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Paying for What You'll Like? The Uncertain Value of Uncertainty

By

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University of California, Berkeley

Committee in charge:

Professor Leif D. Nelson, Co-Chair
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Professor Clayton R. Critcher
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Abstract

Paying for What You'll Like? The Uncertain Value of Uncertainty

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Doctor of Philosophy in Psychology

University of California, Berkeley

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Risk and uncertainty can be perceived in seemingly contradicting ways. Receiving a surprise gift can be exciting, whereas not knowing the outcome of a job interview can be incredibly anxiety-provoking. Even the same uncertain event, such as gambling, can simultaneously evoke positive *and* negative emotions. When is uncertainty positive, and when is it negative? We find that how much people value uncertainty depends on the context, and in particular, how value is measured. Namely, when considering pricing measures (e.g., willingness-to-pay), uncertainty is evaluated negatively, whereas when considering rating measures (e.g., enjoyment), uncertainty is evaluated positively. This effect holds when the outcomes are positive or negative, and even when changing the amount of uncertainty, uncertainty remains negative with pricing measures and positive with rating measures. We explore possible explanations, such as perceived selling price of uncertain prospects, and discuss crucial implications for both theory and applications.

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Paying for What You'll Like? The Uncertain Value of Uncertainty

Imagine that you want to go on a vacation. You stumble across an airline that offers "blind bookings," in which the location of the vacation is a surprise to you until the day before you leave. It's likely that this type of uncertainty could produce both excitement and anxiety, but how does uncertainty influence preference and value? For instance, how much would you expect to enjoy your vacation, and relatedly, how much would you be willing to pay for this vacation? Though this may seem unusual for a business model[1], many of our daily decisions are wrought with uncertainty. Even trivial decisions, such as what to wear for the day, can become complicated by uncertainty about the weather (e.g., whether it will rain).

When investigating whether uncertainty is good or bad, most research has suggested that uncertainty is negative. Uncertainty is normally perceived as fear- and anxiety-provoking (see Slovic, 1987 and Loewenstein, Weber, Hsee, & Welch, 2001 for reviews) as well as ego-depleting (Milkman, 2012) to the point that uncertainty reduction is thought to be a fundamental human motivation in various domains (e.g., Hogg & Abrams, 1993; van den Bos & Lind, 2002). Nevertheless, a small subset of researchers has shown that there can be a positive side of uncertainty. For example, Wilson and colleagues (e.g., Wilson, Centerbar, Kermer, & Gilbert, 2005) found that uncertainty can prolong positive emotions because people cannot adapt as quickly to an uncertain positive event compared to a certain positive event.

Although it seems contradictory that uncertainty is both positive *and* negative, in a follow-up paper, Bar-Anan, Wilson, and Gilbert (2009) proposed the *uncertainty intensification hypothesis*, which stated uncertainty intensifies all emotions, both positive and negative. That is, when uncertainty concerned positive events, positive emotions were intensified, and when uncertainty concerned negative events, negative emotions were intensified. The *uncertainty intensification hypothesis* seemed to explain much of the past literature on uncertainty, giving a reason for when uncertainty was positive and when uncertainty was negative.

However, in 2006, Gneezy, List, and Wu discovered a perplexing phenomenon that they termed the "uncertainty effect," which seemed to clearly demonstrate that people devalued uncertainty even when the uncertainty involved <u>only positive outcomes</u>. They revealed that people were so risk-averse that they valued lotteries less than their *worst possible outcomes*. In particular, participants were asked to report their willingness-to-pay (WTP) for either: (a) a $50 Barnes & Noble (B&N) gift certificate, or (b) a lottery ticket that would for sure provide them with a reward of a $50 B&N gift certificate or a $100 B&N gift certificate with equal probability. Participants were willing to pay around $38 on average for the $50 gift certificate, but astonishingly, they were only willing to pay around $28 for the lottery between the $50 and the $100 gift certificates. This effect held in both hypothetical and real-stakes scenarios, and extended to other goods (e.g., a field experiment with baseball trading cards), and notably, to the measure of choice (i.e., choice between the prospect and $25 in cash). Given that the only possible outcomes were positive, the uncertainty effect seemed to directly contradict the idea that uncertainty is positive with positive outcomes and negative with negative outcomes.

While various decision-making theories – including expected utility theory and prospect theory – differ in the way they propose that people deal with risky prospects, the finding that people value risky prospects even less than they do their worst possible outcome violates all of these theories. Despite the considerable interest in the uncertainty effect for researchers, the uncertainty effect is incompletely understood. Because the uncertainty effect provides some direct evidence regarding the value of uncertainty, a greater understanding of the uncertainty

effect could help shed light on when and why uncertainty is devalued. Therefore, we review a number of the explanations that have been put forth and the relevant evidence: (a) joint versus separate evaluations, (b) misunderstanding of instructions, (c) disappointment aversion, (d) bad deal aversion, (e) perceived value of the lottery, and (f) direct risk aversion.

Explanations for the Uncertainty Effect

Joint versus Separate Evaluations. The original uncertainty effect paper asked participants in the certain conditions to evaluate the certain outcomes independently from each other. That is, the $50 gift certificate was evaluated separately from the $100 gift certificate. The risky prospect of the lottery, on the other hand, always requires participants to evaluate the $50 and $100 gift certificates jointly. Given that research has found that people devalue lower-value outcomes in the presence of a higher-value outcome (e.g., Hsee [1996] found that participants were WTP less for a dictionary when evaluated with a better dictionary than when evaluated on its own), there is the possibility that the uncertainty effect was due to this difference in joint versus separate evaluations. Simonsohn (2009) raised this issue and tested it by asking participants in the certain condition to jointly consider their WTP for a $50 gift certificate and for a $100 gift certificate. Even when using the joint evaluation version of the certain condition, the uncertainty effect was observed. This finding indicates that it is not the difference between joint and separate evaluations that accounts for the uncertainty effect.

Misunderstanding of Instructions. An oft-explored explanation for the uncertainty effect has proposed that the uncertainty effect is simply an artifact of participants' misunderstanding what the lottery offers. A participant could potentially interpret the lottery descripton such that the chance for the $50 gift certificate and the $100 gift certificate are independent, and therefore, there would be a chance to win either of the certificates, both of the certificates, or importantly, neither of the certificates.

To account for this possiblity, Keren and Willemsen (2009) included a true/false comprehension check after the lottery description that stated: "It is 100% certain that you will win at least 50 euros in terms of a book certificate." They found that excluding the participants who answered this question incorrectly eliminated the uncertainty effect: participants in the lottery condition were WTP as much as participants asked about the $50 gift certificate. Simonsohn (2009) argued, however, that there were two problems with Keren and Willemsen's (2009) approach: (1) the wording of the comprehension check itself was confusing, and (2) adding a comprehension check to, thereby eliminating participants from, only the lottery condition and not the certain conditions introduced statistical bias. Simonsohn (2009) introduced a new comprehension check which asked, "What was the lowest possible payment the lottery could pay?" with multiple-choice values ranging from $0 to $250 in $25 increments. When using this comprehension check, he found that 92% of participants answered correctly and none of the participants chose $0 as the lowest possible payment of the lottery, which seems to reject the idea that participants thought of the probabilities for the gift certificates as being independent. Moreover, even when only including those who answered the comprehension check correctly, he still observed the uncertainty effect. These findings seem to strongly suggest that misunderstanding the lottery does not account for the uncertainty effect.

In a separate attempt to increase understanding of the lotteries, Rydval, Ortmann, Prokosheva, and Hertwig (2009) tried to use physical lotteries to increase participants' understanding of the lottery and found that this eliminated the uncertainty effect. However, in addition to this change, they also elicited WTP through a multiple-price list (a list of prices increasing in increments was shown and participants were asked whether they would pay each of

the prices listed). Simonsohn (in prep) has found multiple-price lists to eliminate the uncertainty effect. Though the reason for this is not well-understood, Simonsohn (in prep) conjectures that this is because a multiple-price list "facilitates the identification of dominated alternatives and induces a more analytical processing of information." [2] Given that these different elicitations have different psychological properties, it is difficult to interpret Rydval et al. (2009)'s results as demonstrating that the uncertainty effect is merely due to participants misunderstanding the lottery. Still, their findings open the possibility that misunderstanding of lotteries helps explain the uncertainty effect.

Disappointment Aversion. The disappointment aversion account states that people devalue the lottery because they do not want to be disappointed by the outcome. Newman and Mochon (2012) tested this idea by manipulating the value of the better outcome. If the uncertainty effect is driven by an aversion to disappointment, then reducing the discrepancy between the better and worse outcomes should reduce the magnitude of the uncertainty effect. They replicated the uncertainty effect even when the two possible outcomes of the lottery were the same value (i.e., a $50 Barnes & Noble gift certificate and a $50 Borders gift certificate) and when the two possible outcomes of the lottery had a much smaller difference in value (i.e., a $50 Barnes & Noble gift certificate vs. a $55 Barnes & Noble gift certificate).[3] These results indicate that the uncertainty effect is not driven by disappointment aversion.

