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Do People Inherently Dislike Uncertain Advice?

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Abstract

Research suggests that people prefer confident to uncertain advisors. But do people dislike uncertain *advice* itself? In 11 studies (N = 4,806), participants forecasted an uncertain event after receiving advice and then rated the quality of the advice (Studies 1–7, S1, and S2) or chose between two advisors (Studies 8–9). Replicating previous research, our results showed that confident advisors were judged more favorably than advisors who were "not sure." Importantly, however, participants were *not* more likely to prefer certain advice: They did not dislike advisors who expressed uncertainty by providing ranges of outcomes, giving numerical probabilities, or saying that one event is "more likely" than another. Additionally, when faced with an explicit choice, participants were *more* likely to choose an advisor who provided uncertain advice over an advisor who provided certain advice. Our findings suggest that people do not inherently dislike uncertain advice. Advisors benefit from expressing themselves with confidence, but not from communicating false certainty.

Keywords

advice, uncertainty, overconfidence, open data, open materials, preregistered

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Is it better for an advisor to be accurate or overconfident? Although there are seemingly obvious benefits to being accurate (e.g., a good reputation), many psychologists and laypeople believe that advisees prefer, and thus reward, advisors who offer certainty, even for events that are inherently uncertain. For example, in his book *Thinking, Fast and Slow*, Kahneman (2011) writes,

> Experts who acknowledge the full extent of their ignorance may expect to be replaced by more confident competitors, who are better able to gain the trust of clients. An unbiased appreciation of uncertainty is a cornerstone of rationality—but it is not what people and organizations want. (p. 263)

Similarly, in their book *Superforecasting*, Tetlock and Gardner (2015) write, "A confident yes or no is satisfying in a way that maybe never is" (p. 138). And, anecdotally, when we teach the perils of overconfidence to Master of Business Administration (MBA) students, they frequently counter with the claim that consumers have an inherent distaste for uncertainty and that they must therefore give overconfident advice in order to be persuasive and successful.

Many forecasters seem to have internalized this belief, often giving advice that is too certain. For example, people tend to place excessively narrow confidence intervals around their forecasts (Moore & Healy, 2008; Moore, Tenney, & Haran, 2016; Soll & Klayman, 2004). This tendency to be overconfident is present in competitive market settings (Radzevick & Moore, 2011), and there is compelling evidence that social motives, such as the desire to appear credible to other people, are drivers of overconfidence (Anderson, Brion, Moore, & Kennedy, 2012; Van Zant, 2017).

Psychologists' belief that people inherently dislike uncertain advice comes (at least in part) from studies

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showing that people dislike advisors who express themselves without confidence. For example, research shows that people may rely on a "confidence heuristic," according to which they infer that advisors who are more confident possess greater knowledge (Price & Stone, 2004). In addition, there is evidence that individuals who express confidence are judged as more competent by their peers and obtain higher status in their groups (Anderson et al., 2012). Indeed, to justify their claim that people inherently dislike "maybes" over more certain "yeses or nos," Tetlock and Gardner (2015) cite research showing that "people trust more confident financial advisers over those who are less confident even when their track records are identical. And people equate confidence and competence, which makes the forecaster who says something has a middling probability of happening less worthy of respect" (p. 138).

Thus, because there is compelling evidence that people dislike advisors who lack *confidence*, scholars have concluded that people dislike advice that lacks *certainty*. However, that need not be the case, as the confidence with which advisors communicate may be different from the certainty implied by what they say. For example, although recipients of advice may almost always dislike advisors who speak in a way that makes them seem unsure (e.g., "I'm not sure, but I think the stock price will increase"), they may not dislike advisors who confidently communicate uncertainty (e.g., "There is a 60% chance that the stock price will increase").

Some research supports this notion. For example, research in settings that provide participants with rapid and unambiguous feedback (i.e., settings in which people can easily compare advisors' forecasts with actual outcomes) shows that people prefer advisors who are calibrated rather than overconfident (Sah, Moore, & MacCoun, 2013; Tenney, MacCoun, Spellman, & Hastie, 2007; Tenney, Spellman, & MacCoun, 2008). Additionally, research by Du, Budescu, Shelly, and Omer (2011) shows that people prefer financial forecasts that are imprecise in settings in which they believe imprecision to be warranted. Still, we do not know whether people tolerate uncertain advice in the absence of feedback, nor whether the tolerance for imprecise financial advice generalizes to other domains and other expressions of uncertainty.

Research Overview

Our research investigated whether advisors have an incentive to provide false certainty or merely an incentive to speak and act confidently.

To investigate whether people inherently dislike uncertain advice, it is important to study events that are inherently uncertain rather than knowable. Indeed, people may dislike uncertain advice about events that are knowable not because of an inherent distaste for uncertainty but because of an inherent distaste for obviously bad advice. For example, an advisor who says that there is a 50% chance that Florida is south of New York will be universally untrusted, not because of an inherent distaste for uncertainty but because being uncertain about something that is so easily knowable is truly diagnostic of incompetence. More generally, it is important to manipulate the uncertainty of the advice while holding the quality of the advice constant. This ensures that people do not like one advisor more than another simply because his or her advice is more accurate.

Additionally, uncertain advice can take many forms, from imprecision (e.g., "The stock price will increase by some amount between 1% and 6%") to statements of probability (e.g., "There is a 55% chance that the stock price will increase") to nonnumerical statements of uncertainty (e.g., "The stock price is more likely than not to increase"). It is important for research on uncertain advice to investigate its various forms. After all, it could be that people do not inherently dislike uncertain advice but that they object to particular forms of it.

In 11 studies, we asked participants to forecast a future (and hence inherently uncertain) event after receiving advice, and we asked them to rate the quality of the advice (Studies 1–7 and S1 and S2) or to choose between two advisors (Studies 8 and 9). In all studies, we manipulated whether the advice itself was certain or uncertain, and we operationalized uncertain advice in seven different ways. In 6 of the first 7 studies, we also manipulated whether the advisor expressed confidence or said that he or she was not sure. In all studies, the quality of the advice was the same across conditions, allowing us to compare people's evaluations of equally good uncertain versus certain advice. Given previous research, we expected people to dislike advisors who said they were unsure about the advice they were giving. More important, however, was the comparison between people's evaluations of certain and uncertain advice. Do people inherently dislike uncertain advice—or not?

Studies 1–6: Advice Evaluation

In Studies 1–6, we asked participants to predict the outcomes of upcoming sporting events. Before each prediction, participants received and evaluated advice. The 6 studies followed a similar procedure, and so we will describe them all at once. All 11 of our studies were preregistered, and the links to those preregistrations can be found in the Open Practices section. The data and materials from all 11 studies are available here: https://osf.io/bjpe3/.

Method

Participants. We conducted Studies 1–6 using U.S. participants from Amazon.com's Mechanical Turk (MTurk). We advertised Studies 1 and 2 as "a survey for NBA [National Basketball Association] basketball fans" and Studies 3–6 as "a survey for Major League Baseball (MLB) fans." Participants received $1 for completing the study, and they could earn up to an additional $1–$4 for accurate forecasting performance. In Studies 1, 2, and 5, we decided in advance to recruit 300 participants, and in Studies 3, 4, and 6, we decided in advance to recruit 400, 600, and 900 participants, respectively. Our analyses included data from all participants who evaluated the advice for at least one of the games. This left us with final samples of 306, 308, 411, 618, 305, and 916 participants in Studies 1–6, respectively. These samples averaged 33 to 35 years of age and were 28% to 42% female.

Procedure. The six studies followed a similar procedure. In each study, participants were asked to predict the outcomes of a series of sporting events on the day on which the games were played. Participants in Studies 1 and 2 predicted NBA games, and participants in Studies 3–6 predicted MLB games. For each study, we randomly selected eight games that began no earlier than 7 p.m. on the selected game day. We posted the study in the morning of the game day to ensure that data collection would be completed before the games started. For each game, participants were presented with the game's start time, as well as the names of the home and visiting teams. For the MLB games, participants also saw the names of the teams' probable starting pitchers. In each study, the order of presentation of the games was randomized between subjects, and the games were presented on the screen one at a time.

