesis. Even against their own point spreads, people were more confident predicting favorites ($M = 4.60$) than underdogs ($M = 3.96$), $F(1, 510) = 10.94$, $p = .001$.[13]

Study 12: Intuitive Uncertainty From an Irrelevant Source

In the previous studies, we manipulated intuitive confidence by selecting game and voting contests with subtle or obvious favorites. In the next two studies, we sought to conceptually replicate the effects of intuitive confidence while holding all relevant game information constant. Recent evidence indicates that decision confidence derives in large part from the feeling of ease or difficulty experienced while making the decision (Epley & Norwick, 2006). Thus, when people feel that a decision is difficult, they will lack confidence in its outcome. Moreover, this occurs even when irrelevant sources of difficulty produce the confidence reduction (see also C. M. Kelley & Lindsay, 1993; Reber & Schwarz, 1999; Werth & Strack, 2003). In Study 12, we introduced an irrelevant but uncertain feature into a game description with the expectation that doing so would lower participants' intuitive confidence and increase the frequency of underdog predictions.

Method

During a mass questionnaire session, 132 undergraduates completed a one-page questionnaire about an upcoming NBA game in San Antonio between the San Antonio Spurs and the Atlanta Hawks. The questionnaire opened with a game description that made it obvious to participants that the Spurs were the better team. After describing the relative competence of the two teams, the questionnaire then presented information about the date and starting time of the game, and this is where we implemented our critical manipulation. In the *time known* condition, participants were informed that "This game will take place on Saturday, March 20th. It will begin at 1:30 p.m. [7:30 p.m.]." Half of the participants in the time known condition read that the game would begin at 1:30 p.m., and half read that the game would begin at 7:30 p.m. In the *time unknown* condition, participants were instead informed that "This game will take place on Saturday, March 20th. It is unknown whether the game will begin at 1:30 p.m. or 7:30 p.m."

All participants subsequently predicted the winner of the game, rated their confidence in this prediction on a 9-point scale, predicted the winner with the Spurs as a 9.5-point favorite, and then rated their confidence in this prediction as well by using the same 9-point scale. To ensure that participants understood how point spreads work, we administered a one-page point spread tutorial just prior to this task.

Because this experiment was part of a mass questionnaire session and because our manipulation was subtle and therefore easily ignored, we took a priori measures to pinpoint, and to subsequently eliminate, participants who were likely to have completed the questionnaire without reading it fully. To accomplish this, we administered a questionnaire at the end of the packet developed for this purpose (Oppenheimer, Meyvis, & Davidenko, 2006). The questionnaire begins with a paragraph of wordy instructions that eventually tells participants to ignore a task that appears in the middle of the page and to instead write somewhere on the page, "I have read these instructions." For our study, we included the 81 people (out of 132; 61.4%) who successfully completed this reading checker. (This rate of success is sadly typical of what other researchers have reported in similar data collection contexts [Oppenheimer et al., 2006].) We removed 7 additional participants who predicted a Hawks victory and 1 who did not complete the task. As a result, the analyses described below include the remaining 73 participants.

Results

As predicted, participants in the time known condition were more confident that the Spurs would win ($M = 7.38$, $SD = .89$) than were participants in the time unknown condition ($M = 6.89$, $SD = 1.51$), $t(72) = 1.69$, $p < .05$ (one-tailed). Most important, we expected participants in the time known condition to predict more favorites than participants in the time unknown condition. As expected, 28 of 36 (77.8%) participants predicted the favorite against the spread when they knew what time the game would begin, whereas only 20 of 37 (54.1%) predicted the favorite when they did not know the game time, $\chi^2(1, N = 73) = 4.56$, $p < .04$. Among time known participants, the percentage of predicted favorites was nearly identical in the 1:30 condition (76.5%) and the 7:30 condition (78.9%), $\chi^2(1, N = 36) = 0.03$, $p = .86$. Thus, although game time had no effect when it was known, an unknown start time decreased intuitive confidence and increased underdog predictions.

Though not the primary objective of the study, we also found modest support for the intuitive betrayal hypothesis. Consistent with earlier studies, a Condition × Prediction analysis of variance on against-the-spread confidence showed that participants were more confident when they predicted that the favorite would win against the spread ($M = 5.89$, $SD = 1.59$) than when they predicted that the underdog would win ($M = 5.24$, $SD = 1.68$), $F(1, 69) = 2.58$, $p < .12$. No other effects approached significance.

Study 13: Intuitive Uncertainty From Another Irrelevant Source

In Study 12, an uninformative source of uncertainty undermined intuitive confidence and increased underdog predictions. Although our intention in Study 12 was to decrease confidence by informing some participants that objectively irrelevant information was unknown, we realize that simply telling participants that information is unknown may make it seem relevant (Grice, 1975). Of course, the idea that participants in the time unknown condition may have believed that the game time was in fact a relevant piece of information does not in itself explain why an unknown game time should systematically decrease predictions of favorites. Nevertheless, in Study 13, we sought to conceptually replicate Study 12's

[13] We eliminated 2 participants from this analysis because they did not answer the confidence question. As a result, we are left with 510 instead of 512 error degrees of freedom.

effect with a manipulation of intuitive confidence that could not be perceived by participants as relevant to the game. To accomplish this, we instituted a manipulation used by Epley and Norwick (2006), who demonstrated that people were relatively less confident in answers on a general knowledge exam presented in poor, difficult-to-read font. Poor fonts reduce fluency, increase the feeling of difficulty, and, in turn, lower exam answer confidence (see also Novemsky, Dhar, Schwarz, & Simonson, 2006; Werth & Strack, 2003).