Bad Deal Aversion. Bad deal aversion is the idea that people avoid paying more for a product than its market price. Yang, Vosgerau, and Loewenstein (2013) proposed that the bad deal aversion account could also explain the uncertainty effect. Specifically, people are willing to pay less for a lottery because there is a possibility of getting a bad deal. A bad deal in the context of lotteries would occur if people paid more than they would for the worse outcome and ultimately ended up with the worse outcome. Though similar to the disappointment aversion account, the bad deal aversion account focuses people on their WTP for the worse outcome, whereas the disappointment aversion account focuses people on the better outcome.

While the bad deal aversion explanation has not yet been ruled out, it cannot by itself explain why WTP for risky prospects is even lower than that for the worse outcome. It is possible that bad deal aversion explains why people choose not to pay more than the worse outcome and that another account, such as direct risk aversion or perceived value (described below), explains why people pay even less than the worse outcome.

Perceived Value. Researchers have also proposed that negative associations with the word "lottery" may be driving the uncertainty effect. If people associate lotteries with low probabilities and/or low prices, this may artificially lower the WTP for the uncertain lottery condition to be lower than that of the lowest possible outcome. Contrary to this idea, however, Newman and Mochon (2012) asked participants to report their WTP for either a voucher for a round-trip coach ticket, a round-trip first-class ticket, or a voucher for a round-trip coach ticket that offered a 50% probability of being upgraded to a round-trip first class ticket, and found that the uncertainty effect was still observed when avoiding the use of the word lottery.

Yang et al. (2013) further investigated whether framing the uncertainty effect in terms of a lottery influenced WTP. They found that although the uncertainty effect was observed with other risky framings, such as coin flips, gambles, and raffles, they found no evidence for the uncertainty effect with riskless framings, such as gift certificates and, surprisingly, vouchers. In particular, when framing the risky prospect as either a $50 or a $100 Barnes & Noble gift certificate (both equally likely), participants were WTP just as much for the uncertain gift

certificate as the lowest possible outcome (the $50 gift certificate). They proposed that their effect was potentially due to lotteries evoking different reference prices than gift certificates.

Interestingly, Newman and Mochon (2012) found that uncertain vouchers produced the uncertainty effect, whereas Yang et al. (2013) found that uncertain vouchers eliminated the uncertainty effect. Why is it that uncertain vouchers conformed to the uncertainty effect in one case but not the other? One difference between the two sets of results is that Newman and Mochon (2012) framed their effect as a promotion, which could have been more consistent with a risky framing similar to a lottery. However, this idea has not yet been tested. Therefore, the notion that lotteries and other risky framings evoke lower reference prices is still viable as an explanation for the uncertainty effect. Although Yang et al. (2013) tested both WTP and willingness-to-accept (from the point of view of a seller) for different framings of the uncertain prospect, willingness-to-accept is motivated by wanting to receive the best possible price for a product and therefore, willingness-to-accept may not be the reference price that comes to mind for buyers. We revisit this issue in a later study (Study 7).

Direct Risk Aversion. The default explanation of the uncertainty effect has been that of "direct risk aversion" (coined by Simonsohn [2009]). Specifically, people simply dislike uncertainty which leads them to devalue risky prospects. This account is consistent with a notion pertaining to the utility of gambling (e.g., Conlisk, 1993; Diecidue, Schimdt, & Wakker, 2004) and directly addresses the question of the value of uncertainty. The direct risk aversion account proposes that risk and uncertainty is devalued.

While a direct risk aversion explanation is consistent with the literature on the negative side of uncertainty, it seems to contradict the idea that people sometimes expect to enjoy uncertainty, like in the case of gambling (e.g., Cowley, 2013). In fact, Kurtz, Wilson, and Gilbert (2007) found that when people were uncertain about whether they would receive one or two prizes at the end of an experiment, they felt happier for longer than when they knew for sure that they would receive two prizes. Moreover, Goldsmith and Amir (2010) discovered that participants were willing to buy products with uncertain promotions (e.g., buy a Coke and receive either 2 Hershey chocolates or a box of Godiva chocolates) at as high a likelihood as the best possible outcome (i.e., buy a Coke and receive a box of Godiva chocolates). They posited that this effect occurred due to people's "innate optimistic response" to uncertain promotions. Goldsmith and Amir (2010)'s finding differed from the original studies in two significant ways: (1) rather than focusing on the purchase of a certain versus uncertain *product*, they examined the purchase of a certain product with a certain versus uncertain *promotion*, and (2) they did not provide information about probabilities of the different rewards (the original effect focused on the 50-50 probability for the two possible outcomes). Nevertheless, these findings demonstrate that people are not always risk averse, and that risky prospects may, in some circumstances, be positive, encouraging hope and excitement instead of fear and anxiety.

Current Research

When and why do people value (vs. devalue) uncertainty? The uncertainty effect has been shown to be incredibly robust and provides compelling evidence that when assessing WTP, uncertainty is devalued. In attempting to reconcile the notion that uncertainty between positive outcomes is positive (and uncertainty between negative outcomes is negative) with the uncertainty effect (which demonstrates that uncertainty between positive outcomes can also be negative), we chose a more direct measure of preference for uncertainty—that of expected enjoyment. Past research has shown that different measures of preference (e.g., choice, rating, and pricing) can at times reveal drastically different preferences (e.g., Lichtenstein & Slovic,

1971; Schkade & Johnson, 1989). Although expected enjoyment is a preference measure that overlaps greatly with WTP (e.g., Kahneman, Ritov, & Schkade, 1999), WTP considers many other factors that are not necessarily related to preference. Indeed, Amir and Ariely (2007) suggested that payment measures consider decision rules, such as the rule that you shouldn't pay to delay positive experiences, in addition to preferences. These results point to the idea that though uncertainty appears to be devalued (given that people are willing to pay less for uncertain prospects than their worst possible outcomes), people may not actually dislike uncertain prospects. In the studies we report here, we uncover an unexpected phenomenon: the value of uncertainty is shaped by how preference is assessed. More specifically, when faced with uncertainty, pricing measures (e.g., WTP) trigger negative valuations of uncertainty, whereas rating measures (e.g., expected enjoyment) trigger positive valuations of uncertainty.

Study 1 reveals that people anticipate enjoying an uncertain prospect as much as the better outcome and significantly more than the worse outcome. Study 2 confirms Study 1 and the uncertainty effect in a single study. Study 3 investigates whether changing the parameters of the uncertain prospects (i.e., varying the likelihoods of the better and worse outcomes) influences the different measures of value. Study 4 extends our findings to negative outcomes. Finally, Studies 5 – 7 test three potential explanations for our effect: the influence of stakes in valuations (Study 5), the discrepancy between anticipated and anticipatory enjoyment (Study 6), and the perceived selling price of uncertain prospects (Study 7). Compliant with Simmons, Nelson, and Simonsohn (2011), we report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the studies.

Study 1: Enjoyment of a Certain versus Uncertain Prospect

Study 1 explored whether people valued uncertain prospects by testing whether people expect to enjoy positive uncertain prospects.

Method

Two hundred and one undergraduates completed a study for course credit.[4]

Procedure

Participants completed an online survey in which they watched trailers for two movies that were premiering one week from the time of the survey. Participants were aware that they would all be coming into a movie theater to watch one of the two movies on the day of the premiere.[5] The movie trailers were for the movies "Friends with Kids" and "Jeff who Lives at Home." The order of the trailers was randomized. After watching the trailers, participants ranked the two movies (1 = Movie they wanted to watch more, 2 = Movie they wanted to watch less).

Participants were then randomly assigned to one of two conditions: Certain (they were told which movie of the two they would be watching; i.e., "You have been randomly assigned to watch [Movie].") or Uncertain (they were told that they would find out which movie of the two they would watch when they got to the theater; i.e., "You will watch one of the two movies… When you get to the theater, the experimenter will randomly assign you to which movie you will be watching.").

Participants were also randomly assigned to the movie they were going to watch. As a result, for those in the Certain condition, some participants would be watching their less preferred movie (hereafter referred to as "Good"), and some participants would be watching their more preferred movie (hereafter referred to as "Better"). Hence, for this survey, participants were essentially assigned to one of three conditions: (1) Good (n = 45), (2) Better (n = 55), or (3) Uncertain (n = 101; participants were not yet informed of which movie they would be watching).

After this manipulation, participants rated how much they expected to enjoy the movie on a 7-point scale ("How much do you think you will enjoy the movie?"; 1 = Not At All; 7 = Very Much).[6] Therefore, in the Good and Better conditions, participants were asked about their expected enjoyment of specific movies, whereas in the Uncertain condition, participants were asked about their expected enjoyment of an uncertain movie.

Results and Discussion

Participants in the Better condition expected to enjoy the movie ($M = 5.18$, $SD = 1.32$) more than participants in the Good condition ($M = 3.78$, $SD = 1.54$), $t(98) = 4.92$, $p < .001$, $d = .98$.