For each of the games that participants were asked to forecast, we told them that, "You will receive advice to help you make your predictions. For each question, the advice that you receive comes from a different person." Importantly, participants always received objectively good advice, which was based on data from well-calibrated betting markets. For each game, we independently manipulated the certainty of the advice, and, in all but one study, we also manipulated the confidence of the advisor. The nature of these manipulations is described in detail in the remainder of this section. Thus, across games, participants were exposed to different kinds of advice (i.e., certain or uncertain advice delivered by either an unsure or a confident advisor).

In Studies 1–4 and 6, we manipulated the confidence of the advisor by either preceding the advice with an expression of low confidence (e.g., "I am not sure, but I think that the Chicago Cubs will win the game") or not (e.g., "The Chicago Cubs will win the game"). In Study 6, we also added a condition in which the advice was preceded by the statement, "I am very confident that . . ." In Study 5, the advice was always confidently stated.

Apart from the minor procedural differences that we describe in the next two paragraphs, the main differences among the six studies were (a) the kind of prediction that participants were asked to make and (b) the ways in which we manipulated advice uncertainty. Table 1 displays which advice-uncertainty manipulations were used in which studies and shows an example of how the manipulations were phrased.

In Studies 1 and 2, participants were asked to predict how many points would be scored in a series of basketball games. For these predictions, we manipulated advice certainty versus uncertainty by manipulating the precision of the advisor's prediction. In the certain conditions, the advisor forecasted an exact point total. In the uncertain conditions, the advisor forecasted a range that was either 20 points wide (in the *range-20* conditions

Table 1. The Manipulations of Certain Versus Uncertain Advice in Studies 1–6

Advice type	Condition	Studies	Example of advice phrasing
		Predicting points scored: precise vs. imprecise advice	
Certain	Precise	1, 2	"The Bucks and the Cavaliers will score 207 points."
Uncertain	Range 20	1, 2	"The Bucks and the Cavaliers will score between 197 and 217 points."
Uncertain	Range 40	2	"The Bucks and the Cavaliers will score between 187 and 227 points."
		Predicting winners: certain vs. probabilistic advice	
Certain	Certain	1, 3, 4, 5, 6	"The Chicago Cubs will win this game."
Uncertain	Exact chance	1, 3, 5	"There is a 57% chance that the Chicago Cubs will win this game."
Uncertain	Approximate chance	3, 6	"There is about a 57% chance that the Chicago Cubs will win this game."
Uncertain	Percent confident	5	"I am 57% confident that the Chicago Cubs will win this game."
Uncertain	"Probably"	3, 4	"The Chicago Cubs will probably win this game."
Uncertain	"More likely"	4, 6	"The Chicago Cubs are more likely to win this game."

Table 2. Advice Evaluation Measures in Studies 1–6

How knowledgeable is this advisor?
How competent is this advisor?
How credible is this advisor?
How much do you trust this advisor?
Would you seek additional information or advice from this person in the future?
How persuasive is this advice?
How accurate is this advice?

Note: All questions were answered on a 7-point scale ranging from 1, *not at all*, to 7, *extremely*, except for the "Would you seek additional information or advice from this person in the future?" question, for which the scale ranged from 1, *not at all*, to 7, *definitely*.

of Studies 1 and 2) or 40 points wide (in the *range-40* condition of Study 2).

In Studies 1 and 3–6, participants were asked to predict which basketball or baseball team would win each game.[1] For these predictions, we manipulated advice certainty versus advice uncertainty by manipulating whether or not the advisor made a probabilistic prediction. In the certain conditions, the advisor simply said, "The [predicted team] will win this game." Because there are many different ways for an advisor to make a probabilistic statement, across the studies we tried out five different phrasings, including three numerical (e.g., "There is a 57% chance that the Chicago Cubs will win this game" in the *exact-chance* conditions) and two nonnumerical (e.g., "The Chicago Cubs are more likely to win this game" in the "*more-likely*" conditions) instantiations of uncertainty. See Table 1 for a complete description of these manipulations.

Advice evaluation. After they received the advice, participants were asked to rate its quality. Specifically, they indicated how knowledgeable, competent, and credible they perceived the advisor to be, how much they trusted the advisor, whether they would seek additional information or advice from the advisor in the future, and how persuasive and accurate the advice was (7-point scales from 1, *not at all*, to 7, *extremely/definitely*). We averaged these seven items to create a single measure of advice evaluation (all αs $\geq$ .93). Table 2 shows the exact wording of these questions.

Incentivized predictions. We also asked participants to make their own predictions for each of the games, and we incentivized them to be accurate. For questions that asked about total points scored in NBA games (Studies 1 and 2), the 5 participants who performed the best (i.e., whose predictions were the closest to the actual game outcomes across all games) received a $3 bonus. For questions that asked about the winner of a given game (Studies 1 and 3–6), those participants who predicted the outcome of a certain number of games correctly (all games for NBA games and six out of eight for MLB games) received a $1 bonus.

Sports knowledge. At the end of the survey, we presented participants with a set of six knowledge questions about the sport they were predicting. Specifically, we asked them to identify the teams of four different players and to identify which teams had the best and worst records at the time of the study. They were asked to answer these questions without looking up the answers.

Demographics. Finally, we assessed participants' age and gender. For Studies 3–6, we also asked participants to indicate their favorite MLB team. In Studies 3–6, we also included other exploratory measures, which are described in full in the Supplemental Material available online.

Results

Analysis plan. We preregistered our plans to analyze the data of each of these studies separately. However, presenting the results from each of these individual studies would make for a needlessly repetitive, tedious, and opaque Results section. Thus, for ease of presentation, we decided to merge the data from these six studies into one data set and to present the results all at once. The independent and dependent variables of the analyses we present here do not differ from those in our preregistrations. The results of the preregistered analyses for the individual studies are in the Supplemental Material, and the means and standard deviations for each game are presented in Tables 3 and 4.

Each participant who fully completed the study contributed eight observations to the data set, one for each game that they predicted.[2] We present the results in two sections, one containing the findings of the points-scored predictions, for which uncertain advice was operationalized as imprecision, and the other containing

Table 3. Studies 1 and 2: Points-Scored Prediction Results by Game

Study	Game	Certain advice forecast	Actual point total	Certain advice		Uncertain advice: Range 20		Uncertain advice: Range 40	
				M	*SD*	*M*	*SD*	*M*	*SD*
				Unsure advisor					
1	Bucks vs. Cavaliers	207	217	3.60	1.31	3.73	1.31		
1	Magic vs. Pistons	210	220	3.55	1.20	3.44	1.40		
1	76ers vs. Nuggets	215	207	3.30	1.37	3.35	1.26		
1	Mavericks vs. Trailblazers	215	212	3.38	1.40	**3.84**	1.26		
2	Raptors vs. Grizzlies	197	194	3.55	1.38	3.79	1.42	3.55	1.39
2	76ers vs. Hornets	207	191	3.40	1.50	3.40	1.34	3.48	1.27
2	Wizards vs. Suns	214	205	3.18	1.56	3.65	1.42	3.56	1.26
2	Nets vs. Knicks	199	196	3.39	1.31	3.76	1.32	3.87	1.41
2	Cavaliers vs. Hawks	199	218	3.85	1.42	4.02	1.49	3.83	1.72
2	Mavericks vs. Pistons	206	187	3.58	1.44	3.69	1.43	3.57	1.34
2	Magic vs. Bucks	197	223	3.49	1.28	3.49	1.40	3.44	1.36
2	Celtics vs. Warriors	222	215	3.81	1.41	3.88	1.64	3.91	1.49
				Confident advisor					
1	Bucks vs. Cavaliers	207	217	4.28	1.13	4.52	1.22		
1	Magic vs. Pistons	210	220	4.29	1.28	4.01	1.23		
1	76ers vs. Nuggets	215	207	3.96	1.34	4.16	1.51		
1	Mavericks vs. Trailblazers	215	212	4.20	1.39	**4.72**	1.03		
2	Raptors vs. Grizzlies	197	194	4.05	1.16	4.36	1.18	3.92	1.26
2	76ers vs. Hornets	207	191	3.91	1.33	4.26	1.44	3.99	1.33
2	Wizards vs. Suns	214	205	3.95	1.51	4.03	1.22	4.10	1.28
2	Nets vs. Knicks	199	196	4.31	1.53	4.33	1.15	4.26	1.37
2	Cavaliers vs. Hawks	199	218	4.35	1.57	4.41	1.14	4.13	1.37
2	Mavericks vs. Pistons	206	187	4.56	1.22	4.55	1.14	4.29	1.29
2	Magic vs. Bucks	197	223	4.43	1.33	4.49	1.43	*3.91*	1.24
2	Celtics vs. Warriors	222	215	4.41	1.37	4.16	1.27	4.17	1.57