Thus, in Study 13, we manipulated the font used in a description of an NFL game. We expected participants in the bad font condition to feel less confident in their predicted winner and to subsequently predict underdogs with greater frequency than participants who read the game description in easy-to-read font.

Method

One hundred eighty-four participants predicted the outcome of an upcoming NFL football game. Conducted over the course of 2 weeks, two different games were administered, depending on when participants took part in the study. Participants in the 1st week read about a game between the San Francisco 49ers and the Arizona Cardinals, with the 49ers favored by 7.5 points. Participants in the 2nd week read about a game between the Kansas City Chiefs and the Detroit Lions, with the Chiefs favored by 15.5 points.[14] All participants predicted the game's winner, reported their confidence on a 9-point scale, predicted the winner against the spread, and finally rated their confidence in their against-the-spread prediction.

The critical manipulation in this study involved the font of the questionnaire. In the *good font* condition, the questionnaire appeared in easy-to-read 9-point Tahoma font. In the *bad font* condition, the questionnaire appeared in difficult-to-read 10-point 25% gray-shaded Haettenschweiler font.

Three participants who predicted that the underdog would win the game were eliminated from the analyses, leaving 181 participants.

Results

The font manipulation was effective: Bad font participants were less confident that the favorite would win (M = 6.61, SD = 1.59) than were good font participants (M = 7.42, SD = 1.28), $t(180) = 3.93$, $p < .001$ (one-tailed). Supporting the main prediction, the results showed that bad font participants were less likely to predict favorites against the spread (50.1%) than were good font participants (67.0%), $\chi^2(1, N = 181) = 5.06$, $p < .03$. Attesting to the robustness of this finding, Table 5 shows that the effect was nearly identical for predictions of both games. Once again, then, the data supported the intuitive confidence hypothesis. Decreased confidence increased underdog predictions, even when irrelevant questionnaire features produced the confidence decrements.

Table 5
Study 13: Percentage of Favorites Predicted Against the Spread as a Function of Font Quality

Game	Good font	Bad font	Difference
49ers vs. Cardinals (n = 87)	81.8%	65.1%	16.7%*
Chiefs vs. Lions (n = 94)	54.0%	36.4%	17.6%*
Total (N = 181)	67.0%	50.5%	16.5%**

* $p < .10$. ** $p < .05$.

We tested the intuitive betrayal hypothesis with a Font × Prediction analysis of variance on against-the-spread confidence. This analysis revealed only the critical main effect of prediction, $F(1, 177) = 16.24$, $p < .001$. Participants were more confident when they predicted that the favorite would win against the spread (M = 6.04, SD = 1.50) than when they predicted that the underdog would win (M = 5.13, SD = 1.50), once again suggesting that predicting against one's intuition comes at the cost of confidence.

Study 14: Intuitive Confidence Effects on Indifference Thresholds

Results from 13 studies support the intuitive confidence hypothesis. Intuitive confidence increases intuitive choosing, an effect that persists with real gambles and even with idiographically determined and context-irrelevant constraints. In introducing this hypothesis, we suggested that feelings of intuitive confidence inform people whether the intuitive option should be chosen in the face of constraint information. Low confidence signals that a decisional switch may be warranted, whereas high confidence signals the reliability of the intuitive option.

This effect does not arise because people consider intuitive confidence and nothing else. Rather, motivated decision makers are sensitive to constraint magnitudes (Studies 1–2) so that intuitive confidence can be fruitfully conceptualized as signaling the magnitude of constraint information that is required in order to switch to the nonintuitive alternative. High intuitive confidence signals that strong constraint information is needed to induce switching, whereas low intuitive confidence signals that weak constraint information is needed to induce switching. The same constraint information that produces switching at low intuitive confidence is less persuasive at high intuitive confidence.

One of our primary objectives in this article is to communicate that, within motivated choice contexts, intuitive biases are determined by the interaction of both intuitive confidence and constraint magnitude. These variables are necessarily contextual, so that the presence or absence of intuitive biases is determined by the experimenters and practitioners who create those contexts. If a context features high confidence and low constraint magnitude, exactly the features typical in judgment and decision-making experiments, strong intuitive biases will result. If the decision context instead features low confidence and high constraint magnitude, motivated and able decision makers will frequently choose the nonintuitive alternative, and the bias will disappear.