Surprisingly, participants in the Uncertain condition expected to enjoy the movie ($M = 4.83$, $SD = 1.29$) more than those in the Good condition ($t(144) = 4.30$, $p < .001$, $d = .74$), and non-significantly less than the Better condition, $t(154) = 1.61$, $p = .11$ (see Figure 1).

Study 2: Enjoyment and WTP Under Uncertainty

In contrast to the uncertainty effect, which establishes that people are less willing to pay for uncertain prospects, Study 1 offered preliminary evidence that people expect to enjoy uncertain prospects. Nevertheless, there are a few limitations of Study 1. One limitation was that the 50-50 likelihood of the uncertain prospect was not specified as it was in the uncertainty effect studies. Instead, in Study 1, we merely told participants that they would be randomly assigned to one of the movies but did not state any likelihood of watching one movie over the other. Although the 50-50 chance was implied, this lack of information could have allowed the participants to assume that there was a higher chance that they would receive the better outcome. Another limitation of Study 1 is that unlike the material products used in previous uncertainty effect studies, we used an experiential product (i.e., watching movies). Though there is no reason to believe that the difference between material and experiential products should affect uncertain prospects in particular, it is possible that people expect to enjoy uncertain experiential products whereas people are willing to pay less for uncertain material products. Lastly, although Study 1 was designed to investigate how uncertainty influences enjoyment, it was an exploratory study with other measures and other possibilities for data analysis. Study 2 sought to address these issues and to replicate Study 1 and the uncertainty effect in a single study. Moreover, in Study 2, participants reported both WTP and expected enjoyment, so that we could explore whether uncertainty moderated the relationship between WTP and expected enjoyment.

Method

Three hundred three participants completed an online survey on Amazon's Mechanical Turk for $0.40.

Procedure

Participants watched trailers for two upcoming movies ("Frozen" and "Free Birds"[7]) in a randomized order, and ranked the two movies in order of which movie they wanted to watch more. Participants were then randomly assigned to one of three certainty conditions: Good (they were asked about the movie they liked less; n = 107), Better (they were asked about the movie they liked more; n = 100), or Uncertain (they were asked about a 50-50 lottery between the two movies; n = 96). Finally, participants were asked how much they valued the prospect in two different ways. They reported both: (1) their WTP for the prospect, and (2) their expected enjoyment of the prospect. The order of the measures was counterbalanced.[8]

Measures

WTP. In the Good condition, participants were asked how much they would be willing to pay for a movie ticket to the movie they wanted to see less. In the Better condition, participants were asked how much they would be willing to pay for a movie ticket to the movie they wanted to see more. In the Uncertain condition, participants were asked how much they would be willing to pay for a lottery ticket that would for sure give them a movie ticket to one of the two movies with equal probability.

Enjoyment. Expected enjoyment was assessed with a single item: "How much do you think you will enjoy the movie?" on a 7-point scale (1 = Not At All; 7 = Very Much). Participants in the Good condition were asked how much they expected to enjoy the movie they wanted to see less. Participants in the Better condition were asked how much they expected to enjoy the movie they wanted to see more. Participants in the Uncertain condition were asked to imagine being entered in a lottery in which they would for sure watch one of the two movies with equal probability and asked to rate their expected enjoyment of the movie.

Results and Discussion

WTP. Participants in the Good condition were willing to pay less (M = \$5.14, SD = \$3.13, Median = \$5) than participants in the Better condition (M = \$7.94, SD = \$3.36, Median = \$8; $t(205)$ = 6.21, $p < .001$, d = .86). Replicating the uncertainty effect, participants in the Uncertain condition were willing to pay even less (M = \$2.56, SD = \$2.22, Median = \$2) than participants in the Good condition, $t(201)$ = 6.70, $p < .001$, d = .95 (see Figure 2A).

Enjoyment. Participants in the Better condition expected to enjoy the movie more (M = 5.58, SD = 1.14) than participants in the Good condition (M = 3.83, SD = 1.54; $t(205)$ = 9.24, $p < .001$, d = 1.29). Replicating our preliminary study, participants in the Uncertain condition expected to enjoy the movie (M = 5.34, SD = 1.26) significantly more than participants in the Good condition ($t(201)$ = 7.59, $p < .001$, d = 1.07), and non-significantly less than participants in the Better condition, $t(194)$ = 1.40, p = .16 (see Figure 2A).

Relationship between Enjoyment and WTP. In light of the discrepancy between our WTP and enjoyment findings, we also explored the relationship between enjoyment and WTP. Uncertainty moderated the relationship between enjoyment and WTP. We conducted a multiple regression with certainty condition (using contrast coding), enjoyment, and their interaction as the predictors and WTP as the outcome. We included two contrast codes: (1) comparing the Uncertain condition to the two certain conditions (Good & Better), and (2) comparing the two certain conditions (Good vs. Better).

Consistent with previous research, greater enjoyment significantly predicted greater WTP, β = .46, $t(297)$ = 9.47, $p < .001$. Of primary interest to this study, we found a significant interaction between enjoyment and the contrast comparing the Uncertain condition to the two certain conditions (β = .16, $t(297)$ = 3.66, $p < .001$; see Figure 2B). Specifically, the relationship between enjoyment and WTP was attenuated (though still significant) in the Uncertain condition compared to the two certain conditions. Furthermore, the two certain conditions did not significantly differ in the relationship between enjoyment and WTP ($p > .33$).

Taken together, the results of Study 2 imply that expected enjoyment and WTP diverge under uncertainty. These findings indicate that people are averse to uncertain prospects when asked about their WTP, yet people prefer uncertain prospects when asked about their expected enjoyment. Our results are especially remarkable given that expected enjoyment and WTP both intend to represent the broader construct of preference. In fact, WTP is often thought to be a

proxy for expected enjoyment (e.g., Kahneman et al., 1999). However, we find that these two thereotically equivalent measures are distinct under uncertainty.

Study 2 also provided evidence against a couple of the remaining explanations for the uncertainty effect: (1) misunderstanding of the instructions, and (2) direct risk aversion. If it were the case that people mistakenly believed it was possible that they could receive nothing with the lottery, people's responses would also be irrational in the case of expected enjoyment, but instead, the uncertain movie was viewed positively with expected enjoyment. If it were the case that direct risk aversion explained the uncertainty effect, then people should also feel averse to uncertain movies when asked about expected enjoyment. However, people expected to enjoy uncertain movies as much as the better movie. Nevertheless, one could argue that risk does not exist with expected enjoyment because there are no stakes involved when asking about a free movie. We return to this point in Study 5.

Study 3: Increasing Likelihoods of Better and Worse Outcomes

Studies 1 and 2 established that people value uncertainty with *rating* measures (e.g., expected enjoyment) and devalue uncertainty with *pricing* measures (e.g., WTP). In Study 3, we sought to investigate the boundaries of the effects of uncertainty. In particular, we changed the likelihood of receiving the better outcome (and thereby, the worse outcome), such that in the lottery, either the better outcome was much more likely (99% likely) or much less likely (1% likely). By including these nearly certain lotteries, we can examine how having even a very small amount of uncertainty would influence people's WTP and expected enjoyment.

There are several possibilities for how modifying the likelihoods of receiving the better and worse outcomes could affect people's valuations of the different prospects. One possibility is that when the probabilities of receiving a particular outcome are very close to certainty, people evaluate the nearly certain prospect the same as a certain prospect. In fact, the original uncertainty effect paper (Gneezy et al., 2006) found that with both a lottery in which the better outcome was nearly certain and in which the worse outcome was nearly certain, the uncertainty effect was eliminated: people were willing to pay at least as much as the worst possible outcome. Therefore, this possibility would predict that people would be willing to pay at least as much for an uncertain movie as the worst possible movie.

A second possibility is that any amount of uncertainty is treated the same. In other words, people may react to the mere presence of uncertainty and may not be sensitive to changes in the likelihoods. This second account would predict that people would be willing to pay the same amount for all the lotteries and that people would expect to enjoy all the uncertain movies the same amount.

A final possibility is that people may be sensitive to the different likelihoods and take this into account when making their evaluations. This final account would predict that when the better outcome is more likely, people's valuations of the uncertain prospect would increase, and when the better outcome is less likely, people's valuations of the uncertain prospect would decrease.

Study 3 was designed to find out which of these explanations was supported, and to examine how changing the likelihoods of the better and worse outcomes influenced people's WTP and expected enjoyment.

Method

One thousand six participants completed an online survey on Amazon's Mechanical Turk for $0.40.[9] *Procedure*

Study 3 used a 5 (Certainty: Good vs. Better vs. Uncertain 50% vs. Uncertain 1% vs. Uncertain 99%) x 2 (Value: WTP vs. Enjoyment) between-subjects design. The procedure and materials were the same as Study 2 with two exceptions: (1) we used new trailers (the movies were "Big Hero 6" and "Penguins of Madagascar"), and (2) in addition to the 3 conditions in Study 2 (Good: n = 200; Better: n = 205; Uncertain 50%: n = 201), we included two additional conditions: Uncertain 1% (participants were asked about a lottery in which the better outcome was 1% likely and the worse outcome was 99% likely; n = 201), and Uncertain 99% (a lottery in which the better outcome was 99% likely and the worse outcome was 1% likely; n = 199). To differentiate between the new conditions, the original Uncertain condition will from hereon be referred to as Uncertain 50%.

