Uncertainty Increases the Reliance on Affect in Decisions

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Abstract

Uncertainty is an unavoidable part of human life. How do states of uncertainty influence the way people make decisions? We advance the proposition that states of uncertainty increase the reliance on affective inputs in judgments and decisions. In accord with this proposition, results from six studies show that the priming of uncertainty (vs. certainty) consistently increases the effects of a variety of affective inputs on consumers' judgments and decisions. Primed uncertainty is shown to amplify the effects of the pleasantness of a musical soundtrack (study 1), the attractiveness of a picture (study 2), the appeal of affective attributes (studies 3 and 4), incidental mood states (study 6), and even incidental states of disgust (study 5). Moreover, *both* negative and positive uncertainty increase the influence of affect in decisions (study 4). The results additionally show that the increased reliance on affective inputs under uncertainty does not necessarily come at the expense of a reliance on descriptive attribute information (studies 2 and 5), and that the increased reliance on affect under uncertainty is distinct from a general reliance on heuristic or peripheral cues (study 6).

Which dish should I order from the menu? How long is our flight going to be delayed by? Will the office party turn out as we expect? What am I going to receive as a gift for my birthday? Will people like my new outfit? What did she really mean when she made that strange comment? Is the world's climate fundamentally changing? Will there be another terrorist attack? As these examples illustrate, uncertainty comes in different forms and is an integral and unavoidable part of human life. Not surprisingly, the notion of uncertainty has played an important role in the social sciences, especially in the judgment and decision-making (JDM) literature where uncertainty is a critical dimension of the judgments or decisions to be made (Kahneman, Slovic, and Tversky 1982). However, as also illustrated by some of these examples, uncertainty is not just an integral dimension of many decisions (e.g., How much should I invest in stocks vs. bonds? How much insurance should I carry?), it is also a general characteristic of the broader environment in which decisions are made (e.g., making dinner choices while waiting for the results of a job interview; making management decisions while dealing with the personal uncertainty surrounding a messy divorce). In this research we investigate how states of uncertainty—that need not be related to the decisions that people face—influence the way people make decisions. In particular, we investigate how states of uncertainty (versus certainty) influence consumers' reliance on affect as an input in judgments and decisions.

A large body of work from multiple disciplines has shown that in judgments and decisions people do not rely solely on descriptive attribute information about the target, they also often rely on their subjective affective feelings toward the target (Bechara, Damasio, Tranel, and Damasio 1997; Pham 1998; Schwarz 2011; Schwarz and Clore 2007; Slovic, Finucane, Peters, and MacGregor 2002; Strack, Werth, and Deutsch 2006). For example, judgments of life satisfaction are often based on the pleasantness of how people feel as they reflect on their lives

(Schwarz and Clore 1983); voters' attitudes toward politicians are largely based on their subjective affect toward these politicians (Abelson, Kinder, Peters, and Fiske 1982); and product and consumption choices are often based on how consumers feel toward available alternatives (Pham 1998; White and McFarland 2009).

In this research we propose that states of uncertainty (vs. certainty) increase the reliance on affective inputs in decisions. We report six studies that provide four sets of results consistent with this proposition. First and foremost, the priming of uncertainty (vs. certainty) increases the effect of momentary feelings on consumers' decisions and product evaluations (studies 1, 2, 5, and 6). Second and consequently, the priming of uncertainty (vs. certainty) increases the relative preference for options that are affectively superior over options that are functionally superior (studies 3A–C and 4). Third, uncertainty linked to *both* negative and positive situations increases the influence of affect in decisions (study 4). Finally, uncertainty amplifies not just the effects of general positive versus negative affective feelings (studies 1–4 and 6), it also amplifies the effects of specific emotions such as disgust (study 5). Besides supporting our main theoretical proposition, our results additionally show that (a) the increased reliance on affective inputs under uncertainty does not necessarily come at the expense of a reliance on descriptive attribute information (studies 2 and 5), and (b) the increased reliance on affect under uncertainty is distinct from a general reliance on heuristic or peripheral cues (study 6).

UNCERTAINTY AND THE RELIANCE ON AFFECT

Uncertainty as a Mental State

While the economics and decision-making literatures often conceptualize uncertainty as a unitary construct that can be reduced to a probability distribution (Knight 1921; Edwards 1954), uncertainty has multiple dimensions (Bradley and Drechsler 2014; Kahneman and Tversky 1982;

Milliken 1987). As pointed out by various theorists (Bradley and Drechsler 2014; Milliken 1987), in addition to (a) uncertainty about the probability of alternative states of the world (e.g., will real estate values go up or down?), which is the most-often studied form of uncertainty (Knight 1921; Edwards 1954), there can be uncertainty about (b) what are the alternative states of the world in the first place (e.g., what could happen on a cruise?); (c) the consequences of alternative states of the world (e.g., what happens if a car's engine suddenly stops when driving?); (d) the evaluative implications of these consequences (e.g., if our 18-year-old son continues to live at home because he has been admitted to the local college, is this a good thing?); (e) the alternative options and courses of action (e.g., our flight got cancelled, what can we do?); (f) the consequences of our own actions and decisions (e.g., what will happen if I threaten the customer service person with complaining to their manager?); and (g) the causes of actions or outcomes (e.g., why did the car's engine stop suddenly?). In general, uncertainty increases with the number of factors that the person needs to consider and the dynamic (changing) nature of these factors (Duncan 1972).

It is important to note that it is only to the extent that it is relevant to the person's self that uncertainty—whether about states of the world, consequences, options, etc.—creates psychological states of uncertainty (Hogg 2007). For example, a consumer who does not know what the good neighborhoods are for staying at a hotel in New York City may not experience this lack of knowledge as genuine uncertainty unless he or she has to travel to New York. It is therefore important to examine uncertainty not just as an objective characteristic of the decision environment but as an experienced state of the individual (Bar-Anan, Wilson, and Gilbert 2009; Kagan 1972; van den Bos 2009). There is general agreement that as a mental state, uncertainty is characterized by a discrepancy between cognitive structures and perceptions (e.g., competing

mental representations of one's plane arriving on time vs. being delayed), a particular degree of psychological discomfort, and a motivation to resolve the uncertainty (Kagan 1972; Laurin, Kay, and Moscovich 2008; van den Bos 2009). Even uncertainty that is associated with positive events—for example, not knowing the sex of one's soon-to-be-born child, not knowing the content of an unwrapped gift, or not knowing who will be there at an anticipated cocktail party—involves conflicting cognitive structures, creates some level of psychological discomfort, and induces an urge to reduce the uncertainty.

States of Uncertainty and the Self

A great deal of research from different literatures suggests that people tend to experience states of uncertainty as threatening to the self (Hogg 2007; McGregor et al. 2001; van den Bos 2009). As Hogg (2007, p. 77) put it, states of uncertainty "challenge people's certainty about their cognition, perceptions, feelings, and behaviors, and ultimately, certainty about and confidence in their sense of self." As a result, a common response to experienced states of uncertainty is a reaffirmation of the self. For example, McGregor, Zanna, Holmes, and Spencer (2001) found that compared to control participants, participants primed into states of uncertainty subsequently exhibited a hardening of personal attitudes about capital punishment, suggesting a compensatory affirmation of the self under primed uncertainty. This effect was mitigated if participants were given an opportunity to express the importance of their own values (i.e., to self-affirm) prior to reporting their attitudes, lending further support to the notion that states of uncertainty trigger a drive to reaffirm the self (see Steele and Liu 1983). Similarly, McGregor, Haji, Nash, and Teper (2008) found that participants primed into states of uncertainty subsequently exhibited stronger beliefs in their religious convictions, again suggesting a stronger affirmation of the self under uncertainty. Conceptually related results have been observed by

Hogg and colleagues (e.g., Grieve and Hogg 1999) who found, for example, that compared to control participants, participants induced into states of uncertainty exhibited a stronger in-group bias, a correlate of self-affirmation.

As illustrated by the above-mentioned findings, the literature on uncertainty-induced self-identity threat and resulting self-affirmation suggests a greater attention to the self under states of uncertainty. If uncertainty triggers greater attention to the self, one would expect states of uncertainty to increase people's reliance on judgment inputs that are closely linked to the self, especially if these inputs have high subjective validity. This reasoning would be consistent with the finding that the priming of randomness increases people's tendency to believe that the universe is governed by God or by some other supernatural order—an effect that is reduced when participants are led to attribute their inner state of tension to an external cause (Kay, Moscovitch, and Laurin 2009; see Whitson and Galinski 2008, for related results).

The Self and the Reliance on Affect

A variety of theoretical conceptualizations and empirical findings suggest that affect—feelings, moods, and emotions—is intimately linked to the self. As Zajonc (1980) pointed out in his seminal article, affective judgments describe "not so much what is in the object or in the event, but something that is in ourselves" (p. 157). Denzin (1983) similarly suggested that "an emotion that does not in some way have the self or the self-system of the person as its referent seems unconceivable" (p. 404–405). Not surprisingly, studies have shown that people are more likely to rely on their momentary emotional feelings to make judgments that are self-related than to make judgments that are not self-related (Gorn, Pham, and Sin 2001; Raghunathan and Pham 1999). Such findings suggest that attention to the self acts as an amplifier of the role of affect in judgments and decisions. Other studies have shown the reverse relation: that the experience of

affect often draws attention to the self (Salovey 1992). Even the mere priming of emotional concepts can increase self-focused attention (Silvia, Phillips, Baumgaertner, and Maschauer 2006). According to Silvia and colleagues (2006), this is because emotional concepts contain information about the self, an interpretation consistent with Zajonc's (1980) position. The connection between emotions and the self is so intimate that Damasio (1999) theorized that the experience of emotion is an essential component of the construction of consciousness and therefore of the experience of the self.