All of this discussion about "high" and "low" constraint magnitude begs the question of what these vague terms mean. When is constraint magnitude too low to induce switching? One mission of Study 14 was to quantify, in this prediction context, the amount of

[14] Because we created the materials for these studies prior to the release of the official point spreads, the spreads that we used were inevitably incorrect. The 49ers–Cardinals spread was slightly below the official spread, whereas the Chiefs–Lions spread was well above the official spread. As we document throughout this article, participants were sensitive to these differences in the spread and accordingly chose more favorites when the spread was too low than when it was too high. This sensitivity was equivalent in both font conditions, enabling us to eliminate the possibility that bad font participants were not processing the game information.

constraint information that is needed to reach an *indifference threshold*, the constraint magnitude at which exactly half of the people will choose the intuitive option. For a given level of intuitive confidence, what would the point spread have to be to persuade half of the people to choose favorites? Moreover, how does this threshold compare with actual point spreads that are offered by bookmakers? On the basis of the results observed so far, we can expect actual point spreads to reside below indifference thresholds and indifference thresholds to increase as intuitive confidence increases.

This prediction leads to the second, more important goal of Study 14: to determine the nature of the positive relationship between intuitive confidence and indifference thresholds. One possibility is that the relationship between these variables is linear, so that indifference thresholds increase with intuitive confidence at a constant rate for all levels of confidence. Stated differently, a linear relation would imply that people are equally sensitive to identical changes in the point spread at all levels of intuitive confidence, indicating, for example, that a 3-point increase in the official point spread would change as many low-confidence minds as high-confidence minds.

We believe that a second possibility is more intriguing and plausible, as it would link intuitive confidence to research documenting the representation of confidence more generally. Prior research indicates that confidence is not represented on a monotonic continuum. Rather, "people overweight outcomes that are considered certain, relative to outcomes which are merely probable" (Kahneman & Tversky, 1979, p. 265). Thus, the psychological difference between 100% certainty and being slightly less certain (95%) is greater than the psychological difference between being slightly uncertain (95%) and more uncertain (90%). Applying this *certainty effect* to our analysis of intuitive confidence suggests that intuitive confidence may exert a nonlinear effect on indifference thresholds by rendering decision makers particularly insensitive to constraint information when intuitive confidence approximates certainty. Thus, we may find that in order to be indifferent, people require multiplicative increases in the point spread as intuitions approach absolute certainty. Further, it may be that certainly held intuitions cannot, for all practical purposes, be undone by any reasonable amount of constraint information.

In Study 14, we tested these hypotheses by revisiting Study 1's Yahoo.com data set. Using the full sample of games ($N = 850$), we regressed the percentage of people predicting the favorite against the point spread on (a) intuitive confidence—the percentage of people believing that the favorite will simply win the game; (b) point spread magnitude; and, in the more complex analyses, (c) the interaction of these variables (discussed in a moment). We then algebraically manipulated the resulting regression equation to solve, at each level of intuitive confidence, for the point spread magnitude that would make half of the sample choose the favorite against the spread (i.e., the indifference threshold).

The idea that intuitive confidence increases indifference thresholds in a linear fashion is captured by the simple regression of the sort that we conducted in Study 1—a regression showing that point spread magnitude is negatively related and that intuitive confidence is positively related to predictions against the spread. After some algebra, this analysis reveals that intuitive confidence is indeed positively related to indifference thresholds: The same point spread that produces indifference at a low level of confidence is insufficient to produce indifference at a higher level of confidence. We do not provide a graph of this line because, as we will soon see, it does not honestly capture the effect of intuitive confidence on indifference thresholds.

The idea that intuitive confidence relates to indifference thresholds in a nonlinear fashion is captured by a complex regression demonstrating a significant interaction between point spread magnitude and intuitive confidence on against-the-spread predictions. Indeed, this regression (which also included the main effect terms) revealed a significant positive interaction ($B = .095$, $SE = .006$, $p < 10^{-44}$), indicating that constraint magnitude exerts less of a negative effect on against-the-spread predictions as intuitive confidence increases. The result is that the effect of intuitive confidence on indifference thresholds is nonlinear and that multiplicatively larger point spread increases are required to produce indifference as intuitive confidence nears certainty.

One final analysis confirmed the operation of Kahneman and Tversky's (1979) certainty effect in this context. According to Tversky and Kahneman's (1992) cumulative prospect theory, the overweighting of outcomes that are certain relative to those that are nearly certain is captured by the probability weighting equation

$$w(p) = \frac{p^{\gamma}}{[p^{\gamma} + (1 - p)^{\gamma}]^{1/\gamma}},$$

where γ is a constant that they estimated to equal 0.61. To examine whether decision makers exhibit a particular insensitivity to point spread magnitudes at absolute relative to near certainty, we converted the measure of intuitive confidence to a weighted measure by using Tversky and Kahneman's equation. We then conducted the same complex regression as above by using this weighted measure of intuitive confidence. As expected, the interaction between point spread magnitude and the weighted measure of intuitive confidence was highly significant ($B = .034$, $SE = .004$, $p < 10^{-20}$). Moreover, when the two interaction terms (one using the weighted measure of intuitive confidence and the other using the unweighted measure) were entered simultaneously (along with all relevant main effect terms), only the weighted interaction term remained significant ($p < 10^{-7}$). All told, these analyses suggest that there are meaningful nonlinearities in the effects of intuitive confidence on point spread thresholds and that the effect is particularly pronounced at the difference between absolute certainty and near certainty.