Results and Discussion

WTP. Participants in the Good condition were willing to pay less ($M = \$5.77$, $SD = \$4.65$, Median = \$5) than participants in the Better condition ($M = \$8.06$, $SD = \$3.58$, Median = \$8; $t(403) = 5.56$, $p < .001$, $d = .55$). Replicating the uncertainty effect, participants in the Uncertain 50% condition were willing to pay even less ($M = \$3.75$, $SD = \$2.93$, Median = \$3) than participants in the Good condition, $t(399) = 5.21$, $p < .001$, $d = .52$.

Central to the purpose of this study, WTP showed a linear pattern with increasing likelihood of obtaining the better outcome. Participants in the Uncertain 1% condition were willing to pay marginally less ($M = \$3.06$, $SD = \$4.62$, Median = \$1) than those in the Uncertain 50% condition ($t(400) = 1.79$, $p = .07$, $d = .18$), and significantly less than participants in the Good condition, $t(399) = 5.85$, $p < .001$, $d = .58$.

Participants in the Uncertain 99% condition were willing to pay ($M = \$5.93$, $SD = \$22.29$, Median = \$5) marginally more than those in the Uncertain 1% condition, $t(398) = 1.79$, $p = .07$, $d = .18$, and non-significantly more than participants in the Uncertain 50% condition, $t(398) = 1.37$, $p = .17$. Participants in the Uncertain 99% condition also did not differ in their WTP from the participants in the Good condition, $t(397) = .10$, $p = .92$ (see Figure 3).

Enjoyment. Participants in the Better condition expected to enjoy the movie more ($M = 5.75$, $SD = 1.28$) than participants in the Good condition ($M = 4.18$, $SD = 1.63$; $t(403) = 10.80$, $p < .001$, $d = 1.07$). Replicating Study 1, participants in the Uncertain 50% condition expected to enjoy the movie ($M = 5.20$, $SD = 1.24$) significantly more than participants in the Good condition ($t(399) = 7.05$, $p < .001$, $d = .70$). Unlike Study 1, participants in the Uncertain 50% condition expected to enjoy the movie significantly less than participants in the Better condition, $t(400) = 4.40$, $p < .001$, $d = .44$.

As with WTP, expected enjoyment showed a linear pattern with increasing likelihood of obtaining the better outcome. Participants in the Uncertain 1% condition expected to enjoy the movie more ($M = 4.76$, $SD = 1.60$) than participants in the Good condition ($t(399) = 3.60$, $p < .001$, $d = .36$), but less than participants in the Uncertain 50% condition ($t(400) = 3.08$, $p = .002$, $d = .31$). Participants in the Uncertain 99% condition expected to enjoy the movie more ($M = 5.89$, $SD = 1.23$) than participants in the Uncertain 50% condition ($t(398) = 5.59$, $p < .001$, $d = .56$) and just as much as those in the Better condition, $t(402) = 1.12$, $p = .26$ (see Figure 3).

Collectively, these results demonstrate that both expected enjoyment and WTP were sensitive to changes in the likelihoods of the better and worse outcomes. Increasing the likelihood of the better outcome (Uncertain 99% condition) increased WTP and decreasing the likelihood of the better outcome (Uncertain 1% condition) decreased expected enjoyment. Nonetheless, though both expected enjoyment and WTP were sensitive to changes in likelihoods, people always expected to enjoy uncertain prospects more than the worse outcome, but at the

same time, people were WTP less for uncertain prospects than the worse outcome except when the better outcome was near certain as in the case of the Uncertain 99% condition. Furthermore, the Uncertain 99% condition, which asked about a prospect in which the better outcome was nearly certain, reached as high as the better outcome for expected enjoyment, but only reached as high as the worse possible outcome for WTP.

Study 4: Expected Dislike and Compensation Demanded With Negative Outcomes

Studies 1 – 3 focused on uncertainty in the realm of positive outcomes. In doing so, the previous studies allowed us to examine the aversiveness of uncertainty itself. Nevertheless, by examining the negative domain (i.e., expected dislike and compensation demanded for two negative possible outcomes), we would learn more about how these effects are operating. Thus, Study 4 was designed to determine whether uncertainty is always positive with rating measures and always negative with pricing measures.

Specifically, for expected dislike (i.e., a rating measure comparable to expected enjoyment in the positive domain), we would learn: (a) whether rating measures always elicit hope (i.e., people always assume that they will receive the better option regardless of the valence of the possible outcomes), or (b) whether rating measures of value always tends toward the more extreme outcome under uncertainty (i.e., people assume that they will receive the better option when the possible outcomes are positive, but assume that they will receive the worse option when the possible outcomes are negative).

For compensation demanded, we would learn: (a) whether pricing measures always elicit fear (i.e., compensation demanded for the uncertain prospect would exceed the compensation demanded for the worse of two negative possible outcomes), or (b) whether fear is not due to pricing itself, but due to the idea of payment and spending your own money (i.e., compensation demanded for the uncertain prospect would display a more rational response).

Method

Six hundred two participants completed an online survey on Amazon's Mechanical Turk for $0.15. *Procedure*

Study 4 used a 3 (Certainty: Bad vs. Worse vs. Uncertain) x 2 (DV: Dislike vs. Compensation Demanded) between-subjects design. Participants were asked to imagine that they worked in a dormitory where the tasks rotate between the workers. In the Bad condition, participants were asked about the task of washing dishes for 20 people who ate at the dormitory cafeteria. In the Worse condition, participants were asked about the task of cleaning three stalls in a dormitory bathroom after a weekend of use. These tasks were adapted from McGraw, Shafir, and Todorov (2010), and we expected that cleaning the bathroom stalls would be worse than washing dishes. In the Uncertain condition, participants were asked about a lottery between the two tasks in which they would for sure be assigned to one of the two tasks with equal probability. Participants were randomly assigned to report either: (a) how much they would dislike the task, or (b) how much they would have to be paid to complete the task (compensation demanded).

Measures

Dislike. Participants rated how much they expected to dislike the task using a single item: "How much do you think you will dislike your task?" on a 11-point scale (1 = Not At All; 11 = Very Much).

Compensation demanded. In the Bad and Worse conditions, participants were asked how much they would have to be paid to complete the task. In the Uncertain condition, participants

were asked how much they would have to be paid to be entered in a lottery which would assign them to one of the two tasks with equal probability.

Results and Discussion

Dislike. As expected, participants expected to dislike the Worse task ($M = 9.21$; $SD = 2.89$) significantly more than they expected to dislike the Bad task ($M = 7.61$, $SD = 2.93$), $t(199) = 3.90$, $p < .001$, $d = .55$.

Consistent with the previous studies, participants expected to dislike the uncertain task ($M = 8.11$; $SD = 2.13$) significantly less than participants expected to dislike the Worse task, $t(200) = 3.08$, $p < .001$, $d = .43$, and non-significantly more than the Bad task, $t(199) = 1.38$, $p = .17$ (see Figure 4). That is, participants expected that an uncertain prospect would not be as bad as the worst outcome.

Compensation demanded. There was an extreme outlier in the Worse condition (z-score = 9.95; demanded to be paid \$200,000 to complete the worse task). Including the outlier, participants needed to be paid non-significantly more to complete the Worse task ($M = \$2171.62$, $SD = \$19884.22$, Median = \$100) than to complete the Bad task ($M = \$34.31$, $SD = \$60.01$, Median = \$20), $t(199) = 1.08$, $p = .28$. Participants demanded to be non-significantly to complete the Worse task than to be entered into a lottery between the two tasks (Uncertain condition; $M = \$562.53$, $SD = \$1645.85$, Median = \$100), $t(198) = .80$, $p = .42$.

When excluding the outlier in the Worse condition, as expected, participants needed to be paid significantly more to complete the Worse task ($M = \$193.34$, $SD = \$330.46$, Median = \$100) than to complete the Bad task, $t(198) = 4.74$, $p < .001$, $d = .67$. Moreover, consistent with WTP in the positive domain, participants demanded to be paid more to be entered into a lottery between the two tasks than to complete the Worse task, $t(197) = 2.20$, $p = .03$, $d = .31$. (see Figure 4).

These results suggest that uncertainty is positive when elicited through rating measures (i.e., expected enjoyment and dislike), regardless of the valence of the possible outcomes. On the other hand, uncertainty is negative when elicited through pricing measures (i.e., WTP and compensation demanded), regardless of whether they require payment on behalf of the person or not. Why is it that uncertainty is devalued with WTP but valued with expected enjoyment? Studies 5 – 7 were designed to test three different possible explanations.