If uncertainty triggers a focus on the self and a reliance on inputs that are closely linked to the self, one would therefore predict that states of uncertainty should generally increase the reliance on affect in judgment. This is because in addition to its intimate connection to the self, affect has high subjective validity (Zajonc 1980). Affective reactions typically feel "right" and "true" (Denzin 1983). They should therefore appear particularly valid to the uncertain self. This leads us to the general proposition that the priming of states of uncertainty, as opposed to certainty (or control states), generally increases the reliance on affective inputs in judgments and decisions. As an initial test of this proposition, our studies focus on documenting this basic phenomenon and clarifying its boundary conditions. We leave more focused tests of the underlying process(es) for further research.

OVERVIEW OF STUDIES

In the following we present six studies in support for our main proposition. In each study we induced incidental states of either uncertainty or certainty, using a variety of priming manipulations, and examined how these states moderate the influence of different affective inputs on a variety of consumer judgments. Study 1 shows that the priming of uncertainty increases the influence of the pleasantness of a TV commercial's musical soundtrack on

behavioral intentions toward the advertised target. Study 2 conceptually replicates and extends these results by showing that the priming of uncertainty similarly increases the influence of the visual attractiveness of a pictured product on willingness-to-pay for this product, but does not alter the influence of nonaffective information about the product. Testing a downstream consequence of the basic phenomenon, study 3 shows across three independent replications that the priming of uncertainty increases the tendency to choose alternatives that are superior on affective dimensions over alternatives that are superior on functional dimensions. Testing a potential boundary condition of the phenomenon, study 4 examines whether the valence of the uncertainty matters in the reliance on affect in judgments. The results show that uncertainty linked to both negative and positive situations increases the relative preference for an option that is superior on affective dimensions over one that is superior on functional dimensions. Study 5 extends the results of the first four studies by showing that primed uncertainty increases not just the influence of generalized positive versus negative affective responses (feeling "good" versus "bad"), but also the influence of specific discrete emotional responses such as disgust.

As a final study, study 6 addresses the apparent conflict between our proposition and results, and previous predictions and findings in the literature. As shall be discussed further in the paper, our findings seem to contradict previous findings showing that uncertainty increases the reliance on systematic processing and decreases the reliance on heuristic cues. Study 6 resolves this conflict by showing that when both affective and nonaffective heuristic cues are available, the priming of uncertainty increases the influence of the former, whereas the priming of certainty increases the influence of the latter. Therefore, the effect of uncertainty is not to increase the reliance on "peripheral" cues in general but to increase the reliance on affective inputs in particular—inputs that could be either peripheral or more central.

STUDY 1

The purpose of study 1 was to provide a direct test of the proposition that states of uncertainty tend to increase the reliance on affect in judgments and decisions. In this study, as in all our studies, we used a priming paradigm to induce states of either uncertainty or certainty that were unrelated to the judgment to be made. Independently of the states of uncertainty or certainty, we additionally manipulated the pleasantness of an affective cue associated with the judgment target. Specifically, participants in this study were first primed with either uncertainty or certainty, and then shown a television commercial whose musical soundtrack was manipulated to induce either pleasant or less pleasant feelings. We predicted that the feelings induced by the soundtrack would exert a stronger influence on participants' behavioral intentions toward the advertised target in the uncertainty-prime condition than in the certainty-prime condition.

Design and Procedure

A total of 113 students (M_{Age} = 22.47; 73% females) from a US university were randomly assigned to the conditions of a 2 (prime: certainty vs. uncertainty) × 2 (feelings: pleasant vs. less pleasant) between-subjects design. The study was conducted in a lab and presented as consisting of two separate parts.

The first part was used to prime uncertainty versus certainty. All participants were given five minutes to recall, re-experience, and describe in writing a past situation in which they either felt uncertain (uncertainty-prime condition) or certain (certainty-prime condition). This manipulation was pretested extensively, as described below.

In the second part, which was based on stimuli developed by Avnet, Pham, and Stephen (2012), participants were shown one of two versions of a TV commercial praising the virtues of books. The two versions were identical except for their musical soundtrack. In the pleasant-

feelings condition, a pleasant musical soundtrack was woven into the commercial, whereas in the less-pleasant feelings condition, a less pleasant soundtrack was used instead. The musical soundtrack manipulated how participants felt toward the commercial without changing the substance of the message. Avnet et al. (2012) showed that participants exposed to the pleasant-soundtrack version of the commercial reported having more pleasant feelings toward the commercial than did participants exposed to the less-pleasant-soundtrack version.

After watching the commercial, as the main dependent measure, participants were asked to indicate (1) how many books they wanted to buy, (2) how many books they wanted to borrow, and (3) how many books they wanted to read, over the next two months. A formative behavioral intention score was computed by summing the responses to these three questions ($\alpha = .66$).

To assess a potential involvement explanation of the predicted results, participants' involvement while watching the ad was assessed using three 7-point agreement items ("I watched the ad as if I was really interested in its message"; "I did not take the task of watching the ad very seriously" [reverse-scored]; and "I watched the ad carefully"; $\alpha = .69$).

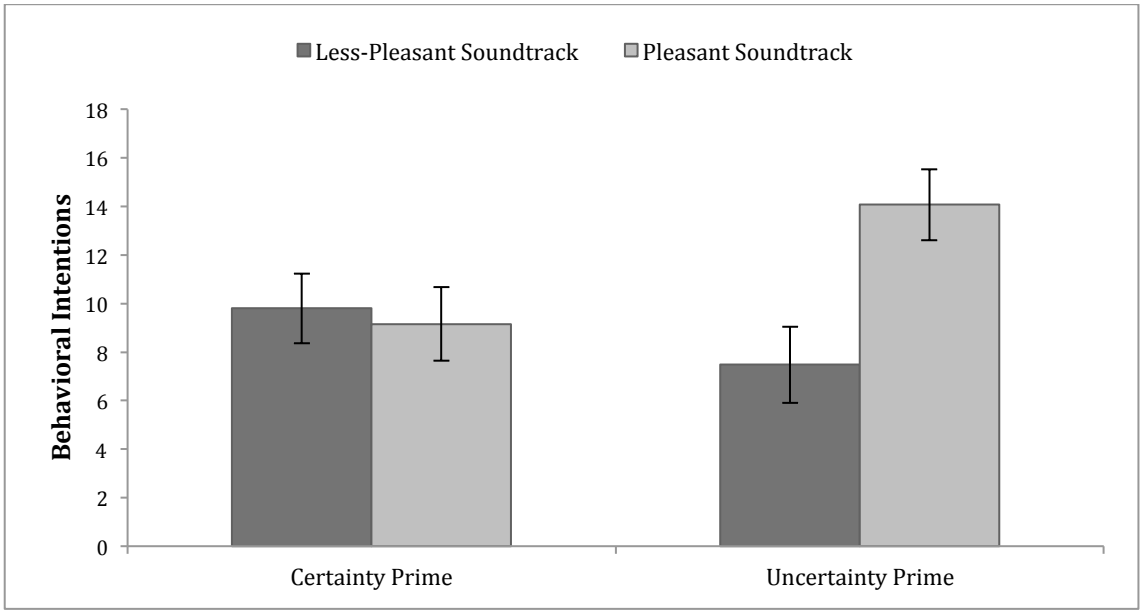
Pretest of the Manipulation of Uncertainty

The manipulation of uncertainty was pretested among 103 participants from the same panel. After describing the requested uncertainty- or certainty-related situation, pretest participants were asked to rate how they felt about their environment on three 9-point items anchored at "unsure/sure," "don't feel confident/feel confident," and "hesitant/determined" ($\alpha = .92$). As expected, participants primed with uncertainty reported feeling less certain and confident ($M = 6.07$, $SD = 2.29$) than did participants primed with certainty ($M = 6.89$, $SD = 1.60$; $F(1, 101) = 4.41$, $p = .038$). To verify that the manipulation did not unintentionally influence participants' mood, pretest participants were also asked to rate their mood on two 9-

point items anchored at "good mood/bad mood" and "joyful/sad" ($\alpha = .93$). There was no significant difference in reported mood across conditions ($F < 1$), which is consistent with previous results showing that priming manipulations of uncertainty similar to ours typically do not alter participants' moods (e.g., McGregor et al. 2001; van den Bos et al. 2005). In addition, to address a potential construal-level theory (Trope, Liberman, and Wakslak 2007) interpretation of the results, participants' level of construal was assessed by having them complete Vallacher and Wegner's (1989) 25-item Behavioral Identification Form (KR-20 = .89). Again, there was no effect of the manipulation on observed levels of construal ($F < 1$).

FIGURE 1

STUDY 1: THE EFFECT OF PRIME AND PLEASANTNESS OF FEELINGS ON BEHAVIORAL INTENTIONS TO READ, BORROW, AND BUY BOOKS



Results

Preliminary analyses. A preliminary examination of the behavior intention scores identified two clear outliers. These two participants reported intentions of reading, borrowing, or

buying a total of 60 and 76 books over a two-month period (more than three standard deviations above the study average), which was clearly implausible. These two observations were therefore removed from the analyses. Additional analyses show no main or interaction effect of the manipulations on participants' reported involvement while watching the ad (largest $F(1,107) = 1.66$, $p = .201$). This suggests that the results cannot be explained in terms of difference in overall task involvement.