Figure 1 displays the resulting regression line, along with a depiction of actual (official) point spread magnitudes at various levels of intuitive confidence. We can learn a number of things from this figure. First, the positive slope of the indifference threshold is consistent with the idea that intuitive confidence informs how strong constraint information needs to be before switching to an alternative: When people are more confident about who will win the game, a larger point spread is required in order for them to predict the underdog. Second, although actual point spreads—represented by the individual dots—also increase with intuitive confidence, the slope of this increase is much smaller than the slope of the indifference threshold. Third, because of this, point spreads tend to fall below the indifference threshold, and the majority of people predict favorites for the majority of the games. Fourth, the size of this effect increases with intuitive confidence: When people are uncertain about the winner of the game, actual

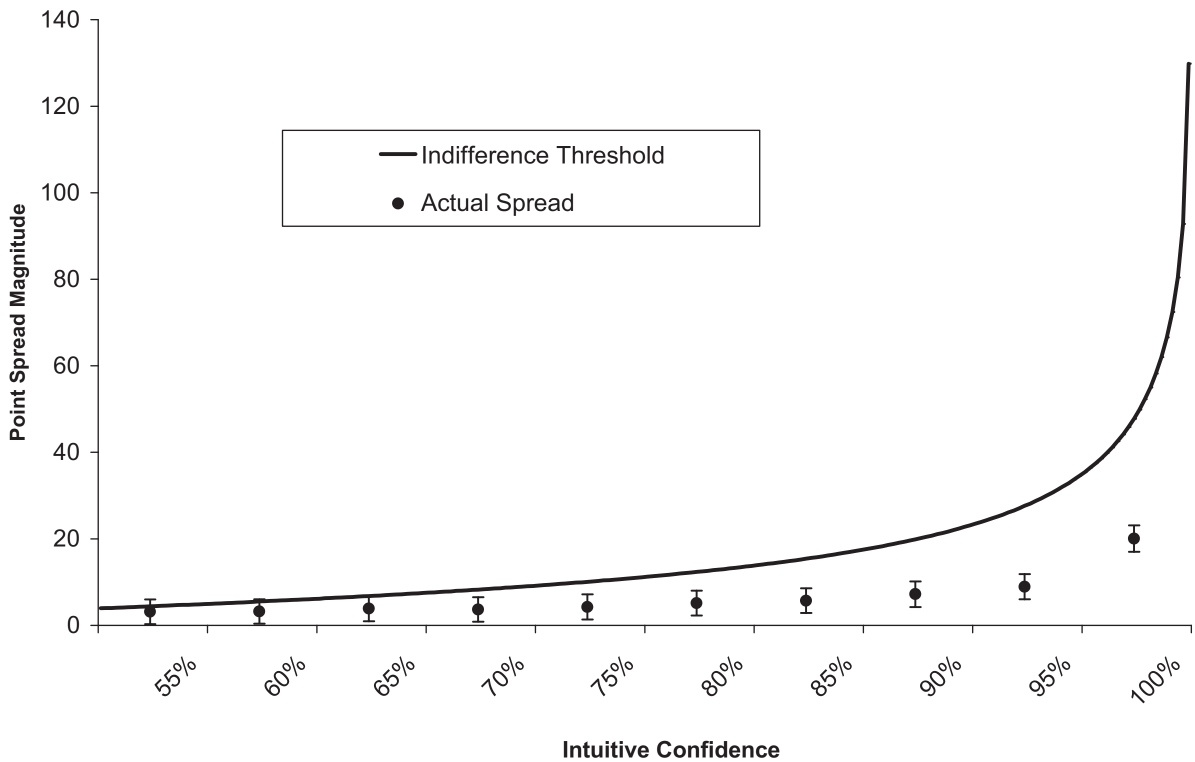

Figure 1. Study 14: Actual point spreads and indifference thresholds (theoretical point spreads that would induce exactly 50% to predict the favorite) as a function of intuitive confidence (the percentage of people who think the favorite will win the game). Error bars for actual point spreads represent 99% confidence intervals.

point spreads encourage roughly equal betting on the favorite and underdog, but when they are very confident about who will win the game, actual point spreads are of insufficient magnitude to induce indifference.

At this point, it is important to realize what this graph is saying about the production of intuitive biases. Intuitive choosing results from a consideration of both intuitive confidence and constraint information. The fact that increases in intuitive confidence require multiplicative increases in point spreads to induce indifference contradicts the reality of official point spreads, which are designed to be accurate and which evidence a slower, more linear calibration with intuitive confidence. If point spreads were not designed to be accurate but instead to equate the betting on each team, then bookmakers would increase point spreads substantially and intuitive biases would be eliminated (and arbitrage opportunities would abound in this market). In this particular context, accurate point spreads are typically not large enough to induce equal choosing, especially at high levels of confidence. To the extent that this fact renders intuitive biases erroneous—or at least error prone (see Study 3b)—one can attribute the error to an insensitivity to (or underweighting of) constraint magnitude, an overconfidence in one's intuitions, or both (cf. Kahneman, 2003). Thus, a context that decreases intuitive confidence may make accurate point spreads sufficient to induce indifference. Similarly, a context that features somewhat reasonable increases in point spreads may induce indifference at most levels of intuitive confidence—so long as intuitions are not held with absolute certainty.