Note: Within the uncertain-advice columns, boldface indicates that participants evaluated uncertain advice significantly more positively than certain advice, and italics indicate that participants evaluated uncertain advice significantly more negatively than certain advice ($p < .05$).

the findings of the winner predictions, for which uncertain advice was operationalized as probabilistic statements. For each type of prediction, we conducted separate regression analyses for each of the uncertain-advice conditions. These analyses tested whether each particular form of uncertain advice was evaluated more positively or negatively than certain advice. Except for the analyses of *percent-confident* advice, which was never presented in an "unsure" manner, we regressed participants' advice evaluation on (a) the uncertain-advice condition (−.5 = certain advice, +.5 = uncertain advice), (b) the advisor-confidence condition (−.5 = unsure advisor, +.5 = confident advisor), and (c) the interaction between the two conditions. For example, in the analyses of the exact-chance advice condition, we regressed participants' advice evaluation on (a) the exact-chance advice condition (−.5 = certain advice, +.5 = exact-chance advice), (b) the advisor-confidence condition (−.5 = unsure advisor, +.5 = confident advisor), and (c) the interaction between the two conditions. (For the percent-confident condition, we omitted the advisor-confidence condition and the interaction term because they were constants). All of our regressions included fixed effects for game and clustered standard errors by participant to account for the non-independence of observations. We report the results of the interactions only when they are significant. The Supplemental Material shows the full results.

In addition, to test whether participants liked very confident advisors more than confident advisors in Study 6, we regressed participants' advice evaluation on the *very-confident* condition (−.5 = confident

Table 4. Studies 1 and 3–6: Winner Prediction Results by Game

						Uncertain advice									
				Certain advice		Exact chance		Approximate chance		Percent confident		"Probably"		"More Likely"	
Study	Predicted winner	Predicted loser	Chance advice probability	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
						Unsure advisor									
1	Wizards	Hawks*	58%	3.03	1.20	**3.68**	1.22								
1	Celtics*	Raptors	55%	3.17	1.31	**3.85**	1.17								
1	Suns*	Lakers	73%	3.39	1.30	**3.96**	1.41								
1	Warriors*	Clippers	83%	3.55	1.50	**4.41**	1.64								
3	Orioles*	Yankees	52%	2.95	1.23	3.39	1.20	3.33	1.20			2.98	1.23		
3	Blue Jays*	Rangers	60%	3.05	1.31	**3.88**	1.33	**3.75**	1.19			2.90	1.24		
3	Marlins*	Diamondbacks	57%	2.89	1.05	**3.53**	1.26	**3.83**	1.33			3.06	1.43		
3	Reds*	Brewers	51%	2.94	1.27	3.07	1.06	**3.50**	1.46			2.96	1.12		
3	Cubs*	Nationals	57%	3.08	1.22	**4.24**	1.28	**3.83**	1.33			3.17	1.41		
3	Red Sox*	White Sox	51%	2.91	1.15	**3.44**	1.30	2.93	1.28			2.64	1.05		
3	Astros	Mariners*	52%	2.79	1.22	3.14	1.22	**3.46**	1.12			2.68	1.17		
3	Mets	Padres*	63%	2.83	1.20	**4.34**	1.14	**4.06**	1.23			**3.40**	1.28		
4	Phillies	Braves*	62%	3.17	1.25							3.33	1.29	3.35	1.27
4	Nationals*	Marlins	57%	3.43	1.40							3.46	1.33	3.34	1.34
4	Mariners*	Reds	56%	3.29	1.44							3.26	1.25	3.47	1.38
4	Indians*	Red Sox	52%	2.91	1.26							2.94	1.21	3.12	1.33
4	Blue Jays*	Twins	55%	3.43	1.27							3.33	1.32	3.61	1.44
4	White Sox	Royals*	61%	3.15	1.28							3.48	1.23	3.40	1.36
4	Astros	Rangers*	61%	3.14	1.29							2.90	1.32	3.18	1.33
4	Cubs*	Giants	64%	3.50	1.48							3.48	1.30	3.21	1.48
6	Pirates*	Mariners	60%	3.15	1.24			**4.09**	1.31					3.22	1.24
6	Cardinals*	Mets	55%	3.08	1.37			**3.76**	1.09					3.38	1.39
6	Cubs*	White Sox	66%	3.46	1.37			**4.01**	1.20					3.30	1.18
6	Brewers	Diamondbacks*	57%	3.21	1.17			**3.84**	1.18					3.19	1.24
6	Twins	Braves*	59%	3.19	1.28			**3.57**	1.34					3.20	1.29
6	Astros*	Yankees	55%	3.28	1.33			3.59	1.35					3.03	1.17
6	Royals*	Angels	53%	3.36	1.17			**3.76**	1.20					3.55	1.39
						Confident advisor									
1	Wizards	Hawks*	58%	3.82	1.29	4.13	1.19								
1	Celtics*	Raptors	55%	4.20	1.48	4.22	1.28								
1	Suns*	Lakers	73%	4.27	1.43	**4.78**	1.10								
1	Warriors*	Clippers	83%	4.85	1.45	**5.33**	1.15								
3	Orioles*	Yankees	52%	4.54	1.33	*4.00*	1.16	*3.65*	1.14			*3.57*	1.30		
3	Blue Jays*	Rangers	60%	4.21	1.27	4.53	0.95	4.54	1.28			3.94	1.15		
3	Marlins*	Diamondbacks	57%	4.30	1.25	4.41	1.05	4.44	1.13			*3.35*	1.11		

(*continued*)

Table 4. (*continued*)