Behavioral intention. Because the raw behavioral intention scores were not normally distributed, they were normalized using the method described by van Albada and Robinson (2007; see also Templeton 2011). The method entails converting the raw observations into ranks, mapping these ranks to a uniform distribution, then applying an inverse-normal transformation of this distribution. A 2 (prime) × 2 (feelings) ANOVA of the normalized behavioral intentions revealed a significant main effect of musical soundtrack on behavioral intentions ($F(1,107) = 5.99$, $p = .016$). Consistent with previous studies on the effects of ad-evoked feelings on persuasion (e.g., Edell and Burke 1987; Park and Young 1986; Pham, Geuens, and de Pelsmacker 2013), behavioral intentions were higher among participants who had seen the pleasant-feeling ad ($M = 11.70$, $SD = 8.40$) than among participants who had seen the less-pleasant-feeling ad ($M = 8.75$, $SD = 7.65$). More importantly, as illustrated in figure 1, this effect was qualified by an interaction with uncertainty ($F(1,107) = 4.70$, $p = .032$). As predicted, feelings induced by the ad had a stronger effect on participants' behavioral intentions in the uncertainty-prime condition ($M_{Pleasant} = 14.07$, $SD = 10.01$ vs. $M_{Less\text{-}pleasant} = 7.48$, $SD = 6.79$; $F(1,107) = 10.35$, $p < .001$) than in the certainty-prime condition ($M_{Pleasant} = 9.15$, $SD = 5.31$ vs. $M_{Less\text{-}pleasant} = 9.80$, $SD = 8.26$; $F < 1$).

Discussion

In this study, participants' behavioral intentions after watching a commercial whose substantive message was held constant were found to depend on whether the commercial had a pleasant or less pleasant musical soundtrack and whether participants were primed into states of uncertainty or certainty. In particular, participants' behavioral intentions were more influenced by the pleasantness of the commercial's soundtrack if they were primed with uncertainty than if they were primed with certainty. This finding is consistent with the proposition that states of uncertainty increase the reliance on affect and momentary feelings in judgment.

One may wonder if the results could be due to the uncertainty-priming manipulation inducing different mood states among participants. Specifically, it may be that priming participants with uncertainty put them in a negative mood, whereas priming them with certainty put them in a more positive mood. This possibility is unlikely. First, the pretest results show no effect of the priming manipulation on participants' moods. Second, previous research on the effects of preexisting mood on persuasion typically shows the opposite pattern of results—that is, more substantive processing under negative mood (which uncertainty could have triggered) than under positive mood (which certainty could have triggered; see Bless, Bohner, Schwarz, and Strack 1990; Bless, Mackie, and Schwarz 1992).

Another possible explanation is that the priming of uncertainty (relative to certainty) could have prompted participants to disengage from the task, resulting in a greater reliance on heuristic processing as predicted by the ELM (Petty and Cacioppo 1986) and HSM (Chaiken, Liberman, and Eagly 1989) models of persuasion. This explanation is also unlikely. First, there was no evidence of difference in task engagement across conditions: Participants' self-reported involvement while watching the commercial was unaffected by the uncertainty/certainty priming

manipulation. Moreover, if anything, uncertainty has been linked with *greater* rather than lower engagement (Tiedens and Linton 2001; Vaughn and Weary 2003). As shall be reported further, we also found no evidence that differential engagement could account for the results of the remaining studies.

STUDY 2

The purpose of the second study was two-fold. The first objective was to replicate and generalize the results of study 1 using a different manipulation of uncertainty, a different manipulation of affect, and a different type of judgment. The second objective was more substantive. In reference to study 1, it could be argued that the reason why uncertain participants were more influenced by the pleasantness of the soundtrack is not that uncertainty increases the reliance on affect in particular but that uncertainty increases the reliance on *all* information that is available, including affect. In study 1 the two interpretations could not be disentangled because affect was the only judgment input that was experimentally manipulated. To address this issue, in this second study we manipulated both the value of the affective cue and the value of nonaffective attributes of the target to assess their respective influence on judgment under primed uncertainty (vs. certainty). If uncertainty increases the reliance on all information that is available, the priming of uncertainty (vs. certainty) should increase the influence of both the affective cue and the nonaffective attributes. However, if it is the reliance on affect in particular that uncertainty increases, as we hypothesized, the priming of uncertainty should increase the influence of the affective cue but not the influence of the nonaffective attributes.

Design and Procedure

A total of 313 participants from Amazon's Mechanical Turk (MTurk) panel (M_{Age} = 36.41; 62.9% females) were asked to evaluate and assess their willingness-to-pay (WTP) for four

different TVs. The experiment was based on a mixed design, with two between-subjects factors—(1) the priming of uncertainty (vs. certainty), and (2) the presence or absence of a positive affective cue for evaluating the TVs—and two within-subject factors—(3) number of HDMI inputs (1 vs. 3), and (4) annual energy cost ($30 vs. $100)—which varied across the four TVs.

The study was presented as consisting of two separate parts. In the first part uncertainty versus certainty was primed as follows. Under the guise of a study on people's reading-speed abilities, each participant was first asked to count the number of occurrences of the letter "i" in a short paragraph, and then asked to count the occurrences of the letter "t" in the same paragraph. Participants were instructed to complete these two tasks as rapidly as possible. The paragraph was approximately 100 words long and purportedly described the results of multidisciplinary studies by a particular researcher. In the uncertainty-prime condition, the researcher's findings pointed to the world becoming more uncertain and more unpredictable compared to the past, whereas in the certainty-prime condition, the findings pointed to the world becoming more certain and predictable. This manipulation was pretested with another sample of 105 MTurk participants. After letter-spotting one of the two versions of the paragraph, these pretest participants completed the same sets of measures as those used in the pretest of study 1. The results show that participants exposed to the uncertainty-priming paragraph reported feeling less certain and confident ($M = 5.95$, $SD = 2.47$) than did participants exposed to the certainty-priming paragraph ($M = 7.03$, $SD = 1.67$; $F(1, 103) = 6.89$, $p = .010$). As in the pretest of study 1, there was no significant difference in reported mood across conditions ($F < 1$), nor was there any difference in observed levels of construal ($F < 1$).

The second part of the main study was described as a market research survey. All participants were presented with the pictures and specifications of four different television sets, which they were asked to evaluate as if they were considering buying a new TV. After reviewing each TV, participants were asked to assess how much they would be willing to pay (WTP) for it, which was the main dependent variable. Three judgment inputs, one affective and two nonaffective, were varied across TV sets (within-subject) and across participants (between-subjects). The four TVs that participants evaluated were identical in dimension (46") and design, but they varied along two orthogonally manipulated attributes that are clearly nonaffective: the number of HDMI slots (1 or 3) and the annual energy cost of using the television set ($30 or $100). The main (within-subject) effects of these two attributes on participants' WTP provide two separate measures of the influence of nonaffective inputs on participants' judgments. In addition to varying the HDMI and energy-cost attributes of the TVs, we independently manipulated, between-subjects, the aesthetic appeal of the TVs by featuring them either with an attractive image showing on the screen or without such an image (dark screen as if the TV is off). The main effect of this factor on participants' WTP provides a measure of the influence of affective inputs on participants' judgments. To test the effectiveness of this manipulation, another 344 MTurk participants were asked to rate one of eight versions of the TV in question, which varied in terms of HDMI slots, annual energy cost, and presence or absence of the attractive image on the screen. As a measure of affective appeal, participants were asked to rate "How pleasant did you find this TV set to look at?" on a 9-point scale. A 2 (HDMI) × 2 (energy cost) × 2 (attractive image) ANOVA of these ratings reveals only a main effect of attractive image, indicating that participants found the TV more pleasant to look at when the screen

featured an attractive image (M = 7.42, SD = 1.28) than when it did not (M = 6.78, SD = 1.62; $F(1, 336) = 16.37$, $p < .001$; other p-values > .13).

In the main study, following participants' evaluations of the four TVs, their overall attention to and engagement with the task were assessed via two memory-based questions. First, participants were shown six different TV sets without any attribute information and asked to identify which one had the same design as the four TV sets that they had evaluated earlier. Second, participants were asked to identify which of four different screen sizes (28", 32", 46", 55") matched the four TVs that they evaluated. As an additional measure of engagement, we recorded the total amount of time that participants took to evaluate the four TVs.

Results

Preliminary analysis. Participants' ability to recognize the actual TV set design that they had been exposed to, which was coded 0-1, was submitted to a logistic regression with three contrast-coded predictors: (1) uncertainty/certainty priming, (2) presence/absence of attractive image; and (3) the interaction between (1) and (2). The analysis revealed no main or interaction effects of the between-subjects manipulations on this measure (largest Wald $\chi^2 = 1.904$, $p > .16$). In particular, participants primed with uncertainty were no less able to recognize the TV set (70.1%) than were participants primed with certainty (67.3%; Wald $\chi^2 < 1$), suggesting that participants were no less engaged in the uncertainty-prime condition than in the certainty-prime condition. A similar analysis of participants' ability to remember the actual screen size of the TV also failed to indicate any effect of the manipulations (largest Wald $\chi^2 = 1.590$, $p > .20$), with almost all participants (97.8%) being correct, suggesting that overall participants were paying attention. Finally, there was no significant main or interaction effect of uncertainty priming and attractive image on the total amount of time that participants took to evaluate the TVs (largest

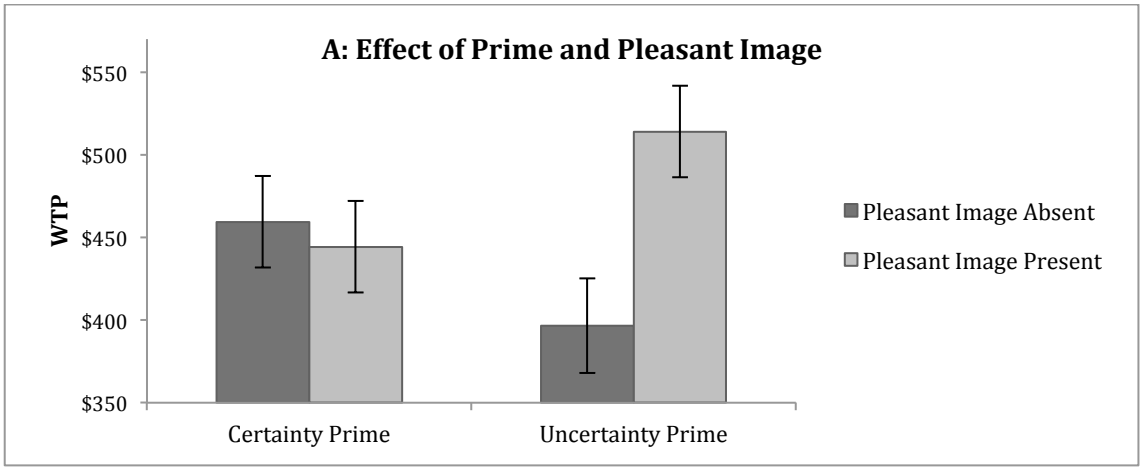
$F(1, 309) = 1.30$, $p = .256$). These preliminary analyses suggest that the results of this study cannot be interpreted in terms of differential engagement under primed uncertainty (vs. certainty).