This discussion leads to the fifth and final observation of Figure 1: The discrepancy between actual and indifference-inducing point spreads is maximal (and huge) when intuitive certainty is absolute. Indeed, Figure 1 shows that when there is absolute certainty about a predicted winner, no reasonable point spread will cause the majority to predict the underdog. (No college or professional football team has ever *scored* 130 points in a single game.)[15] Thus, as a general point, it seems that intuitive certainty makes people especially likely to cling to their intuitions and especially insensitive to constraint magnitudes, so that no reasonable magnitude of constraint information will induce indifference.

This finding is important not only because it agrees with and extends theorizing on how confidence is represented, but also because it potentially reveals something more general about the (im)possibility of convincing people to choose against a certainly held intuition. Intuitions held with certainty are likely to be experienced as percepts rather than judgments, as truths about the world rather than potentially erroneous inferences about the world. And just like percepts, certain intuitions may be almost impossible to counteract. As difficult as it is to convince someone that a percept is not valid (e.g., "That's not really an ice cream truck"), it may be

[15] The most points scored in a Division I NCAA football game was 103, by Wyoming in their defeat of Northern Colorado on November 5, 1949. The most points scored in an NFL game was 72, by the Washington Redskins in their pasting of the New York Giants on November 27, 1966.

equally difficult to convince someone to choose against an intuition held with certainty, whether the intuition be about sports ("Florida State will definitely beat Harvard on Saturday") or (we suspect) other sorts of outcomes ("I know that he will be perfect for the faculty position"). Indeed, Figure 1 suggests that it may be almost impossible to alter certainly held intuitions even with very powerful constraint information. People will bet on Florida State more frequently than Harvard even if the point spread is ridiculously excessive, and employers may hire the spectacular interviewee even if they are aware that the candidate is obviously lacking on paper. Indeed, when intuitions come to mind effortlessly, there may be no stopping them.

General Discussion

In this article, we developed and tested an account of how people choose between intuitive and nonintuitive alternatives in the face of constraint information. We suggested four hypotheses. In what follows, we review the supporting evidence, comment on how each hypothesis may generalize to other research domains, and describe possibilities for future research.

Intuitive Bias Hypothesis

First, we proposed that because decision makers often hold their intuitions with high confidence, they frequently choose in line with their intuitions. Our investigation of predictions against point spreads confirmed this hypothesis. In a national online sample (Study 1), a panel of experts (Study 2), samples of undergraduates making real gambles (Studies 3a and 3b), and even in samples of participants predicting against their own point spreads (Studies 4, 5, 6, 7, and 9), we found that people predicted favorites more frequently than underdogs against the spread. This intuitive bias persists when favorites and underdogs are equally likely to win against the spread (Studies 1 and 2) and even when favorites tend to lose (Study 3b).

Though our data may represent the most persuasive evidence for the bias toward favorites, we are not the first to document this effect. As discussed earlier, economist Steven Levitt (2004) investigated bets made during the 2001 NFL season and found that significantly more bets were placed on favorites than on underdogs. In yet unpublished work, Strumpf (2003) investigated the records of imprisoned illegal bookmakers and in so doing noted that "bookmakers accept greater bet volume on favorites" (p. 43). And in a how-to book for potential bookmakers, James "J. J." Jeffries and Charles Oliver (2000) even suggested that bookmakers should increase point spreads so as to capitalize on the intuitive bias toward favorites:

> Gamblers bet favorites, and they will do it every night, without exception. Use this to your advantage. While the 17½ game goes to 19, the 4½ game might only go to 5. The point is that the slightest change in the [spread] in your favor will greatly increase your profits. "What if I [increase the spread], and the [client] knows the [spread] has been upped and then plays the underdog?" He won't. Gamblers play favorites. Every night. Every game. (p. 106)

Intuitive biases are interesting in the context of sports gambling, where many researchers and laypeople believe that point spreads typically equate the betting on each team (e.g., Gandar, Dare, Brown, & Zuber, 1998; Gray & Gray, 1997; Surowiecki, 2004) and where highly motivated decision makers are able to easily process and understand the constraint information (i.e., point spreads). Indeed, the fact that strong intuitive biases arise in this context suggests that intuitive biases are not a mere product of people's failure to process constraint information in the environment, as they persist even when people recognize such unambiguous and quantifiable constraints on their intuitions—and, indeed, even when people set the constraints themselves. Rather, our research suggests that intuitive biases are particularly pervasive, occurring even when all relevant information in the immediate decision context is processed and understood. It is important to note that this conclusion need not apply only to predictions against point spreads, as it is wholly consistent with other research demonstrating similarly persistent intuitive biases in other, seemingly unrelated, domains (e.g., Denes-Raj & Epstein, 1994; Gilbert & Jones, 1986).