Study 5: Adding Stakes in Enjoyment

In the studies we presented so far, the expected enjoyment findings are devoid of any investment in that participants in the Uncertain conditions are asked to imagine being entered into a lottery without any investment. It is possible that people value uncertain prospects that do not contain an element of potential loss (as with expected enjoyment in the previous studies) and devalue uncertain prospects that do contain an element of potential loss (as with WTP in the previous studies). This begs the question of whether expected enjoyment allows people to have hope simply because they have no stakes in the outcome of the uncertain prospect. Study 4 was designed to test this explanation by examining whether adding stakes would influence how much people expected to enjoy an uncertain prospect compared to a certain one.

Method

Three hundred four participants completed an online survey on Amazon's Mechanical Turk for \$0.40.

Procedure

Study 5 used a 3 (Certainty: Good vs. Better vs. Uncertain) x 2 (Stakes: Original vs. Payment Information) between-subjects design. The procedure and materials were the same as Study 2 with three exceptions: (1) we used new trailers (the movies were "3 Days to Kill" and "Non-Stop"), (2) we added an additional factor of Stakes in which half of the participants were first asked to imagine having paid $7 for the prospect (Payment Information condition), and (3) participants were only asked to report their expected enjoyment because the objective of this study was to examine whether including this factor of Stakes influenced how much uncertain prospects were valued.

If investment was the key reason for the effect of uncertainty on enjoyment, we would expect that for those in the Payment Information conditions, participants' enjoyment of the Uncertain prospect would no longer be significantly higher than participants' enjoyment of the Good prospect.

Results and Discussion

There was a main effect of Certainty, $F(2, 298) = 26.32$, $p < .001$. Participants in the Better condition expected to enjoy the movie more ($M = 5.54$, $SD = 1.40$) than participants in the Good condition ($M = 4.09$, $SD = 1.50$), $t(202) = 7.19$, $p < .001$, $d = 1.01$. Replicating our previous studies, participants in the Uncertain condition expected to enjoy the movie ($M = 5.19$, $SD = 1.55$) significantly more than participants in the Good condition ($t(201) = 5.16$, $p < .001$, $d = .72$), and marginally less than participants in the Better condition ($t(199) = 1.71$, $p = .09$).

There was also a main effect of Stakes, $F(1, 298) = 5.09$, $p = .03$, $d = .28$. Having stakes in the prospect (Payment Information condition) decreased expected enjoyment of the movie ($M = 4.71$, $SD = 1.68$) compared to the Original condition ($M = 5.16$, $SD = 1.50$).

Most importantly, there was no interaction between Certainty and Stakes, $F(2, 298) = .25$, $p = .78$ (see Figure 5). That is, having stakes involved did not change the pattern of results with expected enjoyment: participants still expected to enjoy the Uncertain prospect more than the Good prospect. Thus, even when having an investment in the prospect, uncertainty is still positive with expected enjoyment. This provides stronger evidence that direct risk aversion cannot fully account for the uncertainty effect, because when measuring value with expected enjoyment, people are not risk-averse.

Study 6: Anticipated versus Anticipatory Emotion

Past literature has noted that there is a crucial difference between *anticipated emotion* (the positive emotion that people predict they will feel when experiencing the positive outcome) and *anticipatory emotion* (the negative emotion that people feel in response to risk; see Loewenstein et al., 1999 for a review). Perhaps we find a discrepancy between enjoyment and WTP because in our studies, enjoyment clearly measures *anticipated emotion*, whereas WTP may instead be reflecting people's *anticipatory emotion*.

Study 6 attempted to address this issue by resolving uncertainty at different times, either resolving uncertainty immediately or delaying it for a month. By resolving uncertainty immediately, we decrease the length of time in which people would feel an *anticipatory emotion*, such as dread and anxiety. Thus, if WTP is driven by anticipatory emotion, we would expect that people would be willing to pay more for an uncertain prospect when the uncertainty is resolved immediately rather than resolved at a later time.

Method

Three hundred ninety-one participants completed an online survey on Amazon's Mechanical Turk for $0.10.[10]

Procedure

Study 6 included 5 conditions altogether, according to a 2 (Certainty: Certain vs. Uncertain) x 2 (Receive: Now vs. Later) between-subjects factorial design, with an additional Uncertain condition (Uncertain Resolve Now condition) in which participants were asked about an uncertain prospect that they would receive later but would find out the outcome of now.

Participants were asked to report their WTP for a prospect. In the Certain condition, participants were asked about their WTP for a $50 Barnes & Noble gift card. In the Uncertain condition, participants were asked about their WTP for a lottery that would for sure give them either a $50 Barnes & Noble gift card or a $100 Barnes & Noble gift card with equal probability.

Because the main purpose of this study was to examine whether *resolving* uncertainty now or later would alter people's WTP, there was an an Uncertain Resolve Now condition in which participants would receive the outcome of the lottery a month later *but* find out the outcome of the lottery now, and an Uncertain Later condition in which participants would receive a lottery ticket a month later at which point they would find out the outcome of the lottery. To ensure that the uncertainty effect held when there was a delay in when the outcomes were received, we included a Certain Later condition in which participants were asked about certain gift card that they would receive later. Finally, to disentangle the effects of receiving an outcome now versus resolving uncertainty now, we included both a Certain Now condition in which participants would receive a certain gift card now and a Uncertain Now condition in which participants would receive a lottery now *and* resolve the uncertainty now.

Hence, the five conditions were: Certain Now (receive certain gift card now), Uncertain Now (receive outcome now and find out outcome of lottery now), Certain Later (receive certain gift card later), Uncertain Later (receive outcome later and find out outcome of lottery later), and Uncertain Resolve Now (receive outcome later but find out outcome of lottery now).

Results and Discussion

Replicating the uncertainty effect, people were willing to pay less for the lottery than for ($M = \$21.21$, $SD = \$18.89$) than for the certain $50 gift card ($M = \$34.92$, $SD = \$13.30$), $F(1, 310) = 57.97$, $p < .001$, $d = .84$. Demonstrating a temporal discounting effect, people were willing to pay less for a prospect that they would receive one month later ($M = \$24.01$, $SD = \$15.61$) than for a prospect that they would receive now ($M = \$32.11$, $SD = \$18.69$), $F(1, 310) = 19.69$, $p < .001$, $d = .47$. There was no interaction between the Certainty and Receive factors, $F(1, 310) = .83$, $p = .36$.

Focusing on the critical comparisons (see Figure 6), both participants in the Uncertain Later condition ($M = \$16.42$, $SD = \$14.87$, Median = $10) and participants in the Uncertain Resolve Now condition ($M = \$19.60$, $SD = \$18.99$, Median = $10) were WTP less than participants in the Certain Later condition ($M = \$31.69$, $SD = \$12.29$, Median = $30), $t(153) = 6.96$, $p < .001$, $d = 1.12$, and $t(152) = 4.69$, $p < .001$, $d = .76$, respectively. Most notably, we found that there was no added utility of resolving the uncertainty sooner rather than later. Specifically, there was no difference in WTP between the Uncertain Later and the Uncertain Resolve Now conditions, $t(153) = 1.16$, $p = .25$. This provides evidence that our effect was not merely reflecting the discrepancy between *anticipated emotion* in enjoyment versus people's *anticipatory emotion* in WTP.

Study 7: Perceived Value

Why is it that people are seemingly irrational in their WTP? One potential explanation is that people may simply have a low reference point of how much they think uncertain prospects

are worth. Indeed, Yang et al. (2013) suggested this possibility as an explanation in their uncertainty effect paper. They proposed that under uncertainty, buyers have a lower reference point in their WTP, whereas sellers have a higher reference point in their willigness-to-accept. However, as sellers, people may be motivated to sell products at a higher price than the actual value. Therefore, in Study 7, we tested whether people actually perceive uncertain prospects as being of lower value by asking people about how much they believed prospects were sold for.

Method

Five hundred two participants completed an online survey on Amazon's Mechanical Turk for $0.15.[11]

Procedure

Study 7 used a 2(Certainty: Certain vs. Uncertain) x 2(Perceived Worth: WTP vs. Perceived Selling Price) between-subjects design. Participants were randomly assigned to one of the two certainty conditions and asked to report either: (1) how much they would be willing to pay for the prospect, or (2) how much they thought the prospect would be sold for by the company.

Measures

WTP. In the Certain condition, participants were told that Whole Foods was selling a $50 gift card. Participants were asked to report the highest amount they would be willing to pay for a $50 Whole Foods gift card. In the Uncertain condition, participants were told that Whole Foods was selling a lottery ticket that would for sure give them either a $50 Whole Foods gift card or a $100 Whole Foods gift card with equal probability. Participants were asked to report the highest amount they would be willing to pay for this lottery ticket.

Perceived Selling Price. In the Certain condition, participants were again told that Whole Foods was selling a $50 gift card. Participants were asked to report how much they thought Whole Foods would sell this gift card for. In the Uncertain condition, participants were told that Whole Foods was selling a lottery ticket that would for sure give them either a $50 Whole Foods gift card or a $100 Whole Foods gift card (with equal probability. Participants were asked to report how much they thought Whole Foods would sell this lottery ticket for.