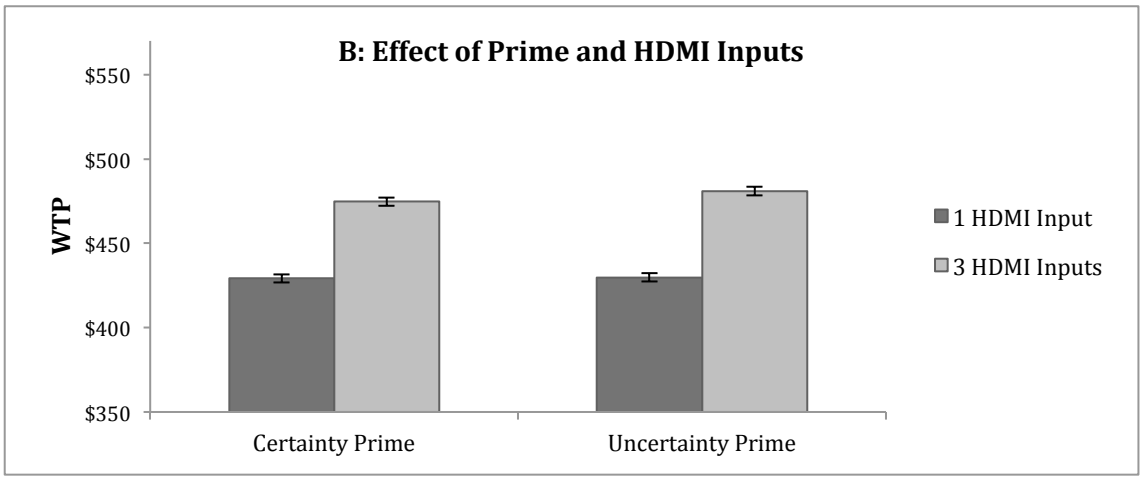
Willingness-to-Pay. Because the raw WTP scores were not normally distributed, they were normalized using the same method as in study 1. A mixed ANOVA of participants' normalized WTP for the four TVs revealed strong main effects of the number of HDMI slots ($F(1, 309) = 111.95$, $p < .001$) and of the energy cost ($F(1, 309) = 12.22$, $p = .001$). Not surprisingly, participants were willing to pay more for a TV with three HDMI slots (M = \$477.8, SD = 14.71) than for a TV with only one slot (M = \$429.5, SD = 13.48), and for a TV with lower energy costs (M = \$463.87, SD = 14.35) than for a TV with higher energy costs (M = \$443.47, SD = 13.98). There was also an interaction between HDMI and energy cost ($F(1, 309) = 5.65$, $p = .018$), showing that the combination of three HDMI slots and lower energy costs was particularly valuable to participants. These effects show that participants were indeed paying attention to the information presented and were sensitive to the nonaffective attributes of the TVs. However, additional results show that neither the main effect of HDMI nor the main effect of energy cost was moderated by the priming of uncertainty/certainty (both 2-way interaction Fs < 1). These latter findings suggest that while participants did incorporate the HDMI and energy-cost information in their judgments, their degree of reliance on these two types of nonaffective information was not affected by their uncertainty (vs. certainty).

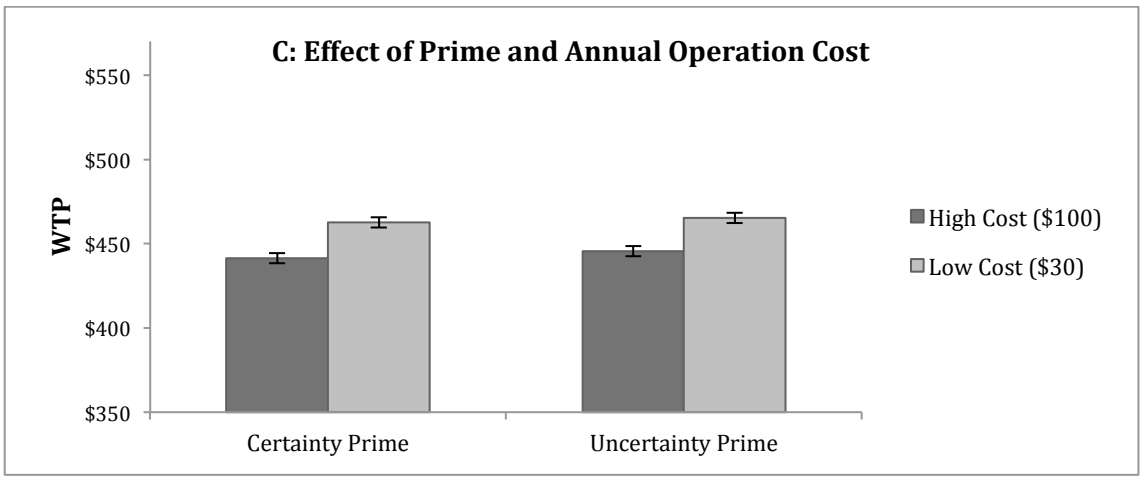
FIGURE 2

STUDY 2: WTP FOR TV SETS AS A FUNCTION OF PRIME AND

(A) PRESENCE OF PLEASANT IMAGE, (B) HDMI INPUTS, (C) OPERATION COST







More importantly, as in study 1, the analysis revealed an affect-by-uncertainty interaction ($F(1, 309) = 5.527$, $p = .019$). Participants were willing to pay slightly more for the TVs if the screen featured an attractive image (M = \$479.06, SD = 289.99) than if it did not (M = \$428.88, SD = 198.21, $F(1, 309) = 2.65$, $p = .105$). However, this effect was stronger in the uncertainty-prime condition ($M_{\text{Pleasant-image}}$ = \$514.13, SD = 335.56 vs. $M_{\text{No-pleasant-image}}$ = \$396.62, SD = 149.32, $F(1, 309) = 7.76$, $p = .006$) than in the certainty-prime condition ($M_{\text{Pleasant-image}}$ = \$444.43, SD = 233.61 vs. $M_{\text{No-pleasant-image}}$ = \$459.50, SD = 232.30, $F < 1$). The results thus conceptually replicate the results of study 1.

Discussion

This second study yielded two main results. First, it was found that an affective cue such as the attractiveness of an image shown on a TV screen exerted greater influence on participants' valuation judgments if they were primed with states of uncertainty than if they were primed with states of certainty. This first result conceptually replicates the results of study 1 with a different priming manipulation of uncertainty, a different operationalization of affective input, and a different type of judgment, suggesting that the basic phenomenon is generalizable. Second, it was found that while participants also relied on nonaffective attributes in their valuation judgments, this reliance was not moderated by the priming of uncertainty (vs. certainty). Together with the first result, this second result suggests that the effect of uncertainty is not to increase the reliance on all information that is available; it is to increase the reliance on affective inputs in particular. As in study 1, the results of the second study show no evidence that the effects are due to some type of disengagement under induced states of uncertainty: Participants' memory for task-related information was equivalent in the uncertainty-prime and certainty-prime conditions, as was the amount of time that participants took to perform their evaluations. Rather

than differences in engagement, the results of this study—and those of the first study—support the proposition that states of uncertainty increase the reliance on affect in judgment. Further evidence is provided in the subsequent studies.

STUDIES 3A–C

The purpose of this next set of parallel studies is to show that the increased reliance on affect under states of uncertainty can have meaningful downstream consequences on consumers' choices. In studies 1 and 2, subjective affect toward the options was manipulated using subtle affective cues—pleasant or less pleasant background music, and an attractive image being shown or not on a TV screen—that might logically be considered somewhat "peripheral" for the judgment to be made. In real life, however, subjective affect toward the options does not have to be peripheral and can in fact be quite central to the judgment or decision to be made (e.g., the aesthetic of a new smartphone, the pleasant smell of a perfume, the warmth of a service provider). If states of uncertainty increase the reliance on affect in judgments and decisions in general, in situations where consumers have to trade off affective attributes against nonaffective attributes across options, we predict that uncertainty would steer consumers toward options that are superior on affective attributes.

In studies 3A, 3B, and 3C, we used a different priming task to again induce a state of uncertainty or a state of certainty. Unlike in the first two studies, we additionally included a control condition. In each study participants were then asked to choose between two options: one that was affectively superior but functionally inferior and one that was functionally superior but affectively inferior—a choice paradigm that has been used extensively in research on the role of affect in decision making (Chang and Pham 2013; Hong and Chang 2015; Rottenstreich, Sood, and Brenner 2007; Shiv and Fedorikhin 1999). We predicted that participants primed with

uncertainty would be more likely to choose the affectively superior option than would participants primed with certainty. Participants in the control condition would exhibit choices somewhere in between.

Design and Procedure

Three studies that were conceptual replications of one another were conducted among participants from the Amazon MTurk panel. There were 244 participants in study 3A (M_{Age} = 33.0; 48.8% females), 165 participants in study 3B (M_{Age} = 34.2; 49.1% females), and 132 participants in study 3C (M_{Age} = 33.6; 49.2% females). In each study, participants were randomly assigned to one of three conditions: certainty prime, uncertainty prime, or control prime. Each study was presented as consisting of two unrelated parts, with the first part serving as a guise for the priming manipulation, and the second part serving as the choice task.