Constraint Magnitude Hypothesis

Nevertheless, despite the intuitive biases that we and others have observed, it is our thesis that intuitive biases are hardly inevitable but rather contingent on the confluence of two variables. According to the constraint magnitude hypothesis, one of those variables is the perceived strength of the constraint information. Consistent with this hypothesis, the first two studies found that people were more likely to predict favorites when point spreads were low than when they were high, at least when controlling for intuitive confidence. This effect obtained even though point spread magnitude is not at all predictive of the prediction outcome.

This effect of constraint magnitude may partially account for the effect of another variable on against-the-spread predictions—home-field advantage. Home teams have a genuine advantage in football (and other sports; e.g., Courneya & Carron, 1992), and point spreads are calibrated to account for this advantage. As a result, games featuring strong visiting favorites have lower point spreads than games featuring strong home favorites. Because visiting favorites come with lower point spreads and because visiting favorites are typically associated with strong intuitive confidence (because weaker, less capable favorites would not be favored on the road), visiting favorites will often be associated with low constraint magnitude but high confidence. By our account, these are the ingredients for strong intuitive biases, and we should expect the bias toward visiting favorites to be even stronger than the bias toward home favorites. In fact, this effect has recently been documented (Levitt, 2004) and was reconfirmed in our Yahoo.com samples as well (Simmons & Nelson, 2004).

We can also apply the constraint magnitude hypothesis more generally and see that it makes sensible predictions. An intuitively appealing job candidate is less likely to be selected when the hiring committee realizes that the candidate has a penchant for crime than when the committee realizes that the candidate has a penchant for mime. Similarly, if a seeming advocate of some policy were revealed to be collecting $1 million for his or her advocacy, observers would certainly draw different inferences about the speaker's true attitude than if the speaker were receiving the traditional, but substantially less motivating, partial fulfillment of a course requirement (H. H. Kelley, 1973). Moreover, constraint information should be more likely to exert an impact when it is fully processed and when its magnitude is unambiguous (cf. Chaiken et al., 1989). Thus, hard-to-notice constraints, such as base rates (e.g., Tversky & Kahneman, 1982) and role assignments (e.g., Ross, Amabile, & Steinmetz, 1977), should exert less influence on judgment and decision making than easy-to-notice constraints, such as point spreads, resulting in more pronounced intuitive biases in the former instances than in the latter.

Intuitive Confidence Hypothesis

The most important aspect of our account suggests that intuitive confidence is in large part responsible for intuitive biases and that intuitive confidence increases the frequency of intuitive choices. This hypothesis was unequivocally supported. Increased intuitive confidence was associated with more predictions of favorites, whether intuitive confidence was measured or manipulated, whether it was operationalized by using a 9-point scale or a measure of group consensus, whether the study included novices or experts, whether the task required predicting against an implicitly equalizing externally provided spread or an explicitly equalizing ideographic spread, and whether the feeling of confidence was relevant or irrelevant to the decision context. Moreover, in order to encourage indifference between favorites and underdogs, incremental increases in intuitive confidence were found to require multiplicatively larger changes in the point spread as decision makers became certain about their intuitions (Study 14).

As suggested above, we believe that the effects of intuitive confidence are not restricted to predictions against point spreads but apply to any decisions made when people are aware of information that opposes their intuitions. Thus, reducing confidence in a manager's intuitive positive evaluation of an interviewee (e.g., by having the interviewee stutter; by having the interviewee do something unattractive) should reduce the manager's probability of hiring the candidate when confronted with negative information. Lowering people's confidence in their initial assessment of two presidential candidates (e.g., by having the people furrow their brows during the assessment; Stepper & Strack, 1993) should increase their tendency to choose the nonintuitive candidate in the face of arguments against their initial preference. Decreasing people's confidence in their preferences by having them list too many reasons for that preference should increase their tendency to switch their preference in the face of an equally attractive alternative (Nelson & Simmons, 2006). In general, any manipulation that decreases intuitive confidence should induce more nonintuitive choosing in the face of constraint information than manipulations that confer people with high intuitive confidence.[16]

Although we know of no existing research that was explicitly designed to test the intuitive confidence hypothesis, research by Heath and Tversky (1991) is clearly relevant and supportive. They discovered that people preferred to bet on the accuracy of their own intuitive judgment rather than an equally likely chance event when they were highly confident in their judgment. For example, people chose to bet on a judgment that they reportedly held with 90% confidence rather than a chance event that offered them a 90% chance of winning. However, this preference changed when subjective confidence was lower: People frequently chose to bet on the chance event when they were merely 55% confident in their own judgment and the chance event offered a 55% chance of victory. To explain this effect, Heath and Tversky argued that people seek to take credit for wins and to avoid taking blame for losses. In contrast, we believe that the effect may be better explained by the fact that high intuitive confidence encourages people to stay with their intuitions, whereas low confidence signals that a decisional switch is warranted. In fact, our set-your-own-spread results were quite similar to those documented by Heath and Tversky, but we achieved these results even in hypothetical and feedback-free decision contexts, contexts that deprive people of the potential glory of credit and the potential shame of blame.