Study	Predicted winner	Predicted loser	Chance advice probability	Certain advice		Uncertain advice									
						Exact chance		Approximate chance		Percent confident		"Probably"		"More Likely"	
				M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
3	Reds*	Brewers	51%	4.25	1.25	4.05	1.12	3.78	1.25			3.84	1.16		
3	Cubs*	Nationals	57%	4.30	1.23	4.43	1.16	4.18	1.08			3.82	1.33		
3	Red Sox*	White Sox	51%	4.74	1.34	*3.85*	1.21	*3.94*	1.06			*3.63*	1.15		
3	Astros	Mariners*	52%	4.39	1.54	3.99	1.20	*3.63*	1.33			*3.65*	1.34		
3	Mets	Padres*	63%	4.77	1.34	4.77	1.08	4.75	0.90			*3.92*	1.31		
4	Phillies	Braves*	62%	4.54	1.31							*4.11*	1.30	4.62	1.19
4	Nationals*	Marlins	57%	4.64	1.31							*4.13*	1.21	4.36	1.15
4	Mariners*	Reds	56%	4.64	1.27							*4.15*	1.28	4.43	1.12
4	Indians*	Red Sox	52%	3.90	1.37							3.60	1.08	3.76	1.26
4	Blue Jays*	Twins	55%	4.63	1.41							4.38	1.24	4.49	1.06
4	White Sox	Royals*	61%	4.48	1.35							*3.89*	1.23	4.35	1.35
4	Astros	Rangers*	61%	3.97	1.37							3.81	1.27	4.07	1.25
4	Cubs*	Giants	64%	4.62	1.36							*4.22*	1.29	4.39	1.36
5	Orioles*	Yankees	52%	3.75	1.29	**4.11**	1.21			3.73	1.17				
5	Red Sox	Blue Jays*	62%	4.46	1.48	4.64	1.12			4.65	1.25				
5	Nationals	Reds*	60%	4.27	1.35	4.37	1.34			4.39	1.03				
5	Rangers*	Mariners	57%	4.20	1.30	4.44	1.03			4.24	1.07				
5	Rays*	Twins	53%	4.20	1.35	4.19	1.05			3.94	1.09				
5	Giants*	Cardinals	52%	4.18	1.40	4.09	1.17			3.88	1.13				
5	Dodgers*	Braves	67%	4.41	1.43	4.68	1.10			4.64	1.23				
5	Padres*	Rockies	59%	4.04	1.34	4.36	1.12			4.26	1.02				
6	Pirates*	Mariners	60%	4.21	1.24			4.38	1.03					4.23	1.23
6	Cardinals*	Mets	55%	4.35	1.22			4.30	1.13					4.25	1.19
6	Cubs*	White Sox	66%	4.42	1.32			**4.86**	1.11					4.44	1.20
6	Brewers	Diamondbacks*	57%	4.12	1.21			4.21	1.10					4.34	1.00
6	Twins	Braves*	59%	4.20	1.25			4.27	0.95					4.34	1.16
6	Astros*	Yankees	55%	3.98	1.45			4.07	1.09					3.87	1.32
6	Royals*	Angels	53%	4.27	1.21			4.12	1.19					4.15	1.16
				Very confident advisor											
6	Pirates*	Mariners	60%	4.49	1.22			4.43	1.00					4.66	1.18
6	Cardinals*	Mets	55%	4.45	1.13			4.17	1.10					4.50	1.12
6	Cubs*	White Sox	66%	4.56	1.32			4.63	1.19					4.71	1.20
6	Brewers	Diamondbacks*	57%	4.44	1.27			4.48	1.06					4.51	1.17
6	Twins	Braves*	59%	4.06	1.25			**4.61**	1.24					**4.41**	1.23
6	Astros*	Yankees	55%	4.05	1.40			3.95	1.25					3.93	1.31
6	Royals*	Angels	53%	4.54	1.18			*4.06*	1.19					4.50	1.47

Note: Within the uncertain-advice columns, boldface indicates that participants evaluated uncertain advice significantly more positively than certain advice, and italics indicate that participants evaluated uncertain advice significantly more negatively than certain advice ($p < .05$). The actual winner of each game is marked with an asterisk.

advisor, +.5 = very confident advisor). We again included fixed effects for game and clustered standard errors by participant.

Main analyses.

Points-scored predictions: uncertainty operationalized as imprecision. Table 3 shows the results for each game. As predicted, and consistent with past research, these analyses revealed a large and significant main effect of advisor confidence, ts > 7.19, ps < .001: Advisors who said "I am not sure but . . ." were evaluated more negatively than advisors who expressed themselves confidently.

More importantly, participants did *not* evaluate uncertain advice more negatively than certain advice. In fact, they evaluated advice in the form of 20-point ranges more *positively* than certain advice, b = 0.139, SE = 0.059, $t(612)$ = 2.36, p = .019. In addition, they evaluated advice in the form of 40-point ranges *no differently* from certain advice, b = −0.014, SE = 0.086, $t(305)$ = −0.16, p = .872.

Thus, these studies provide no evidence that people inherently dislike uncertain advice in the form of ranges. In fact, participants preferred advice that spanned a 20-point range to certain advice, and they did not significantly dislike uncertain advice that spanned a very large (40-point) range. While it is obviously the case that making the uncertain ranges even wider would eventually cause participants to disfavor it—for example, nobody would value advice such as, "The teams will score between 0 and 1,000 points"—our results suggest that people do not inherently dislike uncertain-range advice when the ranges are of a reasonable width.

Winner predictions: uncertainty operationalized as probabilistic statements. Table 4 shows the results for each game. As in the previous analysis, there was a large and significant main effect of advisor confidence in all regressions, ts > 16.42, ps < .001: Advisors who said "I am not sure but . . ." were evaluated more negatively than advisors who expressed themselves confidently. We also found, in Study 6, that advisors who preceded their advice by saying, "I am very confident that . . ." were evaluated more positively than advisors who did not express themselves with such high confidence, b = 0.132, SE = 0.039, $t(914)$ = 3.37, p = .001. More important are the comparisons between participants' evaluations of certain advice and uncertain advice, to which we now turn.

Participants evaluated exact-chance advice (e.g., "There is a 57% chance that the Chicago Cubs will win the game") more positively than certain advice (e.g., "The Chicago Cubs will win the game"), b = 0.400, SE = 0.047, $t(1014)$ = 8.46, p < .001. Moreover, a significant interaction with advisor confidence, b = −0.587, SE = 0.092, $t(1014)$ = −6.40, p < .001, revealed that participants evaluated exact-chance advice significantly more positively than certain advice when the advisor said that he or she was unsure, b = 0.694, SE = 0.074, $t(648)$ = 9.38, p < .001, and marginally more positively than certain advice when the advisor was confident, b = 0.106, SE = 0.056, $t(960)$ = 1.89, p = .059.

Participants also evaluated *approximate-chance* advice (e.g., "There is about a 57% chance that Chicago Cubs will win the game") more positively than certain advice, b = 0.269, SE = 0.043, $t(1306)$ = 6.29, p < .001. There was again a significant interaction with advisor confidence, b = −0.649, SE = 0.078, $t(1306)$ = −8.33, p < .001. Participants evaluated approximate-chance advice more positively than certain advice when the advisor was unsure, b = 0.593, SE = 0.055, $t(1116)$ = 10.75, p < .001, but no differently from certain advice when the advisor was confident, b = −0.057, SE = 0.060, $t(1133)$ = −0.95, p = .343.

In Study 5, we introduced a percent-confident condition, in which participants received confident advice in the form of "I am X% confident that . . . " We found that participants evaluated this advice the same as certain advice, b = 0.027, SE = 0.079, $t(302)$ = 0.34, p = .736.[3]

The results of the "*probably*" condition were different, as participants did evaluate advice of the form "The [predicted team] will probably win the game" more negatively than they evaluated certain advice, b = −0.236, SE = 0.038, $t(1023)$ = −6.14, p < .001. This effect was significantly stronger when the advice came from an advisor who was confident, b = −0.527, SE = 0.076, $t(1023)$ = −6.94, p < .001. Specifically, participants evaluated this form of uncertain advice no differently from certain advice when the advisor was unsure, b = 0.028, SE = 0.053, $t(951)$ = 0.53, p = .596, but more negatively than certain advice when the advisor was confident, b = −0.499, SE = 0.055, $t(961)$ = −9.00, p < .001. Thus, people do seem to dislike uncertain advice from a confident advisor who uses the word "probably." This raises an important question: Do people inherently dislike all forms of uncertain advice that are nonnumerical, or do they simply dislike it when advisors use the word "probably"?

The results of the "more-likely" condition suggest the latter. Participants evaluated advice of the form "The [predicted team] is more likely to win the game" no differently from certain advice, b = −0.003, SE = 0.033, $t(1516)$ = −0.08, p = .940. These evaluations were not dependent on whether the advice came from an advisor who was "not sure," b = −0.110, SE = 0.067, $t(1516)$ = −1.64, p = .101.