In the first part of each study, under the pretense of a study on the effects of scale length on people's self-report of emotions, participants were asked to repeatedly rate a particular feeling state on scales of increasing length. In the uncertainty-priming condition, participants were asked to rate "How uncertain do you feel right now?" on five different scales with 5, 9, 11, 15, and 19 points, with each scale going from "somewhat uncertain" to "totally uncertain." In the certainty-priming condition, participants were asked to rate "How certain do you feel right now?" on five similar scales, with each scale going from "somewhat certain" to "totally certain." Therefore, the questions were designed such that participants in the uncertainty (vs. certainty) condition would always report that they felt uncertain (vs. certain), and by doing so they would feel more uncertain (vs. certain). In the control condition, participants were simply asked to rate "How do you feel right now?" on five similar scales going from "bad" to "good."

This manipulation was pretested among 103 participants from the same panel. After completing the five scales of increasing length, pretest participants were asked to rate their state of uncertainty-certainty on the same 3-item measure as in the pretests for the first two studies (α = .91). As expected, participants primed with uncertainty reported feeling less certain and confident (M = 5.70, SD = 2.38) than did participants primed with certainty (M = 6.86, SD = 1.73), with participants in the control condition scoring in between (M = 6.04, SD = 1.86; $F(2, 100) = 3.09$, $p = .05$). Pretest participants were also asked to rate their mood on the same 2-item measure as in the previous pretests (α = .94). There was no significant difference in reported mood across conditions ($F(2, 100) = 1.50$, $p = .228$).

In the second part of studies 3A–C, participants made a choice between two alternatives: one that was affectively superior but functionally inferior and one that was functionally superior but affectively inferior. In study 3A the choice was between two apartments: one with a great view and ample sunlight (affective dimensions) but with smaller size and limited closet space (functional dimensions), and one with a poor view and low sunlight but with larger size and closet space. (The stimuli were adopted from Chang and Pham 2013; see also Hong and Chang 2015). In study 3B the choice was between two laptops: one with higher consumer ratings on aesthetics and coolness (affective dimensions) but lower ratings on performance and battery (functional dimensions), and one with the reverse pattern of ratings. In study 3C, the choice was between two cars: one that was superior on design (an affective dimension) but inferior on fuel economy (a functional dimension), and one that was superior on fuel economy but inferior on design. The dependent measure in each study was the choice between the two options.

To test for demand characteristics, participants in each study were additionally asked to guess its purpose. Participants were also asked to report their mood on two 9-point items

anchored at "good/bad" and "pleasant/unpleasant" ($\alpha = .97$) to test for the possibility of a mood explanation of the findings. As an objective measure of engagement with the task, we recorded the amount of time that participants took to review the options and make their choice. Finally, as a check that the options in each study did operationalize a tradeoff between affective and functional superiority, in each study half the participants were asked to indicate which option they would choose if they had to rely only on their "emotions," and the other half were asked to indicate which option they would choose if they had to rely only on their "logical considerations."

TABLE 1

Studies 3A–C: Choice of Affectively Superior Options as a Function of Priming Manipulation

		Priming Condition		
		Certainty	Control	Uncertainty
Study 3A (N = 244)	Apartments	51.9%[a] (41/79)	49.4%[a] (41/83)	68.3%[b] (56/82)
Study 3B (N = 165)	Laptops	36.8%[a] (21/57)	49.1%[ab] (26/53)	60.0%[b] (33/55)
Study 3C (N = 132)	Cars	20.0%[a] (9/45)	27.3%[ab] (12/44)	44.2%[b] (19/43)
Total across replications (N = 541)		39.2%[a] (71/181)	43.9%[a] (79/180)	60.0%[b] (108/180)

Results

Preliminary analyses. None of the participants suspected that the two parts of the three studies might be connected. In all three studies, participants indicated that they would be more likely to choose the affectively superior option if they had to rely on their feelings than if they

had to rely on logical considerations (study 3A: $\text{Proportion}_{\text{Feeling}} = 91\%$ vs. $\text{Proportion}_{\text{Logic}} = 29\%$; $\chi^2(1) = 99.73$, $p < .001$; study 3B: $\text{Proportion}_{\text{Feeling}} = 60\%$ vs. $\text{Proportion}_{\text{Logic}} = 39\%$; $\chi^2(1) = 7.40$, $p = .007$; study 3C: $\text{Proportion}_{\text{Feeling}} = 45\%$ vs. $\text{Proportion}_{\text{Logic}} = 28\%$; $\chi^2(1) = 4.16$, $p = .041$). These results confirm that the choices that participants were asked to make indeed operationalized a tradeoff between affective superiority and functional superiority. The priming of uncertainty did not affect participants' moods in any of the study replications (study 3A: $F < 1$; study 3B: $F(2,162) = 1.790$, $p > .17$; study 3C: $F < 1$), nor did it affect the amount of time that participants took to review the options and make their choices (study 3A: $F < 1$; study 3B: $F < 1$; study 3C: $F(2, 129) = 1.42$, $p = .244$).

Choice. Participants' choices were significantly affected by the priming manipulation in all three studies (study 3A: χ^2 (2) = 7.026, $p = .03$; study 3B: χ^2 (2) = 6.02, $p = .049$; study 3C: χ^2 (2) = 6.377, $p = .041$). As summarized in table 1, in all three studies, choice of the affectively superior option was significantly higher in the uncertainty-prime condition than in the certainty-prime condition, with the control-condition choices falling in between in two of the three studies. In study 3A, 68% of the participants chose the affectively superior apartment in the uncertainty-prime condition, compared to 52% in the certainty-prime condition ($Z = 2.13$, $p = .034$) and 49% in the control-prime condition ($Z = 2.47$, $p = .014$). In study 3B, 60% of the participants chose the affectively superior laptop in the uncertainty-prime condition, compared to 37% in the certainty-prime condition ($Z = 2.45$, $p = .014$) and 49% in the control-prime condition ($Z = 1.14$, $p = .254$). In study 3C, 45% of the participants chose the affectively superior car in the uncertainty-prime condition, compared to 20% in the certainty-prime condition ($Z = 2.44$, $p = .015$) and 27% in the control-prime condition ($Z = 1.65$, $p = .099$). Pooled across studies, 60.0% of the participants in the uncertainty-prime conditions chose the affectively superior options,

compared to 39.2% in the certainty-prime conditions ($Z = 3.95$, $p < .001$) and 43.9% in the control conditions ($Z = 3.45$, $p < .001$).

Discussion

The results of three studies converge in showing that compared to participants who were primed with certainty, participants who were primed with uncertainty had a greater probability of choosing an option that was affectively superior over an option that was functionally superior. Participants who received a neutral prime tended to exhibit preferences that were somewhere in between. These results are consistent with the notion that by increasing the reliance on affect in judgments, uncertainty can shift consumers' preferences toward options that are particularly attractive on affective dimensions, even if these options are inferior on more functional dimensions.

The results of these studies extend those of the prior two studies in two ways. First, they show that the phenomenon identified in the prior studies can have meaningful downstream consequences on consumer choice. Second, they show that the greater reliance on affect under states of uncertainty is not restricted to seemingly irrelevant, "peripheral" affect; it extends to affect that is more relevant and that consumers appear willing to trade off against more functional considerations.

It is interesting to note that in all three replications, choices in the control conditions were closer to those in the certainty-prime conditions than to those in the uncertainty-prime conditions. This asymmetry may indicate that, at least among people represented in our sample, people's baseline state is closer to one of certainty than to one of uncertainty (van den Bos 2001; van den Bos et al. 2005). As with the previous studies, the results do not appear to reflect

differences in engagement with the task. In all three studies, participants took a comparable amount of time to review and evaluate the options across the different priming conditions.

An alternative explanation for the results of studies 3A–C is that the priming of uncertainty might have lowered participants' mood compared to the other conditions. A more negative mood may have triggered a motivation to compensate by choosing the option that was more affectively rewarding (Andrade 2005; Zillman 1988). Two results make this alternative explanation somewhat unlikely. First, in our studies the priming of uncertainty (vs. certainty) did not appear to have a measurable effect on participants' mood. More importantly, as shall be reported in study 4, the effects of uncertainty appear to be independent of the valence of the situation that uncertainty is linked to.

STUDY 4

As already noted, not all uncertainty is associated with negative situations (e.g., being uncertain about the sex of one's expected child; being uncertain about the content of a gift). This raises the question of whether the phenomenon documented in the previous studies is specific to uncertainty linked to negative situations ("negative uncertainty") or applies to uncertainty in general, whether positive or negative. To investigate this issue, in this study in addition to priming uncertainty versus certainty, we manipulated the valence of this uncertainty or certainty. Then, as in study 3A, we asked participants to choose between an apartment that was affectively superior and one that was functionally superior. If the phenomenon uncovered in the first three studies mostly pertains to negative uncertainty, we should replicate the results of study 3A in the negative-prime condition but not in the positive-prime condition. If the phenomenon arises from uncertainty in general, we should replicate the results across both valence conditions.

Design and Procedure

A total of 158 MTurk participants (M_{Age} = 32; 65% females) were randomly assigned to one of four conditions of a 2 (primed uncertainty vs. certainty) × 2 (positive vs. negative valence) between-subjects design. The study was presented as consisting of two unrelated parts. In the first part participants were given five minutes to relive and describe a situation in which they felt (a) "certain in a positive way," (b) "certain in a negative way," (c) "uncertain in a positive way," or (d) "uncertain in a negative way." After completing this task, participants were directed to the second part of the study, which was identical to the part described in study 3A.