Results and Discussion

There was a main effect of Certainty, $F(1, 498) = 24.29$, $p < .001$, $d = .43$. Participants in the Uncertain condition reported lower prices for the lottery ($M = \$36.38$, $SD = \$27.45$) than for the Certain gift card ($M = \$45.22$, $SD = \$8.75$). There was also a main effect of Perceived Worth, $F(1, 498) = 19.45$, $p < .001$, $d = .39$. Participants' WTP was lower ($M = \$36.84$, $SD = \$18.19$) than participants' perceived selling price ($M = \$44.76$, $SD = \$22.52$). Importantly, there was no interaction between Certainty and Perceived Worth, $F(1, 498) = .32$, $p = .57$ (see Figure 7).

This advances the idea that the uncertainty effect occurs because uncertain prospects evoke different reference prices – namely, perceived selling price. If people believe that uncertain products are sold for a lower price than the worst outcome, then it is rational to be WTP less for the uncertain product than the worst outcome as well.

General Discussion

Uncertainty gives rise to a multitude of reactions, both positive (hope, excitement) and negative (fear, anxiety). When faced with uncertainty, which response prevails? Across several experiments, we found that people's responses to uncertainty depend on how the evaluation is measured. Specifically, with pricing tasks (i.e., WTP), people devalue uncertainty, thereby willing to pay less for an uncertain prospect than the worst possible outcome. Conversely, with

rating tasks (i.e., expected enjoyment), people value uncertainty, expecting to enjoy the uncertain prospect more than the worst possible outcome. Put another way, with uncertain prospects, people appear to be irrational when they reporting value with pricing measures, but display rational responses when reporting value with rating measures. These effects are sensitive to changes in likelihoods of better and worse outcomes (Study 3), and hold in the negative domain (Study 4), such that people demand to be compensated more for an uncertain prospect than the worst possible outcome, but expect to dislike the uncertain prospect less than the worst possible outcome. Moreover, the discrepancy between pricing and rating measures is not explained by a lack of information about payment with rating measures (Study 5), nor is it explained by the difference between anticipated versus anticipatory emotions (Study 6). There was compelling evidence that perceived selling price provides a reference point for pricing measures (Study 7). This could explain why WTP for uncertain prospects is low while rating measures, which should be unaffected by this reference point, for uncertain prospects is high.

Implications

The present research helps elucidate when uncertainty is valued or devalued. For instance, in the medical field, people are often reluctant to undergo genetic testing to find out whether they are susceptible to an incurable disease, such as Huntington's disease (e.g., Quaid & Morris, 1993). Our findings could help explain why people may avoid learning whether they have or are carriers for diseases such as Huntington's. Specifically, in Study 4, we found that people dislike uncertain negative prospects significantly less than they dislike the worst outcomes. In the same way, people may expect to dislike the worse news of being a carrier more than they dislike the uncertainty of whether they are a carrier or not. On the positive side, for expectant parents, our research suggests that people will more positively anticipate their baby when there is uncertainty – for example, about the gender of the baby. However, in the case of surrogacy, it is likely that people would be willing to pay less for a surrogate baby when they don't know the gender of the baby.

An important theoretical implication of this work concerns WTP (and other pricing measures) as a measure of preference. WTP is a complex measure that takes multiple factors into consideration (e.g., Amir & Ariely, 2007), including reference prices, one's own valuation, and subjective probabilities. Although WTP allows researchers to put a face-valid economic value on people's preferences, the noisiness of the measure can often be problematic. Our research suggests that not only is WTP a noisy measure, but WTP is sensitive to a host of factors that obscure people's actual preferences and at times, can even erroneously appear to be a reflection of irrational preferences. When attempting to measure people's valuations and preferences, more direct measures of preference, such as rating measures, may be more accurate reflections of people's preferences and exhibit more rational patterns of preference. Nevertheless, pricing measures are still useful for determining purchase behavior. One interesting avenue for future research could examine what the differential consequences of these various measures of value predict. It is possible that expected enjoyment influences willingness-to-participate in uncertain promotions but that WTP influences purchase decisions of uncertain products. Given the prevalence of uncertain prospects in everyday life, future research should investigate the consequences of these different valuations of uncertainty.

Related Phenomena

Disjunction effect. Tversky and Shafir (1992) found that when faced with uncertainty, people make different choices than when faced with any sure outcome. For example, when deciding on whether or not to go on a vacation after an exam, a student may choose not to go on

that vacation when they don't know whether they passed or failed that exam. However, if that person knew for sure that they passed the exam, they would choose to go on vacation to celebrate, and if that person knew for sure that they failed the exam, they would also choose to go on vacation but in this case, to cheer themselves up. Because the act of thinking through the consequences of the different outcomes is difficult, under uncertainty, people fail to recognize that they would go on the vacation no matter what the outcome. Similar to the disjunction effect, the uncertainty effect illustrates that people are willing to pay less for an uncertain prospect than any of the possible outcomes, which could suggest that people pay less for the uncertain prospect simply because people do not like to think through possibilities in the face of uncertainty. However, contrary to that explanation, we find that people are not entirely irrational, because they are sensitive to likelihoods of the different outcomes (Study 3), which shows that do process information even under uncertainty. Moreover, even if people did not think through the possibilities of uncertain prospects, there is no reason to believe that people would be influenced by uncertainty in opposing ways for WTP and expected enjoyment, which gives us reason to believe that the disjunction effect does not account for our results.

Preference reversals. People have been found to exhibit inconsistent preferences with regards to risky prospects (called "preference reversals"; e.g., Lichtenstein & Slovic, 1971). The classic example demonstrated that when evaluating two different gambles: (1) a gamble with a high probability of winning a small outcome (*high-probability gamble*), and (2) a gamble with a low probability of winning a large outcome (*large-outcome gamble*), participants report that they would choose to play the high-probability gamble over the large-outcome gamble, but for the same set of gambles, the same participants report willing to pay more for the large-outcome gamble than the high-probability gamble. This occurs because when people make choices, probabilities of winning and losing are weighted more heavily, whereas when people make pricing estimates, outcomes are weighted more heavily. Consequently, pairs of gambles exist in which people will choose one gamble but will assign a higher price for the other gamble. Though our effects are between-subjects (i.e., participants do not evaluate both the certain and uncertain prospects), our findings provide additional evidence that preferences are constructed by demonstrating another context in which people's preferences diverge.

Cognition versus affect. Although we provided evidence that WTP may be driven by the salient reference price of perceived selling price (Study 7), there are other differences between WTP and expected enjoyment that could also account for the discrepancies in the value of uncertain prospects. One such difference is that WTP is a more cognitive measure, whereas expected enjoyment is a more affective measure. This distinction is similar to ones made in the past literature, such as: affect-poor versus affect-rich and monetary versus nonmonetary. Research has found that people are more rational with regards to affect-poor gambles than affect-rich measures (i.e., they are more sensitive to probability information with affect-poor gambles; Rottenstreich & Hsee, 2001). Similarly, monetary gambles are more sensitive to probability information than nonmonetary gambles (McGraw et al., 2010). Hsee and Rottenstreich (2004) suggest that these types of findings occur because people arrive at their valuation of a prospect by different processes: valuation by calculation or valuation by feeling. Though these studies focused on different types of outcomes rather than on different types of elicitation methods, one could predict that our findings match up with these distinctions. However, the findings we report here do not align with these distinctions. We found that people were irrational with WTP but rational with expected enjoyment. Furthermore, expected enjoyment displayed a clearer pattern of sensitivity to probability information than WTP.

Limitations and Future Directions

There are several opportunities for future research. First, because we never specified which movie participants in the Uncertain condition would be watching, it is unclear what participants in this condition were responding to when they reported their expected enjoyment. One possibility is that participants substituted this question with the question of how much they enjoy movies in general. We believe this is unlikely given that: (a) participants watch trailers of the two possible movies before providing their ratings and in the case of Study 1, they know they will actually watch one of the two possible movies, and (b) in Study 3, we found that participants are sensitive to the changes in likelihood of the possible movies, which suggests that people do not simply respond to the question of how much they enjoy movies in general, a response that should be stable. Nevertheless, it is possible that the ambiguity of the question in the Uncertain condition caused people to provide ratings that were oftentimes as high as the better movie.

Second, another difference between WTP and expected enjoyment is that within the measure of WTP, there is a question of whether they would like to opt into the prospect. That is, people who respond that they would be willing to pay $0 for a prospect are indicating that they would choose not to watch the movie at any price. On the other hand, expected enjoyment asks the question of whether people expect to enjoy the movie after it has already been decided that they are watching. Future research could investigate whether people's ratings of wanting to watch the movie (or likeliness of watching the movie) shows the same pattern as expected enjoyment.