In sum, we found that people do not inherently dislike uncertain advice that contains numerical

probabilities, and they also do not dislike uncertain advice that uses the words "more likely." More specifically, we found that people evaluated exact-chance advice and approximate-chance advice more positively when the advisor said that he or she was unsure. When the advisor expressed confidence, people evaluated exact-chance advice, approximate-chance advice, and percent-confident advice as no different from certain advice.

People's evaluation of "more-likely" advice did not depend on the confidence of the advisor; they evaluated "more-likely" advice no differently from certain advice regardless of whether the advisor was confident or not sure. For advice that used the word "probably," the results were different: We found that people evaluated "probably" advice no differently from certain advice when the advisor said that he or she was unsure, but when the advisor expressed confidence, they evaluated "probably" advice more negatively than certain advice.

Because Studies 1–6 were so similar, it is reasonable to consider whether these results hinge on specific aspects of their design. Here, we consider two such aspects. First, in these studies, we manipulated the nature of the advice within subjects (i.e., participants were randomly assigned to different advice for each game they predicted). This should have made participants more sensitive to the differences between certain and uncertain advice. For example, it could be that participants receiving "probably" advice dislike it only once they have been exposed to other types of advice. To see whether our effects would be different in a between-subjects design, we reran our analyses on the first game that participants predicted. These analyses have less power, but the size and direction of the effects are illuminating. As the two right columns of Table 5 show, participants did not significantly or substantially dislike *any* form of uncertain advice when it was the first piece of advice that they received.

Second, all of these studies were conducted in the domain of sports, and so it is possible that people's tolerance of uncertain advice is restricted to this domain. To test this, we conducted another study (N = 413; Study S1 in the Supplemental Material), in which we asked participants to predict whether the high temperature of eight cities on a future date would be higher or lower than a particular temperature (e.g., "Will the high temperature in Denver, CO, on October 21, 2017, be higher than 74 degrees Fahrenheit?"). As in Studies 1–6, participants received advice for each of the forecasts that they made, and we asked them to evaluate the advice. For each forecasting question, we manipulated whether the advisor was confident or unsure and whether the advice was certain or uncertain (in the form of "more-likely" advice). Participants evaluated confident advisors more positively than unsure advisors, $b = 1.095$, $SE = 0.070$, $t(412) = 15.67$, $p < .001$, but they did not evaluate "more-likely" advice more negatively than certain advice, $b = -0.014$, $SE = 0.049$, $t(412) = -0.29$, $p = .771$. Thus, the results of this weather forecasting study closely resemble those of the sports prediction studies, suggesting that our findings are not limited to the domain of sports.

Analyses of advice following. In our investigation, we were chiefly interested in how people evaluate advice. Thus, we specified advice evaluation to be our critical dependent variable in all of our preregistrations. But we can also analyze the degree to which people followed the advice that they received. Were participants more or less likely to follow the advice when the advice was uncertain?

To answer this question, we had to define what it means for a participant to "follow the advice." For the winner predictions, this was easy: Following the advice means predicting the same winning team as the advisor. But for the points-scored predictions, this is not obvious, because the advice in the certain conditions (e.g., "The teams will score 200 points") is different from the advice in the range conditions (e.g., "The teams will score between 180 and 220 points"). Thus, for this example, a participant who predicted 190 total points scored would be deviating from the certain advice (200 points), but his or her prediction would still fall within the uncertain-range advice (180–200 points). Given this difficulty in defining what it means to "follow advice" for the points-scored predictions, we restricted our analyses to the winner predictions, assessing whether or not participants predicted the same winning team as the advisor.

As in the analyses of advice evaluations, we ran separate analyses for the different forms of uncertain advice. In each of these analyses, we regressed whether participants followed the advice (1 = they followed the advice, 0 = they did not follow the advice) on (a) the uncertain-advice condition (−.5 = certain advice, +.5 = uncertain advice), (b) the advisor-confidence condition (−.5 = unsure advisor, +.5 = confident advisor), and (c) the interaction between the two conditions. We included fixed effects for game and clustered standard errors by participant. (Again, the advisor-confidence condition and the interaction term were necessarily omitted from analyses of the percent-confident condition). We present ordinary least squares (OLS) regressions here because the coefficients are easy to interpret (i.e., as percentage point differences between conditions); logistic regressions yielded nearly identical results.

Table 5. Studies 1–6: Regression Results Based on All Observations and Just the First Observation

Uncertain-advice condition	All observations		First observation only	
	Effect of uncertain advice (vs. certain advice) on advice evaluation		Effect of uncertain advice (vs. certain advice) on advice evaluation	
	Unsure advisor	Confident advisor	Unsure advisor	Confident advisor
Range 20	$b = 0.16$, $SE = 0.073$, $p = .031$	$b = 0.12$, $SE = 0.078$, $p = .132$	$b = 0.15$, $SE = 0.212$, $p = .477$	$b = 0.18$, $SE = 0.199$, $p = .374$
Range 40	$b = 0.12$, $SE = 0.109$, $p = .275$	$b = -0.15$, $SE = 0.11$, $p = .190$	$b = -0.30$, $SE = 0.257$, $p = .241$	$b = -0.15$, $SE = 0.242$, $p = .525$
Exact chance	$b = 0.69$, $SE = 0.074$, $p < .001$	$b = 0.11$, $SE = 0.056$, $p = .059$	$b = 0.80$, $SE = 0.192$, $p < .001$	$b = 0.10$, $SE = 0.125$, $p = .417$
Approximate chance	$b = 0.59$, $SE = 0.055$, $p < .001$	$b = -0.06$, $SE = 0.060$, $p = .343$	$b = 0.51$, $SE = 0.149$, $p = .001$	$b = 0.10$, $SE = 0.132$, $p = .435$
Percent confident		$b = 0.03$, $SE = 0.079$, $p = .736$		$b = -0.07$, $SE = 0.163$, $p = .688$
"Probably"	$b = 0.03$, $SE = 0.053$, $p = .596$	$b = -0.50$, $SE = 0.055$, $p < .001$	$b = -0.01$, $SE = 0.162$, $p = .962$	$b = -0.09$, $SE = 0.131$, $p = .503$
"More likely"	$b = 0.05$, $SE = 0.047$, $p = .263$	$b = -0.06$, $SE = 0.047$, $p = .224$	$b = 0.07$, $SE = 0.136$, $p = .599$	$b = 0.12$, $SE = 0.113$, $p = .303$

Note: These results come from regressing advice evaluation on the uncertain-advice condition in analyses that include fixed effects for game and clustered standard errors by participant. Positive coefficients indicate that the uncertain advice was evaluated more favorably than the certain advice, and negative coefficients indicate that the uncertain advice was evaluated more negatively than the certain advice. The coefficients are interpretable as the average mean difference between the uncertain-advice condition and the certain-advice condition. For example, the first result in the table indicates that, when the advisor was unsure, participants evaluated range-20 advice 0.16 scale points more favorably than certain advice.

The results were fairly consistent across each type of uncertain advice. In all analyses, there was a significantly positive effect of advisor confidence, indicating that participants were more likely to follow the advice of confident advisors than advisors who said they were not sure, bs > 0.047, ts > 2.76 ps < .007. Across all of the analyses, there was only one significant difference in advice following between the certain- and uncertain-advice conditions: A significant positive effect of exact-chance advice, $b = 0.030$, $SE = 0.015$, $t(1014) = 2.01$, $p = .044$, indicated that participants were *more* likely to follow the advisor's advice when it was uncertain rather than certain. There were no significant interactions between advisor confidence and advice uncertainty. Thus, consistent with the advice evaluation results, we found that participants were no less likely to follow uncertain advice than to follow certain advice.

Discussion

These results suggest that people do not inherently dislike uncertain advice. They do not disvalue uncertain advice that comes in the form of ranges, numerical probabilities, or "more likely." The only distaste for uncertainty that we observed was very specific: People seem not to like "probably" advice from a confident advisor when it is not the first piece of advice that they see. Otherwise, uncertain advice seems to go unpunished.