Results

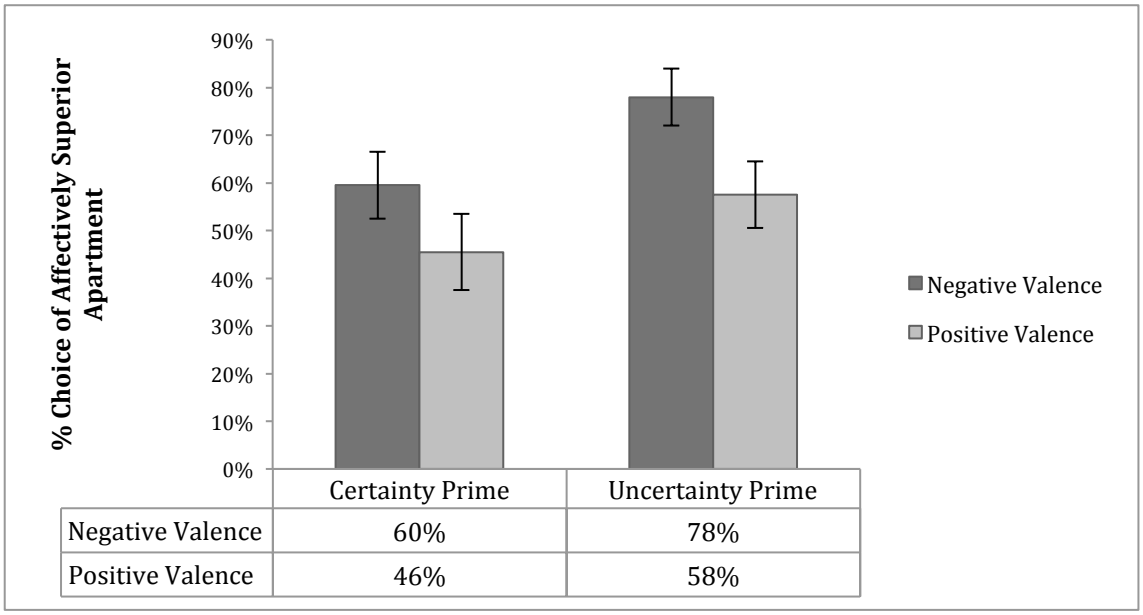
Preliminary analyses. While six participants suspected that the two parts of the study might be connected, none was able to articulate the actual hypothesis being tested. They were thus retained in the analyses. (Removing them does not substantively change the results.) Participants' moods were largely equivalent across conditions, except for a marginally significant main effect of uncertainty, whereby participants in the uncertainty-prime condition reported being in a slightly better mood (M = 6.87) than did participants in the certainty-prime condition (M = 6.37; $F(1, 154) = 3.71$, $p = .056$). There was again no significant effect of the manipulations on amount of time spent reviewing the options and making a choice (largest $F(1, 154) = 2.29$, $p = .132$), suggesting no significant differences in engagement.

Choice. Participants' choices of the affectively superior apartments across conditions are depicted in figure 3. A logistic regression analysis of these choices uncovered a main effect of valence ($\beta = -0.387$, Wald $\chi^2 = 5.247$, $p = .022$) showing that choice of the affectively superior apartment was higher in the negative-prime conditions (69%) than in the positive-prime conditions (51%). This result may reflect a compensatory preference for hedonically rewarding options after thinking of a negative event. More importantly, the analysis again revealed a main

effect of uncertainty (β = 0.347, Wald χ^2 = 4.211, p = .04) showing that choice of the affectively superior apartment was higher in the uncertainty-prime conditions (68%) than in the certainty-prime conditions (52%). This result further replicates the previous studies' basic findings. Most importantly, there was no interaction between uncertainty and valence (β = -0.096, Wald χ^2 = 0.320, p = .572). This result suggests that the effects of uncertainty and valence on the reliance on affect are independent from one another.

FIGURE 3

STUDY 4: CHOICE OF AFFECTIVELY SUPERIOR APARTMENT AS A FUNCTION OF UNCERTAINTY AND SITUATION VALENCE



	Certainty Prime	Uncertainty Prime
Negative Valence	60%	78%
Positive Valence	46%	58%

Discussion

The results of study 4 further replicate the findings from studies 3A–C that uncertainty increases the preference for options that are affectively superior over options that are functionally superior. More importantly, the results suggest that the valence of the uncertainty does not moderate the basic phenomenon. Both uncertainty that is positively valenced and uncertainty that is negatively valenced increase the preference for affectively superior options. In

other words, incidental uncertainty in *itself* increases the reliance on affect independently of the valence of this uncertainty, which has its own, separate effect. The latter effect—an increased preference for affectively superior options after describing negative events—is consistent with previous findings on mood repair through compensatory consumption (Andrade 2005; Raghunathan, Pham, and Corfman 2006; Zillman 1988).

STUDY 5

This study had two main objectives. The first was to replicate study 2's finding that the priming of uncertainty increases the reliance on affective inputs but does not increase the reliance on nonaffective inputs. A second and more important objective was to test the phenomenon using a very different type of affective input. In the first four studies, the type of affect that participants seemed to rely on more when primed with uncertainty (as opposed to certainty) was overall positive feelings associated with the target (through a pleasant soundtrack, an attractive picture, or positive affective attributes of the target). This raises the question of whether uncertainty increases the reliance on affective inputs in general or only increases reliance on positive feelings that are closely associated with the target. To answer this question, study 5 examines whether primed uncertainty (vs. certainty) also moderates the influence of incidental feelings of disgust on subsequent decisions. Such feelings provide a strong test of the boundaries of the phenomenon for two reasons. First, because incidental feelings are by definition logically unrelated to the target (Bodenhausen 1993), any affect-congruent effects of such feelings on judgment under a specific condition are strong evidence of a clear inclination to rely on affective inputs under that condition. Second, unlike the feelings examined in the previous studies, disgust is a clearly negative emotion. Should uncertainty be found to amplify its

effects on subsequent judgments, this would be strong evidence that the effects of uncertainty on the reliance on affect are not restricted to positive overall feelings but are in fact general.

Participants were first induced to feel either disgusted or not, and then primed with either uncertainty or certainty. They were then asked to indicate their WTP for a carton of fruit drink. As in study 2, nonaffective attribute information about the target was additionally manipulated. Based on previous research showing that incidental feelings of disgust can prompt avoidance of food products (Morales and Fitzsimons 2007; Rozin and Fallon 1987), it was expected that participants induced to feel disgust would exhibit lower WTP for the fruit drink than control participants not induced to feel disgust. Moreover, this effect of incidental disgust was expected to be stronger among participants primed with uncertainty than among those primed with certainty. Consistent with the results of study 2, the priming of uncertainty (vs. certainty) was not expected to modify the influence of the nonaffective attribute information about the target on participants' WTP.

Design and Procedure

A total of 517 MTurk participants (M_{Age} = 34.88, 61.3% females) were randomly assigned to one of eight conditions of a 2 (primed uncertainty vs. certainty) × 2 (disgust vs. control) × 2 (healthy vs. unhealthy product attributes) between-subjects design. The study was introduced as consisting of three unrelated parts. The first part served as a manipulation of participants' incidental feelings. Under the guise of a supposed effort to "compile a database of daily experiences and emotions," participants in the disgust condition were given three to five minutes to recall, re-experience, and describe in writing a past experience in which they felt disgusted, whereas participants in the control condition were asked to describe a typical day in their lives.

The second part of the study served as a manipulation of uncertainty versus certainty. Under the guise of a supposed assessment of vocabulary, participants were asked to come up with five synonyms for either the word "uncertain" (in the uncertainty-prime condition) or the word "certain" (in the certainty-prime condition). Participants were further instructed not to rely on any external sources, and they took on average about 90 sec to complete this task. The manipulation was pretested with another sample of 105 MTurk participants who completed one of the two versions of the task, then completed the same measures as in the pretest of study 2. The pretest results show that participants who completed the uncertainty version of the task reported feeling less certain and confident ($M = 5.95$, $SD = 2.47$) than participants who completed the certainty version ($M = 7.03$, $SD = 1.67$; $F(1, 103) = 6.89$, $p = .01$). There were no differences in reported mood or in construal level (both Fs < 1).