In related research, Nelson and Simmons (2006) recently investigated the impact of intuitive confidence on the choice between equated alternatives. Seminal research on this topic asked participants, for example, to match two baseball players on home runs and batting average so as to make them equally valuable (Slovic, 1975) and then to choose between the equated options. Although the options were constructed to be equally valuable, participants did not choose the options with equal frequency. Instead, Slovic found that 77% of participants chose the player who was superior on the more important, or prominent, dimension (batting average). Slovic demonstrated this *prominence effect* in a number of domains, and it has since been replicated a number of times (e.g., Fischer & Hawkins, 1993; Tversky, Sattath, & Slovic, 1988).

To understand the prominence effect, Nelson and Simmons (2006) began by assuming that participants form an intuition based on their evaluation of the options along only the prominent dimension and that confidence in this intuition would determine whether people would choose in line with the prominent option. In this light, the prominence effect repeatedly shows up in investigations of choices between equally attractive alternatives precisely because experiments often make it easy for participants to assess options along the prominent dimension (e.g., it was easy to determine which baseball player had a higher batting average), an ease that fosters high confidence in their intuitions. In support of this, Nelson and Simmons discovered that participants were less likely to choose an equally attractive prominent option when their prominent-dimension assessment was difficult and associated with low confidence than when their prominent-dimension assessment was easy and associated with high confidence. This effect arose whether intuitive confidence was manipulated by altering a relevant or irrelevant aspect of the decision context. Along with the 14 studies presented here, this research demonstrates the important influence of intuitive confidence on decision making. Moreover, this research establishes the generality of this important hypothesis, suggesting that intuitive confidence affects choices even in a nonprediction, risk-free decision context.

Intuitive Betrayal Hypothesis

The intuitive betrayal hypothesis predicts that people will be more confident in their final decisions when they choose the intuitive option than when they choose a nonintuitive alternative.

[16] We believe that the effects of intuitive confidence will be evident for any dichotomous choice task as well as for any continuous judgment that involves a choice operation (e.g., a scale ranging from *strongly prefer Option A* to *strongly prefer Option B*; see Nelson & Simmons, 2006). However, further research is needed to determine the extent to which our hypotheses apply to continuous judgments that do not require a choice operation.

Studies 3–13 confirmed this hypothesis, with the most interesting findings coming from Studies 3a and 3b. In Study 3a, we found that participants wagered nearly all of their money on favorites rather than underdogs and that overall prediction confidence was positively correlated with predicting more favorites. In Study 3b, increased confidence was associated with predicting more favorites even though favorites were more likely to lose, and confidence consequently correlated negatively with prediction accuracy. These findings agree with previous research demonstrating that people anticipate feeling greater regret for an incorrect choice after switching away from an initial choice (Kruger, Wirtz, & Miller, 2005; Simonson, 1992), and with research demonstrating that people like to choose intuitively appealing options even when they know that such decisions are logically unwise (Denes-Raj & Epstein, 1994; Kirkpatrick & Epstein, 1992). Generally, our findings suggest that intuitive choosing feels right, whereas intuitive betrayal feels wrong (Epstein, 1994), and that the desire to choose the intuitive, feel-good option may play a considerable role in the persistence of intuitive biases.

One plausible explanation for the intuitive betrayal effect implicates intuitive confidence as the root cause. By this account, final decision confidence (e.g., How confident am I that the favorite will beat the point spread?) is determined in large part by intuitive confidence (e.g., How confident am I that the favorite will simply win the game?), so that decision confidence at an early stage in the decision process determines decision confidence at a later stage. Thus, because people who choose (non)intuitive options have high (low) intuitive confidence, they consequently have high (low) confidence in their final decision. Notice that this suggests that the act of choosing the intuitive versus nonintuitive option against an equally valid alternative does not in itself explain the intuitive betrayal effect. Rather, it is the intuitive confidence that accompanies these choices that determines final decision confidence. In support of this account, supplemental analyses of the intuitive betrayal effect documented in the set-your-own-spread studies show that the effects of intuitive versus nonintuitive choosing on final decision confidence reduce to nonsignificance when controlling for intuitive confidence. However, the effects of intuitive versus nonintuitive choosing on decision confidence were reduced but remained highly significant ($p = .003$) when controlling for intuitive confidence in Study 13, and the same control only modestly decreased the already modest intuitive betrayal effect in Study 12 (increasing the p value from .11 to .17). At this point, it is probably safe to conclude that intuitive confidence plays some role in the production of the intuitive betrayal effect. However, whether it accounts for the entirety of the effect is still an open question. We look forward to future research exploring the determinants and implications of the intuitive betrayal effect.