In Studies 1, 3, 5, and 6, participants received uncertain advice in the form of numerical probabilities. Exploratory analyses of our data suggested that people's evaluation of numerical probabilistic advice may depend on the exact probability provided. For example, a close examination of Table 4 shows that, in the face of a confident advisor, participants judged probabilistic advice more negatively than certain advice for some of the games for which the advisor stated a probability very close to 50% (i.e., 51% or 52%). In contrast, in the face of a confident advisor, participants sometimes judged probabilistic advice more positively than certain advice when the advisor stated a much higher probability (e.g., 73% and 83%). This suggests that people's fondness for probabilistic advice may depend on whether the stated probability is perceived to be sufficiently informative (e.g., sufficiently different from 50% for a binary decision). We tested this in Study 7.

Study 7: Advice Evaluation and Varied Probabilities

In Study 7, we again asked participants to predict the outcomes of upcoming sporting events and to evaluate the advice that they received prior to making each prediction. We focused our investigation on uncertain advice in the form of an approximate-chance prediction that was rounded to the nearest 5% (e.g., "There is about a 60% chance that . . . "), and we manipulated across games what probability was contained in the uncertain advice.

Study 7 also extended our investigation in other ways. First, we conducted this study in the laboratory. Second, we increased the incentives for accurate forecasting performance to ensure that participants would be sufficiently motivated to make accurate predictions and to consider the advice carefully. Third, we asked participants to predict how many hits two teams would accumulate in a given MLB game. Since this is an outcome people are less familiar with, they should be more desirous of good advice. Finally, we assessed participants' advice evaluation by asking only about the advice itself, rather than also asking participants to judge the quality of the advisor.

Method

Participants. We conducted Study 7 in the laboratory. (We also replicated Study 7's design and results with an MTurk sample. We report this study in the Supplemental Material as Study S2.) Participants completed the study as part of a 1/2-hr or 1-hr lab session for which they received $5 or $10, respectively. In addition, participants could earn up to an additional $6 for accurate forecasting performance ($1 for each correct prediction). We preregistered our plan to conduct multiple batches of lab sessions until we obtained at least 300 participants. We ended up running three batches of lab sessions in July and August of 2017, resulting in a final sample size of 309 participants (average age: 27 years; 60% female).

Procedure. Participants predicted the outcomes of a series of MLB games prior to the games being played. For each batch of lab sessions, we selected six games that began no earlier than 7 p.m. on the last day of each lab session batch. For each game, participants were presented with the game's start time, the names of the home and visiting teams, and the names of the teams' probable starting pitchers. They were asked to predict whether the two teams would combine to accumulate more than X hits in the game, where X differed for each game. The order of presentation of the games was randomized between subjects, and the games were presented on the screen one at a time.

As in Studies 1–6, participants learned that they would receive advice to help them make their predictions. For each game, we independently manipulated the certainty of the advice and the confidence of the advisor. We manipulated advice certainty versus uncertainty by manipulating whether the advisor gave approximate-chance advice (e.g.,

"There is about a 60% chance that the two teams will accumulate more than 15.5 hits in this game") or not (e.g., "The two teams will accumulate more than 15.5 hits in this game"). We manipulated advisor confidence by manipulating whether the advisor preceded the advice by saying, "I am not sure, but I think that . . . " or not.

We also manipulated across games whether the uncertain version of the advice offered a moderate probability (55% or 60%), an extreme probability (90% or 95%), or a probability in between (70% or 80%). Importantly, we computed the probabilities and hit thresholds so that participants received good advice for each game. First, we randomly assigned the six probabilities (55%, 60%, 70%, 80%, 90%, and 95%) to the six games. Second, using data from the 2015 MLB season, we could determine, for example, that roughly 60% of the games had more than 15.5 hits. Thus, for the game that was assigned the 60% probability, participants were asked to predict whether the two teams would accumulate more or fewer than 15.5 hits, and the advisor in the approximate-chance advice condition said, "There is about a 60% chance that the two teams will accumulate more than 15.5 hits in this game." The Supplemental Material shows exactly which predictions participants made and what advice they received.

Advice evaluation. After participants received the advice, we asked them to rate the advice. We used a different set of items to assess advice evaluation in this study than we used in Studies 1–6. Specifically, participants indicated how persuasive, accurate, good, and reliable the advice was, and how smart it was to follow the advice (7-point scales from 1, *not at all*, to 7, *extremely*). We averaged these five items to create a single measure of advice evaluation ($\alpha = .94$).

Incentivized predictions. We also asked participants to make their own predictions for each of the games, and we incentivized them to be accurate. Participants predicted whether the two teams would accumulate more or fewer hits than the hit threshold assigned to each game. Participants received a $1 bonus for each correct prediction, and since they made six predictions in this study, they could earn up to an additional $6.

Motivation. We asked participants in this study to indicate how motivated they were to make accurate predictions (from 1, *not at all motivated*, to 7, *extremely motivated*). Participants were made aware that their answer to this question would not affect their bonus payment.

MLB knowledge. At the end of the survey, we presented participants with the same six MLB knowledge questions that we used in Studies 1–6.

Demographics. We also asked participants to indicate how closely they follow Major League Baseball (from 1, *not at all closely*, to 7, *extremely closely*) and to indicate their favorite MLB team. Finally, we collected participants' age and gender.

Results

Analysis plan. Each participant contributed six rows to the data set, one for each of the games that they predicted. We preregistered our plan to run two different regression analyses for this study, one investigating only the effects documented in Studies 1–6 and the other also investigating whether extreme uncertain advice was more preferable to more moderate uncertain advice. Because the latter regression answers all of the questions we were interested in here, it is the one that we report.

In what follows, we report the results from regressing the average advice evaluation on (a) the "not-sure" condition (contrast-coded), (b) the approximate-chance condition (contrast-coded), (c) the interaction between the "not-sure" condition and the approximate-chance condition, (d) a mean-centered measure of the extremity of the uncertain advice, and (e) the interaction of this mean-centered measure of extremity and the approximate-chance condition. We clustered standard errors by participant. Because extremity varied across games, this regression did not include fixed effects for game.

Main analysis. Consistent with the findings from Studies 1–6, this regression revealed a large and significant main effect of advisor confidence, $b = 0.873$, $SE = 0.064$, $t(308) = 13.67$, $p < .001$: Advisors who said "I am not sure but . . . " were evaluated more negatively than advisors who expressed themselves confidently.

More importantly, participants did *not* evaluate approximate-chance advice more negatively than certain advice. In fact, they evaluated approximate-chance advice more *positively* than certain advice, $b = 0.528$, $SE = 0.063$, $t(308) = 8.33$, $p < .001$. The interaction between the advisor-confidence condition and the approximate-chance advice condition was significant as well, $b = -0.395$, $SE = 0.115$, $t(308) = -3.44$, $p = .001$. The preference for approximate-chance advice was stronger when the advisor was unsure, $b = 0.725$, $SE = 0.085$, $t(305) = 8.51$, $p < .001$, than when the advisor was confident, $b = 0.330$, $SE = 0.086$, $t(305) = 3.85$, $p < .001$.

We also found a significant main effect of the extremity of the uncertain advice, $b = 0.018$, $SE = 0.002$, $t(308) = 11.19$, $p < .001$, and a significant interaction between this extremity measure and the approximate-chance advice condition, $b = 0.021$, $SE = 0.004$, $t(308) = 5.69$, $p < .001$.