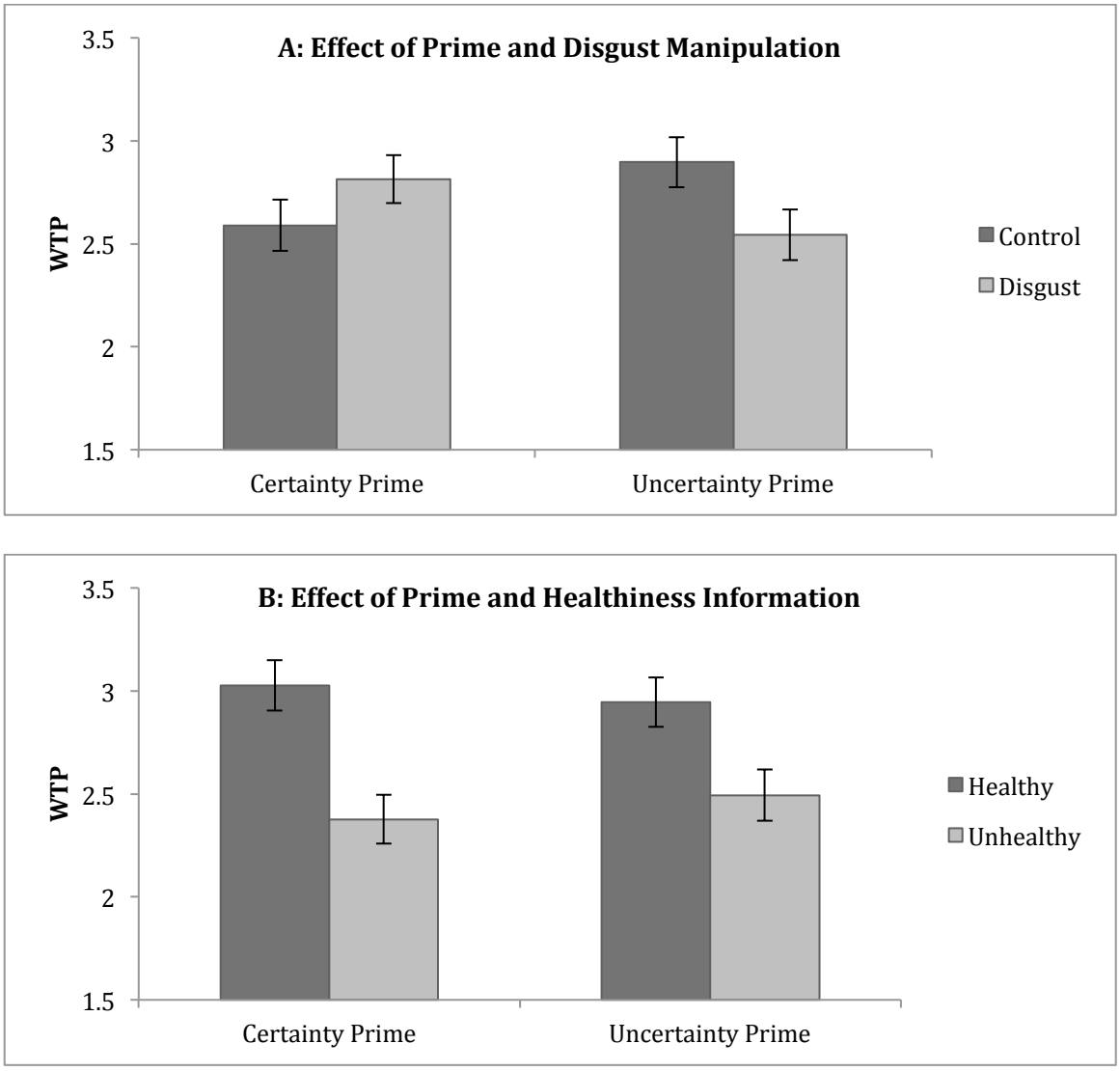
The third part of the study introduced the target, manipulated its nonaffective attributes, and administered the dependent measures. Under the cover of a market research survey, participants were shown the picture of a 59-fluid-oz carton of "Welch's Dragon Fruit Mango Juice," along with a short paragraph of information about the product. Across conditions, the product was described as "a blend of two tropical fruit juices: mango and dragon-fruit" whose taste "has been described as mildly sweet to sweet." In the healthy-attributes condition, the product was further described as containing "75 calories per serving, which is just 3.75% of a normal 2000 calories-per-day intake," receiving an "A on an A–D scale of healthiness." In the unhealthy-attributes condition, the product was described as containing "200 calories per serving, which is 10% of a normal 2000 calories-per-day intake," receiving a "D on an A–D scale of healthiness." After reviewing this information, all participants were asked to indicate their WTP for the product, which was the main dependent measure. As in studies 2–4,

participants' engagement with the task was assessed by recording the total amount of time that they took to review the product information and assess their WTP.

FIGURE 4

STUDY 5: WTP FOR JUICE AS A FUNCTION OF PRIME AND

(A) DISGUST, (B) HEALTHINESS



Results

A preliminary analysis of the amount of time that participants took to review the product and assess their WTP reveals no effect of the manipulations on this measure (largest $F(1, 509) = 2.04$, $p = .15$; all other Fs < 1).

Because the raw WTP scores were not normally distributed, they were again normalized as described in study 1. A 2 × 2 × 2 ANOVA of participants' normalized WTP scores revealed a strong main effect of the product's nonaffective attributes. Participants were understandably willing to pay more for the product if it was described as healthy ($M = \$3.01$, $SD = 1.46$) than if it was described as unhealthy ($M = \$2.43$, $SD = 1.28$, $F(1, 509) = 22.43$, $p < .001$). More importantly, as shown in figure 4 (bottom panel), the effects of this nonaffective attribute information were not moderated by the priming of uncertainty versus certainty (interaction $F(1, 509) = 1.17$, $p = .280$). The results are consistent with the findings of study 2 and further support the notion that uncertainty does not increase reliance on all information.

Most importantly, the analysis revealed a significant feeling × uncertainty interaction ($F(1, 509) = 5.57$, $p = .019$). As illustrated in figure 4 (top panel), if participants were primed with uncertainty, they were willing to pay significantly less for the juice if they had recently been made to feel disgust ($M = \$2.55$, $SD = 1.25$) than if they had not been made to feel disgust ($M = \$2.91$, $SD = 1.32$; $F(1, 509) = 4.86$, $p = .027$). However, if participants were primed with certainty, WTP for the juice was not significantly different between the disgust condition ($M = \$2.85$, $SD = 1.69$) and the control condition ($M_{\text{Control}} = \$2.56$, $SD = 1.25$, $F(1, 509) = 1.26$, $p = .262$). (Under primed certainty, there was in fact a nonsignificant reversal of the effect of disgust, which we return to in the discussion.)

Discussion

The results of this study conceptually replicate those of the previous studies, while extending them in important respects. First, the results show that states of uncertainty increase not just the reliance on affective inputs that are closely associated with the target but even the reliance on incidental affective feelings that are clearly unrelated to the target. That the phenomenon generalizes to feelings that are purely incidental—and this in the presence of other information that is clearly relevant for evaluating the target—points to a distinct orientation toward affective inputs under states of uncertainty. Second, the results show that states of uncertainty increase not just the reliance on overall positive feelings toward the target, they also increase the reliance on specific negative emotions such as feelings of disgust. This finding suggests that the effect of states of uncertainty is to increase reliance on affect in general, not just the reliance on overall positive feelings.

In addition, the findings replicate those of study 2 in showing that the priming of uncertainty does not equally increase the weight attached to nonaffective attributes of the target. Therefore it appears that uncertainty does not increase the reliance on any available information: It increases the reliance on affect in particular.

The finding that the effect of disgust on WTP almost reversed under primed certainty—although not significantly—may seem surprising at first. Although this pattern was unexpected—we would have predicted a null effect of disgust under primed certainty (parallel to studies 1 and 2)—it is not totally inconsistent with our theorizing and with previous findings. Indeed, prior research shows that when people attempt to exclude certain contextual inputs (e.g., incidental feelings) from their judgments, they sometimes overcorrect, resulting in a contrast effect in the

final judgment (Martin, Seta, and Crelia 1990; Ottati and Isbell 1996; Schwarz and Bless 1992; see also Chang and Pham, 2013 for similar results).

STUDY 6

On the surface, our consistent finding that the priming of uncertainty increases the reliance on affect in judgment seems to conflict with an established finding in the literature. Prior research has shown that uncertainty increases the reliance on systematic processing and decreases the reliance on heuristic cues (Tiedens and Linton 2001; Vaughn and Weary 2003). If one assumes that a reliance on affect indicates heuristic processing, whereas a reliance on nonaffective attributes indicate systematic processing, the results of studies 1–5 would seem to be inconsistent with previous findings. This inconsistency exists only in appearance.

It is important to recognize that, conceptually, the reliance on affective versus nonaffective input is independent from the notion of heuristic versus systematic processing. Affective inputs can be "peripheral" (e.g., the attractiveness of a spokesperson) or very "central" (e.g., the scent of a perfume). Similarly, nonaffective attribute information can be "central" (e.g., the reliability rating of a car) or "peripheral" (e.g., whether the product packaging is recyclable). Therefore, an increased reliance on affect does not necessarily indicate an increased reliance on heuristic processing (or decreased reliance on systematic processing), nor does an increased reliance on heuristic processing necessarily imply an increased reliance on affect.

The purpose of this final study was to demonstrate that the effects of uncertainty on the reliance on affect are orthogonal to the effects of uncertainty on heuristic-versus-systematic processing. To separate the two effects in this study, we independently manipulated both the value of an affective cue and the value of a nonaffective heuristic cue. Participants who were primed with either uncertainty or certainty were asked to evaluate a product. As a potential

affective input, the valence of participants' incidental mood state was manipulated. As a nonaffective heuristic cue, the expertise of the product's endorser was independently manipulated. We predicted that (a) uncertainty (vs. certainty) would increase the influence of participants' moods on their product evaluations, consistent with our previous results; and (b) uncertainty (vs. certainty) would decrease the influence of the endorser's expertise as a heuristic cue, consistent with reports in previous literature.

Design and Procedure

A total of 481 MTurk participants (M_{Age} = 35.65; 54.9% females) were randomly assigned to one of the eight conditions of a 2 (primed uncertainty vs. certainty) × 2 (happy vs. neutral mood) × 2 (expert vs. nonexpert endorser) between-subjects design.

Again, the study was introduced as consisting of three unrelated parts. The first part served as a manipulation of participants' incidental mood state. Using the same cover story as in the first part of study 5, we gave participants in the happy-mood condition three minutes to recall and describe a situation in which they felt happy, while participants in the neutral-mood condition were asked to recall and describe a typical day in their lives. The second part of the study primed uncertainty versus certainty using the same procedure as in the second part of study 5.

In the third part of the study, positioned as a market research survey, participants were presented with a picture of a set of headphones along with a short paragraph describing its main characteristics: "powerful sound experience with deep and punchy bass…excellent comfort…four different sizes…effective noise blocking." The content of this paragraph was constant across conditions. Below the paragraph was additional information about a certain "Tomas Wolfe" who had endorsed the product. In the expert-endorser condition, this person was

described as “one of the world’s most renowned sound engineers.” In the nonexpert-endorser condition, he was described as “an up-and-coming part-time DJ in a local club.” After reviewing the headphone information, participants were asked to evaluate the product on three 7-point items, anchored at bad/good, dislike/like, and unfavorable/favorable attitude, whose average (α = .89) served as the dependent measure. As in the previous studies, engagement with the task was assessed by recording the total amount of time that participants took to review the product and report their evaluations. As a manipulation check of the endorser’s expertise, participants were asked to rate their agreement with two statements, “The endorser is credible” and “The endorser is an expert,” on 7-point scales (α = .88).