Third, in Study 7, we found that people also expect companies to sell uncertain products at a much lower price than the worst possible outcome. Again, if uncertain products are thought to be sold at a lower price than the worst outcome, this would provide a rational explanation for why the uncertainty effect occurs. This offers a couple opportunities for future research: (a) future research should explore whether the reference price of perceived selling price can be altered, and (b) in order for people to more positively value uncertainty, future research could explore whether framing uncertain prospects in terms of experiences (e.g., expected enjoyment) instead of expenditures (e.g., WTP) could allow people to value uncertainty.

Finally, although we provide evidence that perceived selling price accounts for the uncertainty effect, it is unclear whether compensation demanded in Study 4 can be explained by the same account. It is possible that people have a rational reference point for compensation demanded for uncertain negative tasks as well. However, uncertain negative tasks, such as the one we described in Study 4, are uncommon in the real world, and thus, it is less obvious what that reference point would be. For an uncertain negative task without a clear monetary value to demonstrate an effect parallel to the uncertainty effect with WTP in the positive domain is a curious finding that future research should investigate further.

Conclusion

The present research provides a major insight into people's preferences under uncertainty that violates assumptions of a prospect's value. Economists and judgment and decision making researchers have worked under the assumption that WTP and expected enjoyment are interchangeable measures of value (e.g., Kahneman et al., 1999). However, our studies document cases which deviate from this assumption. Complementing the research on preference reversals for gambles (e.g., Lichtenstein & Slovic, 1971), we find that people expect to enjoy uncertain prospects but are less willing to pay for them. We offered evidence that this discrepancy occurs because people perceive uncertain prospects as being sold at lower prices. This account

recommends that though pricing measures may be invaluable in predicting purchase behavior, rating measures may be more informative for revealing people's preferences.

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Footnotes

[1] Although unusual, this is one way to book flights on Germanwings, a German-based airline. It was also the original business model for a couple start-ups, such as getgoing.com.

[2] Interestingly, Simonsohn (in prep) also demonstrated that the uncertainty effect remains when using multiple-price *sequences*—that is, when asking about the different prices one-by-one on separate screens rather than in a list form.

[3] The WTP for these lotteries was less than the WTP for the original lottery between the $50 and $100 gift certificates, demonstrating that people are sensitive to the discrepancy between the outcomes. Nevertheless, the effect that people valued lotteries less than their worst possible outcome remained significant with the equal outcome lottery and the smaller discrepancy lottery, which indicates that disappointment aversion cannot account for the uncertainty effect.

[4] We attempted to recruit 50 participants per cell in Studies 1, 2, 4, and 5.

[5] This pre-survey was the first part of a three-part study. Only the pre-survey is relevant for this paper and therefore, the other parts of the three-part study will not be discussed further.

[6] In Study 1, we also asked participants two questions after each movie trailer (and prior to the manipulation): (1) how much they enjoyed the trailer, and (2) how much they wanted to see the movie.

[7] Although "Frozen" was ultimately much more successful than "Free Birds," prior to the movies premiering, participants were essentially indifferent to the two movies (about half ranked each of the movies as being the one they liked more).

[8] Although there was a significant interaction between the certainty condition and the order of the measures for both enjoyment and WTP in this study, this interaction was not hypothesized nor did it alter the pattern of results that we report. Additionally, this interaction was not significant in Study 7. Therefore, we do not discuss it further.

[9] Because of the large number of cells in Study 3 (a 5 x 2 between-factors design), we attempted to recruit 100 participants per cell.

[10] Study 6 was a replication of a study we conducted with slight tweaks. Because the previous study did not demonstrate a well-known effect (that of temporal discounting), we increased our sample size when running Study 6 to 75 participants per cell.

[11] Study 7 was also a replication of a study we conducted with slight tweaks. As in Study 7, the previous version did not show an interaction between Certainty and Perceived Worth. Unlike Study 7, in the previous study, we found that there was no significant difference between the certain and uncertain prospects for perceived selling price. Therefore, Study 7 was a replication

with more participants (75 participants per cell) to determine whether there was a significant interaction.
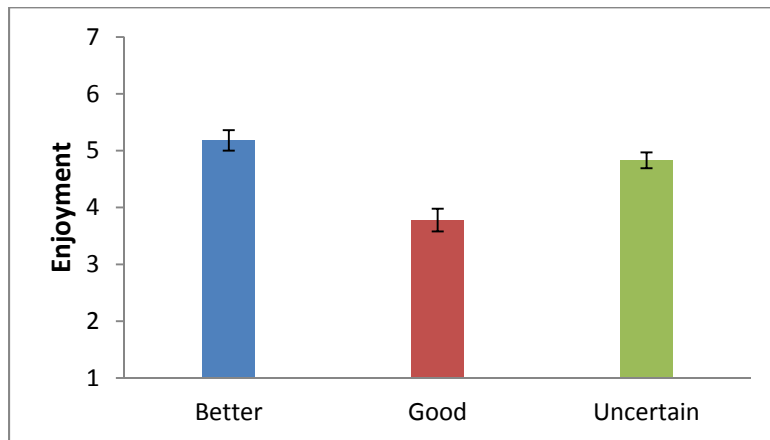
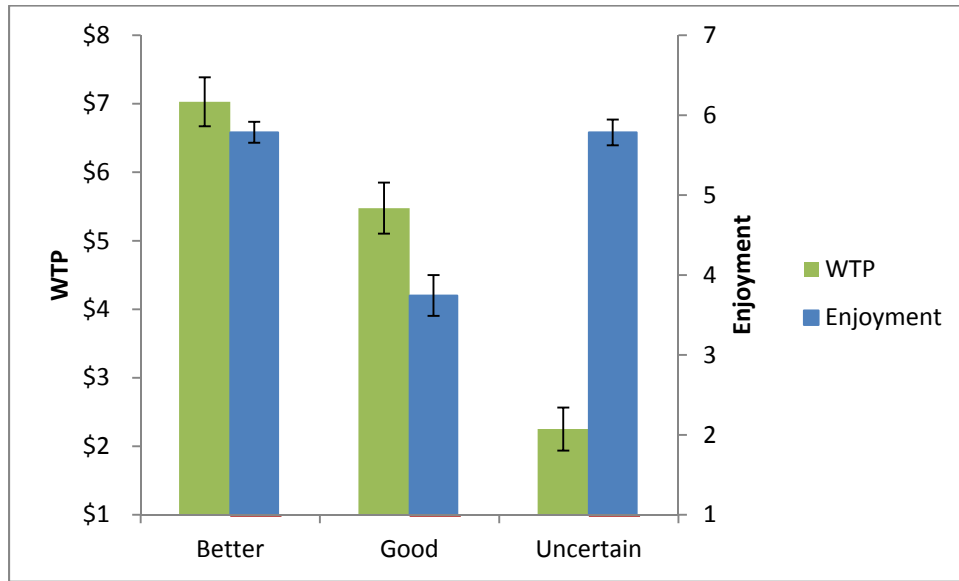*Figure 1*. Expected enjoyment of a certain or an uncertain movie in Study 1.