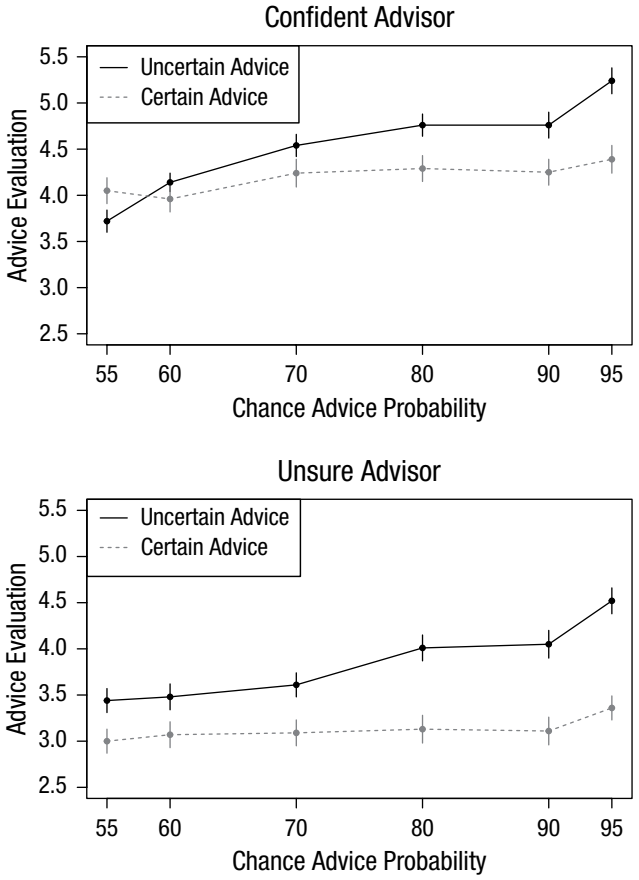

Fig. 1. Results from Study 7: mean advice evaluation as a function of the probability associated with the uncertain advice, separately for confident and unsure advisors. People's more positive evaluation of uncertain versus certain advice was more pronounced when the uncertain advice (and thus the event itself) was associated with a more extreme probability. This was true both when the advisor was confident (top panel) and when the advisor was unsure (bottom panel). Error bars represent ±1 *SE*.

As shown in Figure 1, this interaction indicates that people's preference for uncertain versus certain advice was greater when the uncertain advice was associated with a larger probability.

Analysis of advice following. To assess whether participants were more likely to follow some types of advice rather than others, we followed the same analytic approach described in the previous section, regressing whether a participant followed the advice (0 = did not follow, 1 = followed) on (a) the "not-sure" condition (contrast-coded), (b) the approximate-chance condition (contrast-coded), (c) the interaction between the "not-sure" condition and the approximate-chance condition, (d) a mean-centered measure of the extremity of the uncertain advice, and (e) the interaction of this mean-centered measure of extremity and the approximate-chance condition. We clustered standard errors by participant.

This analysis generated three significant main effects. First, participants were more likely to follow advice from a confident advisor than from an unsure advisor, $b = 0.046$, $SE = 0.019$, $t(308) = 2.37$, $p = .018$. Second, participants were more likely to follow uncertain advice than certain advice, $b = 0.056$, $SE = 0.019$, $t(308) = 3.03$, $p = .003$. Third, participants were more likely to follow advice for games associated with an extreme probability, $b = 0.006$, $SE = 0.001$, $t(308) = 9.62$, $p < .001$, probably because advice for these games was more unambiguously wise. Thus, participants in Study 7 not only judged uncertain advice more favorably than certain advice; they were also more likely to follow it.

Discussion

Study 7's results confirm those of Studies 1–6: People do not seem to inherently dislike uncertain advice. In fact, we found the opposite, as people judged uncertain advice more favorably than certain advice, especially when the uncertain advice contained a more extreme probability. This result is interesting, particularly as past work on risky decision making suggests that people are less sensitive to the differences among middling probabilities and more sensitive to the difference between certainty and some degree of uncertainty (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981). Although that may be true about the perception of risky prospects, it does not appear to be true about the perception of advice. It seems that people prefer an advisor who correctly says that an event is about 95% likely over an advisor who simply says that the event will happen.

So far, participants in our studies were simply asked to rate the quality of advice. Thus, we did not know whether people would tolerate uncertain advice when they are directly choosing between two advisors, as they sometimes have to do. To investigate this, we conducted Studies 8 and 9.

Studies 8 and 9: Choosing Between Two Advisors

In Studies 8 and 9, we asked participants to predict baseball games and stock prices, respectively. For each item, they received similar advice from two advisors, one who provided certain advice and one who provided uncertain advice, and indicated which advisor they preferred. The two studies were very similar and so we describe them together.

Method

Participants. We conducted Studies 8 and 9 using U.S. participants from MTurk. We advertised Study 8 as a

"survey for Major League Baseball (MLB) fans," and we advertised Study 9 as a "survey about making stock predictions." Participants received $0.60 for completing each of the studies. In Study 8, participants could also earn an additional $1 for accurate prediction performance. We decided in advance to recruit 400 participants for both studies. We analyzed data from all participants who indicated their advisor preference for at least one of the advisor pairs. This left us with a final sample of 408 participants in each study. The samples were 47% and 41% female and averaged 35 and 34 years, respectively.

Procedure. The two studies followed a similar procedure. Participants saw a series of four prediction questions (about baseball in Study 8 or stocks in Study 9), and for each one they received advice from two advisors. The advisors always agreed in their forecasts, but they differed in their certainty: One of the two advisors provided certain advice, and the other advisor provided uncertain advice. For each advisor pair, we manipulated whether the certain advice was presented first (by Advisor 1) or second (by Advisor 2). Before making their own prediction, participants were asked to indicate which advisor they preferred. In each study, the four prediction questions were presented on the screen one at a time in randomized order. The two studies differed with respect to (a) the prediction domain and (b) the ways in which we manipulated advice uncertainty.

In Study 8, participants were asked to predict how many points would be scored in a series of baseball games. We randomly selected four games that were played on August 5, 2016, and that began no earlier than 7 p.m. As in Studies 1–6, we posted the study on the morning of the game day to ensure that data collection was completed before the games started, and we provided participants with details about each game. Participants also saw advice from two advisors. The advisor who provided certain advice simply stated that, "The [predicted team] will win this game." The advisor who provided uncertain advice either provided approximate-chance advice (e.g., "There is about a 67% chance that the Chicago Cubs will win this game") or used the words "more likely" (e.g., "The Chicago Cubs are more likely to win this game"). We manipulated between subjects which two games featured an advisor who provided approximate-chance advice versus "more-likely" advice. As in our previous studies in the domain of sports, participants received objectively good advice in all of the experimental conditions, which was based on data from well-calibrated betting markets.

In Study 9, participants were asked to predict the stock prices of four different companies. We randomly selected 4 of the 20 companies from the NASDAQ Stock Market with the largest market capitalization. Participants saw the name of the company and its stock symbol and were asked to predict whether the stock price of the company would be higher or lower in a year from the day the study was conducted. As in Study 8, participants saw advice from two advisors. The advisor who provided certain advice simply said that, "The stock price of [company] in a year will be higher [lower] than it is today." The advisor who provided uncertain advice used the words "more likely" (e.g., "The stock price of Starbucks in a year is more likely to be higher than it is today"). Given that there is no objectively good advice for stock price predictions, we manipulated whether the two advisors predicted that the stock price would be higher versus lower in a year.

Dependent measures.

Advisor choice. After they received the advice, participants were asked to indicate which advisor they preferred. In Study 8, participants indicated their preference by answering, "From which of the two advisors would you prefer to receive advice for upcoming games?" and, in Study 9, participants indicated their preference by answering the question, "From which of the two financial advisors would you prefer to receive advice for future stock predictions?"

Incentivized predictions. We also asked participants to make their own predictions. In Study 8, we incentivized participants to make accurate predictions by providing a $1 bonus to all participants who predicted the winner of at least three of the four games correctly. Because in both studies the advisor who provided certain advice and the one who provided uncertain advice always agreed in their advice (i.e., they provided directionally consistent advice), analyses of participants' own predictions could not tell us whether they more closely followed certain versus uncertain advice. Thus, we did not analyze participants' own predictions.