Alternative Explanations

Previous research investigating judgment and choice processes has documented, in a wide variety of domains, the very robust tendency for people to choose in line with invalidated intuitions. As reviewed in the Introduction, theories explaining the ubiquity of intuitive biases have attributed their pervasiveness to either the ubiquity of cognitively lazy or unable perceivers (e.g., Chaiken et al., 1989; Petty & Cacioppo, 1986) or to the near-guaranteed tendency for people to insufficiently adjust away from an intuitive anchor (Epley & Gilovich, 2004, 2006; Epley et al., 2004). These explanations quite powerfully explain a wide variety of psychological phenomena—the HSM and ELM can predict when people will consider hard-to-process constraint information, and the anchoring and adjustment model can explain why people giving numerical estimates might express answers that are too close to the first answer that springs to mind. Despite their utility, however, none of these dual-process models can account for all of the findings reported here. The HSM and ELM are designed to explain when people will process constraint information, not how persuaded people will be by constraint information that has already been processed. Thus, these theories cannot account for the fact that intuitive biases persist even when people are highly motivated to be accurate and even when people generate the constraint information themselves, thus fully processing it. The anchoring and adjustment model cannot generally account for choice phenomena, nor specifically account for the fact that intuitive biases are predictably nonuniversal. Indeed, only our model predicts that intuitive biases arise in large part because of intuitive confidence and that decreasing confidence will decrease, and sometimes eliminate, such biases.

Of course, although neither the HSM, ELM, nor anchoring and adjustment models can account for all of our results, ruling out these theories does not rule out the possibility that other existing theories may explain our findings. In what follows, we discuss how two other theoretical approaches relate to our own.

Griffin and Tversky (1992). One seemingly relevant theory that we have so far neglected to mention is Griffin and Tversky's (1992) account of confidence. According to Griffin and Tversky, "people are highly sensitive to variations in the extremeness of evidence and not sufficiently sensitive to variations in its credence or predictive validity" (p. 413). On the surface, at least, this theory seems potentially able to account for some of our findings, so long as one assumes that intuitive confidence measures the strength of evidence and that the point spread measures the weight or credence of evidence. However, there are good reasons to question this assumption and to consider our theory and theirs to be quite different.

First, our theory benefits from its general conceptualization of how people integrate intuitions with invalidating or opposing constraint information. Thus, unlike Griffin and Tversky (1992), our theory describes not only how decision makers integrate the strength and weight of an intuition, but also how they integrate their intuitions with any evaluatively opposite piece of evidence. Indeed, the decision that we investigated—predictions against point spreads—does not feature a distinction between the strength and weight of evidence, but rather a distinction between an intuition (who is going to win the game) and information that evaluatively opposes that intuition (the favorite is losing points in this decision context).

Second, for Griffin and Tversky's (1992) theory to shed light on our findings, one must assume that point spread magnitude captures the weight of evidence. However, because the point spread's magnitude serves as an excellent indication of the relative quality difference between the two teams (indeed, there is arguably no better indicator), there is a better a priori reason for categorizing the point spread as an indication of the strength of evidence rather than as an indication of its weight. In addition, the magnitude of the spread does not speak directly to the credibility of the intuition that the favorite is going to win the game, which is required if Griffin and Tversky's theory is to account for our findings. Indeed, among participants predicting that the favorite will win the game (i.e., among those included in our studies), the point spread may give high credence to the initial intuition by suggesting that expert bookmakers also agree that the favorite should be favored.

Attitude strength. Finally, another possible explanation for our results implicates attitude strength. Strong attitudes are less resistant to change than are weak attitudes (e.g., Krosnick & Petty, 1995). If one considers intuitive confidence as a measure of attitude strength, then it may be that this idea can explain our findings: When attitudes toward favorites are strong, then people are less resistant to changing those attitudes in the face of constraint information than when attitudes toward favorites are weak.

Although this notion is consistent with our treatment, there are reasons to doubt its utility. First, attitude strength is not a unitary construct (e.g., Visser, Krosnick, & Simmons, 2003); it is measured by many indicators (e.g., certainty, importance, knowledge), and those indicators do not exert redundant effects. Second, an attitude is defined as a liking or disliking of some object. However, in our treatment, it is not the pure evaluative response to the favored team that is critical (indeed, there is some evidence that people like underdogs more than favorites; Vandello, Goldschmeid, & Richards, 2006) but the confidence in the favorite's relative superiority. Thus, although an attitude strength perspective would explain our effects in terms of the confidence associated with liking or disliking the favorite, our perspective explains our effects in terms of the confidence associated with assessing the relative superiority of the favorite. Finally, attitude theories are hurt by the fact that it is difficult to determine the relevant attitude object a priori. Is it people's liking of the favorite that matters, or is it people's liking of the favorite minus the point spread that matters? Indeed, this is in part why an attitude is not the same thing as an intuition. Whereas an intuition is defined here as the answer to an easy question where a difficult one is required (Kahneman & Frederick, 2002), an attitude may be the answer to either the easy (I like the favorite to win) or difficult question (I like the favorite to beat the point spread) or to a different question altogether (I simply like the favorite). Thus, attitude theories lack the predictive precision that our treatment provides.

Conclusion

In this article, we have developed an account that explains why intuitions frequently pervade the choices that people make. Specifically, we have proposed that intuitive biases arise in large part because of intuitive confidence and that decreasing confidence in the intuition will decrease, or even eliminate, such biases. In so doing, we uniquely predict when intuitive biases will and will not occur, while offering a promising recipe for reducing them.

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