Figure 2A. Mean willingness-to-pay for and expected enjoyment of a certain or an uncertain movie in Study 2.
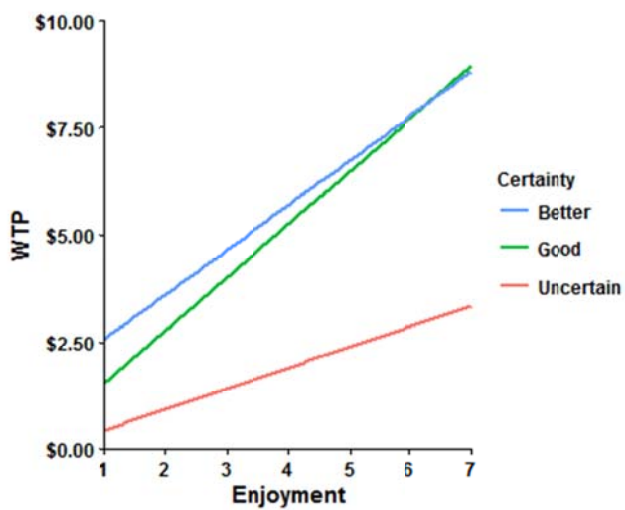
Figure 2B. The relationship between expected enjoyment and willingness-to-pay is attenuated in the Uncertain condition in Study 2.
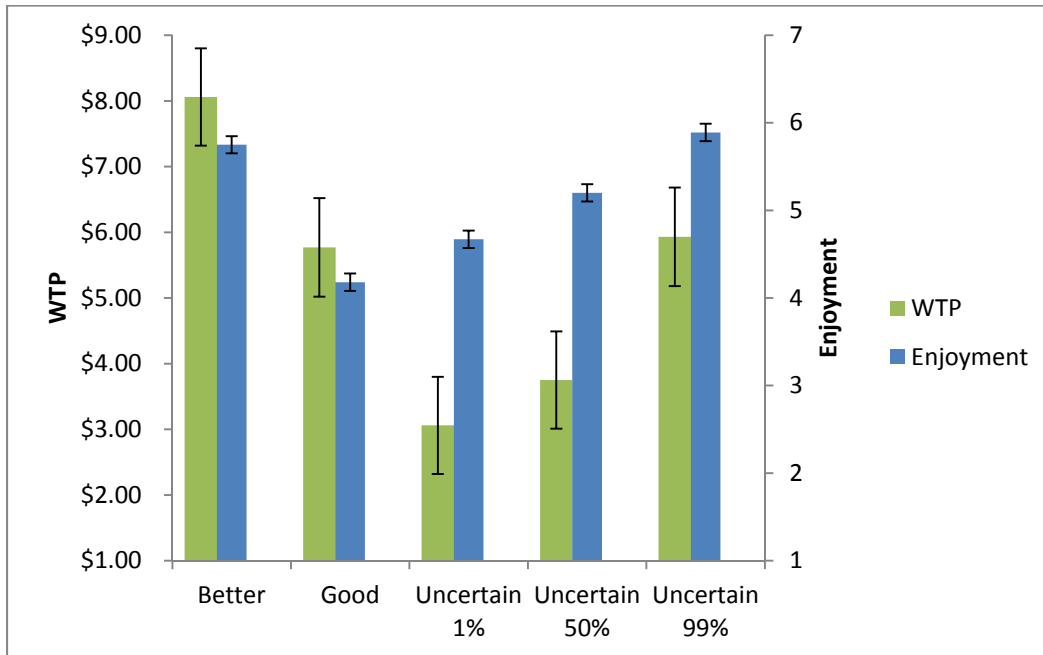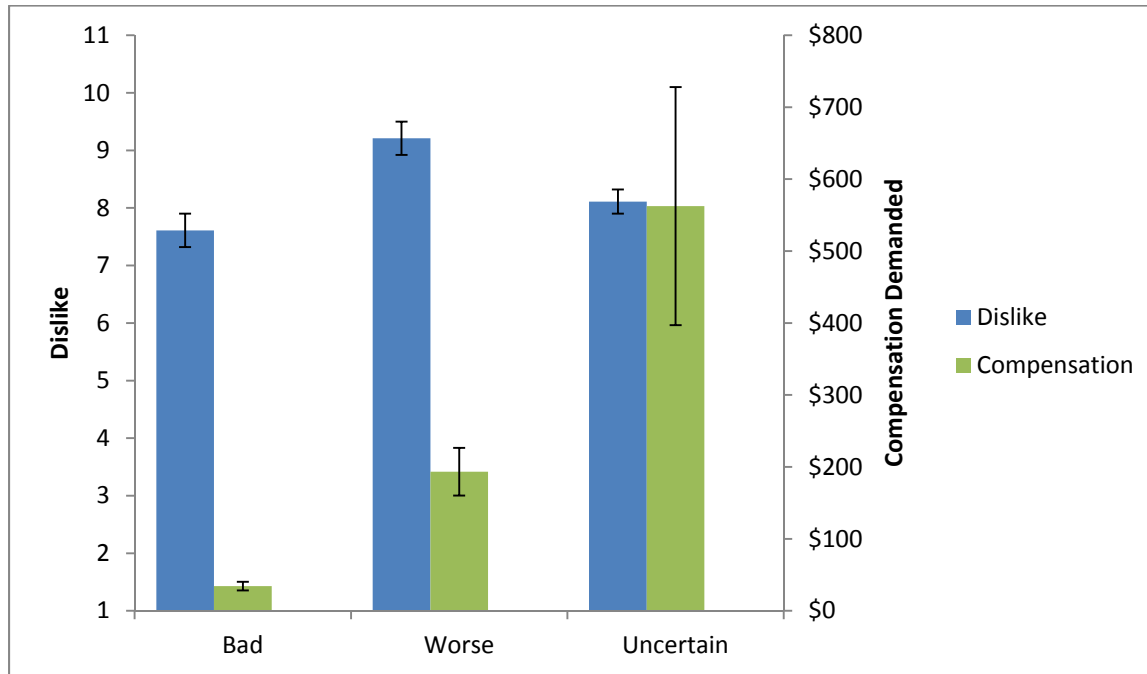
Figure 3. Mean willingness-to-pay for and expected enjoyment of a certain or an uncertain movie in Study 3.

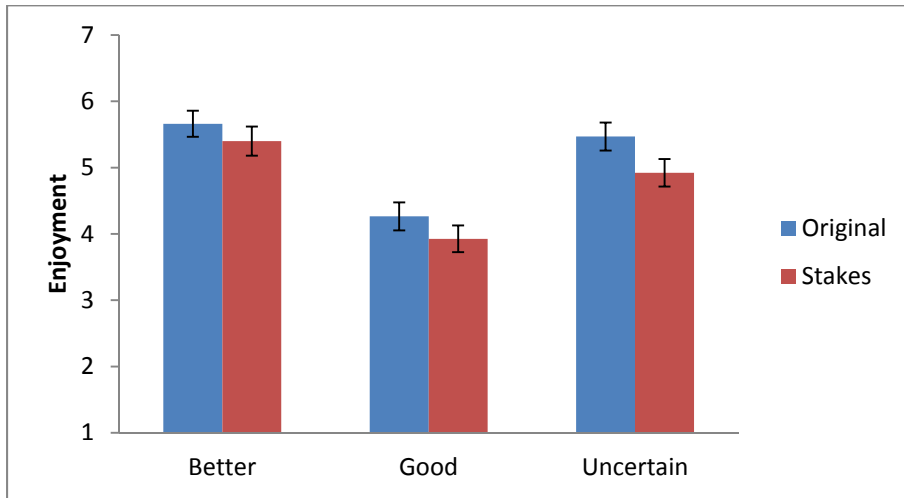*Figure 4.* Mean compensation demanded for and expected dislike of a certain or an uncertain task in Study 4.

Figure 5. Mean expected enjoyment for a certain or an uncertain movie when payment information is included (Stakes) or excluded (Original) in Study 5.
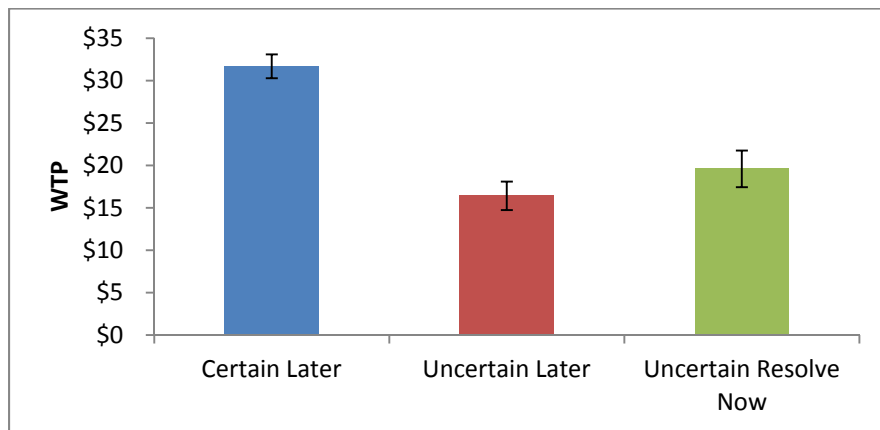
Figure 6. Mean willingness-to-pay for a certain gift card received one month later (Certain Later), an uncertain lottery between gift cards received one month later with uncertainty resolved one month later (Uncertain Later), and an uncertain lottery between gift cards received one month later with uncertainty resolved immediately (Uncertain Resolve Now) in Study 6.
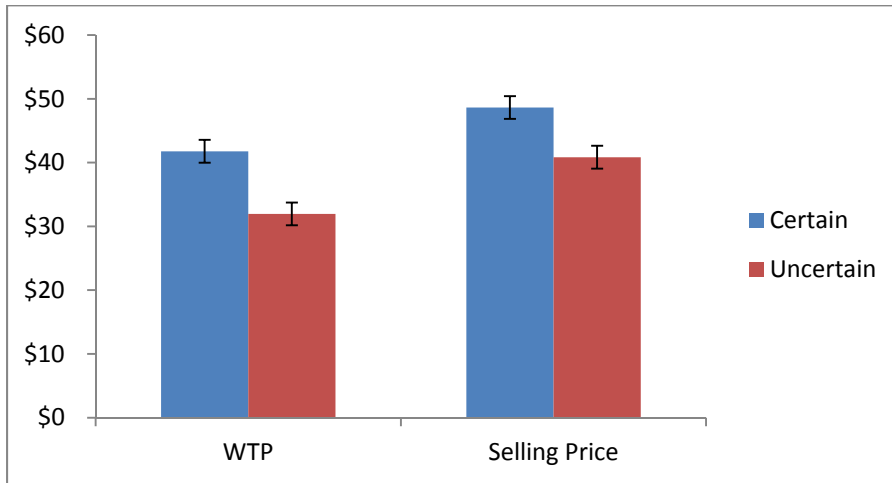
Figure 7. Mean willigness-to-pay and perceived selling price of certain and uncertain prospects in Study 7.