Knowledge. At the end of each study, we presented participants with questions aimed at assessing their knowledge about the domain for which they made predictions. In Study 8, we assessed participants' knowledge about baseball by asking them the same six MLB knowledge questions that we used in Studies 3–6. In Study 9, we asked participants to self-report how much they know about stocks in general and about each of the four companies using 7-point scales that ranged from 1, *nothing*, to 7, *a lot*.

Demographics. Finally, we assessed participants' age and gender. In Study 8, we also assessed participants' favorite MLB team.

Results

We preregistered our plans to analyze the data of the two studies separately. However, for ease of presentation, we decided to merge the two studies into one data set and to report the results of the merged data set. Otherwise, the analyses follow our preregistration plan. We provide the item-by-item results in Tables 6 and 7, and we report the results from the preregistered analyses for the individual studies in the Supplemental Material.

We conducted two separate regressions, one for the approximate-chance advice condition (which we used only in Study 8) and one for the "more-likely" advice condition (which we used in both Study 8 and Study 9). In each analysis, we regressed whether or not the participant chose Advisor 2 (1 = yes, 0 = no) on whether Advisor 2 provided uncertain or certain advice (1 = uncertain advice, 0 = certain advice). We included fixed effects for game or item and clustered standard errors by participant. We present the results from OLS regressions here because the coefficients are easy to interpret (i.e., as percentage point differences between conditions); logistic regressions yielded nearly identical results.

In both regressions, we found a large and significantly *positive* effect of the uncertain-advice condition, indicating that more participants preferred Advisor 2 when Advisor 2 provided uncertain advice than when Advisor 2 provided certain advice. This was true both when the uncertain advice came in the form of approximate-chance advice and in the form of "more-likely" advice. When one advisor provided certain advice and the other approximate-chance advice, 82.4% of participants chose Advisor 2 when Advisor 2 provided approximate-chance advice, but only 16.2% of participants chose Advisor 2 when Advisor 2 provided certain advice, $b = 0.661$, $SE = 0.032$, $t(407) = 20.39$, $p < .001$. When one advisor provided certain advice and the other "more-likely" advice, 70.7% of participants chose Advisor 2 when Advisor 2 provided "more-likely" advice, but only 28.0% of participants chose Advisor 2 when Advisor 2 provided certain advice, $b = 0.427$, $SE = 0.030$, $t(810) = 14.09$, $p < .001$.

Thus, as in Study 7, participants seemed to actually prefer advisors who provided uncertain advice to advisors who provided certain advice. It is possible that we observed this effect because participants who disagreed with the advice perceived the uncertain advice to be less wrong than the certain advice. For example, if a participant believes that the Reds are going to beat the Pirates, but an advisor tells him or her that the Pirates are going to beat the Reds, the participant may prefer the advisor who implies that the Reds *might* win rather than an advisor who implies that they definitely will not. To examine the viability of this explanation, we reran the analyses, restricting the sample to those instances in which the participant gave the same prediction as the advisor and thus agreed with the advice. This did not impact the results. Even when analyzing only those who agreed with the advice, we found that participants in Studies 8 and 9 strongly preferred the uncertain advice to the certain advice (ps $< .001$). Together, these results demonstrate a strong preference for uncertain advice over certain advice when participants are faced with an explicit choice.

Table 6. Study 8: Percentage of Participants Who Chose Advisor 2 by Game

				Percentage of participants who chose Advisor 2			
				When Advisor 2 gave uncertain advice		When Advisor 2 gave certain advice	
Uncertain-advice condition	Predicted winner	Predicted loser	Winning probability	*N*	*M*	*N*	*M*
Approximate chance							
	Pirates*	Reds	59%	103	80.6%	101	22.8%
	Astros*	Rangers	62%	103	85.4%	101	11.9%
	Mariners*	Angels	63%	101	82.2%	102	15.7%
	Cubs*	Athletics	67%	101	81.2%	103	14.6%
"More likely"							
	Pirates*	Reds	59%	103	81.6%	100	21.0%
	Astros*	Rangers	62%	100	69.0%	103	22.3%
	Mariners*	Angels	63%	101	80.2%	103	18.4%
	Cubs*	Athletics	67%	101	73.3%	102	24.5%

Note: The actual winner of each game is marked with an asterisk.

Table 7. Study 9: Percentage of Participants Who Chose Advisor 2 by Item

Advice direction and company	Percentage of participants who chose Advisor 2			
	When Advisor 2 gave "more-likely" advice		When Advisor 2 gave certain advice	
	N	*M*	*N*	*M*
Higher in a year				
Comcast	101	65.3%	101	25.7%
Starbucks	101	60.4%	101	28.7%
The Priceline Group	91	65.9%	110	30.0%
Qualcomm	88	72.7%	113	31.0%
Lower in a year				
Comcast	101	72.3%	99	32.3%
Starbucks	100	73.0%	100	31.0%
The Priceline Group	111	66.7%	90	33.3%
Qualcomm	114	68.4%	88	39.8%

General Discussion

In 11 studies, we found that people do not inherently dislike uncertain advice. We observed this in studies of sports, weather, and stocks. We observed this in studies that operationalized uncertain advice as imprecision, as statements of numerical probability, and as statements of nonnumerical uncertainty. And we observed this in studies in which people directly evaluated the advice and in studies that asked people to choose between an advisor who provided certain advice and one who provided uncertain advice. The only reliable distaste for uncertainty that we observed was that people seem not to like it when confident advisors use the word "probably," and even this effect was not evident when the word "probably" was used by the first advisor that they saw. Taken together, our results challenge the belief that advisors need to provide false certainty for their advice to be heeded. Advisors do not have a realistic incentive to be overconfident, as people do not judge them more negatively when they provide realistically uncertain advice.

Although we investigated various forms of uncertain advice in our studies, we cannot conclude that people are never less tolerant of uncertain advice. We can speculate that people may prefer certain advice in domains in which they expect to receive certain advice or in circumstances in which they want advisors to be persuasive rather than informative. For example, a manager who *wants* to hire a particular job candidate may prefer to hear that that candidate is definitely the best one rather than probably the best one. These idiosyncratic possibilities aside, our investigation should lay to rest the belief that people are generally and inherently intolerant of uncertain advice.

Action Editor

Bill von Hippel served as action editor for this article.

Author Contributions

C. Gaertig designed and ran the studies. C. Gaertig and J. P. Simmons analyzed the data and wrote the manuscript.

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Supplemental Material

Additional supporting information can be found at http://journals.sagepub.com/doi/suppl/10.1177/0956797617739369

Open Practices

All data and materials have been made publicly available via the Open Science Framework and can be accessed at https://osf.io/bjpe3/. The design and analysis plans for the experiments were preregistered at http://AsPredicted.org and can be accessed at the following links:
Study 1: https://aspredicted.org/2rp5k.pdf
Study 2: https://aspredicted.org/u6442.pdf
Study 3: https://aspredicted.org/4b8j8.pdf
Study 4: https://aspredicted.org/ga8xg.pdf
Study 5: https://aspredicted.org/ni7zv.pdf
Study 6: https://aspredicted.org/758ba.pdf
Study 7: https://aspredicted.org/qi57c.pdf
Study 8: https://aspredicted.org/zf6qi.pdf
Study 9: https://aspredicted.org/4tc3d.pdf
Study S1: https://aspredicted.org/kg4zt.pdf
Study S2: https://aspredicted.org/ir7eu.pdf
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Notes

1. In Study 1, we asked participants to make both types of predictions, points scored and winners, separated into randomly ordered blocks of four games each.
2. Study 6 contained an error that caused the advice for one game to be displayed incorrectly, rendering its results invalid. We excluded this game from our analyses and from Table 4.
3. The percent-confident advice contained a typo: It read, "I am X% confident that the [predicted team] win this game."

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