Results

Preliminary analyses. A 2 × 2 × 2 ANOVA of the amount of time that participants took to review and evaluate the product reveals no effect of the manipulations, except for a marginally significant main effect of mood indicating that happy-mood participants took slightly longer to review and evaluate the product (M = 43.2 sec) than did neutral-mood participants (M = 37.09; $F(1, 473) = 3.05$, $p = .08$). A similar analysis of perceived endorser expertise reveals only a main effect of expertise, with participants perceiving the expert endorser as more credible and expert (M = 5.27) than the nonexpert endorser (M = 4.74; $F(1, 473) = 24.80$, $p < .001$).

Product evaluations. An ANOVA of participants’ product evaluations revealed a main effect of incidental mood. As expected, participants in the happy-mood condition evaluated the headphones more favorably (M = 5.29, SD = 1.08) than participants in the neutral-mood condition did (M = 4.99, SD = 1.20; $F(1, 473) = 7.30$, $p = .007$). More importantly, this effect was moderated by a mood-by-prime interaction ($F(1, 473) = 4.65$, $p = .032$). As predicted and illustrated in figure 5 (top panel), the mood effect on evaluations was stronger among

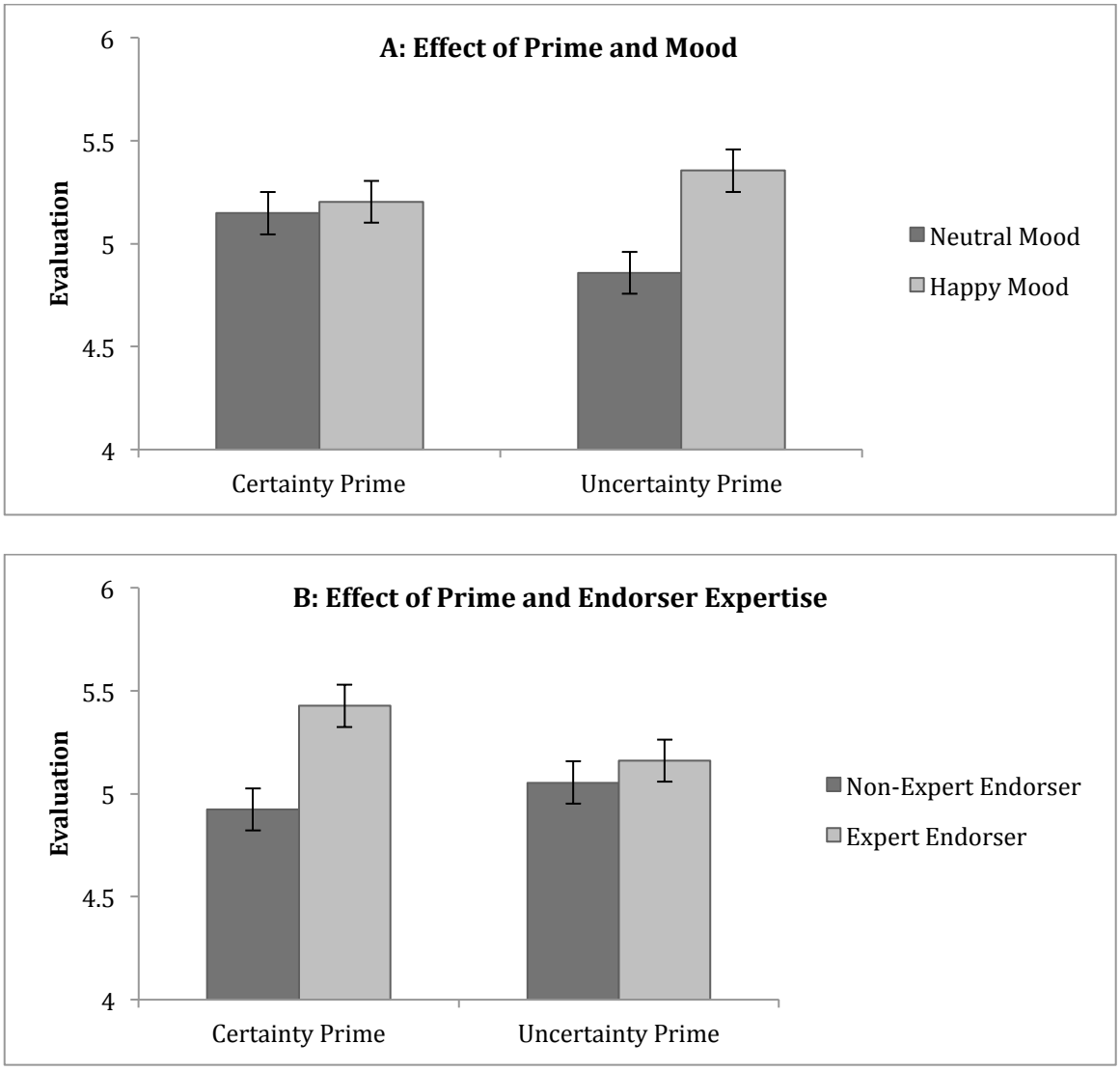
participants who were primed with uncertainty (M_{Happy} = 5.36, SD = 1.07, $M_{Control}$ = 4.86, SD = 1.20, $F(1, 473) = 11.76$, $p < .001$) than among participants who were primed with certainty (M_{Happy} = 5.22, SD = 1.08, $M_{Control}$ = 5.13, SD = 1.19, $F < 1$). This result replicates once more our main finding.

There was also a main effect of endorser credibility. Evaluations were understandably more favorable in the expert-endorser condition (M = 5.29, SD = 1.23) than in the nonexpert-endorser condition (M = 4.99, SD = 1.05, $F(1, 473) = 8.85$, $p = .003$). More importantly, this effect was moderated by an endorser-by-prime interaction ($F(1, 473) = 3.77$, $p = .053$). As depicted in figure 5 (bottom panel), the endorser's expertise had a stronger influence on participants' product evaluations in the certainty-prime condition (M_{Expert} = 5.44, SD = 1.23, $M_{Nonexpert}$ = 4.93, SD = 0.98, $F(1, 473) = 12.13$, $p < .001$) than in the uncertainty-prime condition (M_{Expert} = 5.15, SD = 1.21, $M_{Nonexpert}$ = 5.05, SD = 1.11, $F < 1$). In other words, whereas uncertainty (vs. certainty) increased the influence of participants' moods on their evaluations, it independently *decreased* the effects of the endorser's expertise. This latter effect conceptually replicates previous findings on the effects of uncertainty on systematic versus heuristic processing.

Finally, there was a mood-by-expertise interaction ($F(1, 473) = 5.53$, $p = .019$). The effect of endorser expertise was stronger among participants in the happy-mood condition (M_{Expert} = 5.55, SD = 1.09, $M_{Nonexpert}$ = 5.00, SD = 0.99; $F(1, 473) = 14.11$, $p < .001$) than among participants in the neutral-mood condition (M_{Expert} = 5.02, SD = 1.30, $M_{Nonexpert}$ = 4.97, SD = 1.10; $F < 1$). This last result is consistent with prior findings showing greater heuristic processing under happy moods (Bless, Bohner, Schwarz, and Strack 1990; Bless, Schwarz, Clore, Golisano, and Rabe 1996). The three-way interaction was not significant ($F < 1$).

FIGURE 5

STUDY 6: EVALUATION OF HEADPHONES AS A FUNCTION OF PRIME AND (A) MOOD, (B) ENDORSER EXPERTISE



Discussion

The results replicate once more our main finding that the priming of uncertainty (vs. certainty) increases the influence of affective inputs (here, incidental moods) on judgment. More importantly, the results help resolve the apparent conflict between this paper's main findings and previous findings suggesting greater systematic processing and lesser heuristic processing under

uncertainty. When affective inputs are manipulated orthogonally from heuristic (peripheral) cues, we found that uncertainty increases the influence of the former but decreases the influence of the latter. Hence, the phenomenon identified in our research is independent of—rather than conflicting with—Tiedens and Linton's (2001) and Vaughn and Weary's (2003) previous findings.

GENERAL DISCUSSION

The Phenomenon and its Boundaries

We advance the proposition that psychological states of uncertainty increase consumers' reliance on affective inputs in judgments and decisions. In line with this proposition, we consistently found that the priming of uncertainty (vs. certainty) increases the effects of a variety of affective inputs on consumer judgments. Specifically, across six studies we found that primed uncertainty amplified (a) the effects of the pleasantness of a musical soundtrack on behavioral intentions (study 1); (b) the effects of the attractiveness of a product picture on WTP for the product (study 2); (c) the relative preference for options that are affectively superior over options that are functionally superior (studies 3 and 4); (d) the effects of a general positive mood state on product evaluations (study 6); and (e) the effects of specific feelings of disgust on WTP for a product (study 5). The consistency of the findings across different types of affective inputs, different types of judgments, and four different methods of priming uncertainty substantiate the reliability and generalizability of the basic phenomenon.

Our studies additionally provide some insights about the boundaries of the phenomenon. First, while uncertainty is often thought of in relation to potentially adverse events (e.g., flight delays, stock market collapse), there also exist more positive forms of uncertainty (e.g., not knowing the content of a gift). This raises the question of whether both forms of uncertainty have

the same effects on people's reliance on affect. The results of study 4 suggest that they do. In that study both positive and negative uncertainty were found to increase the relative preference for an affectively superior option over a functionally superior option.

Second, one may wonder whether uncertainty encourages reliance on positive affect only, or reliance on both positive and negative affect. If uncertainty is discomforting and threatening to the self, one could conceivably assume that it encourages a reliance on positive affect only. The results of study 5 suggest that this is not the case. In that study the priming of uncertainty amplified the effects of disgust on participants' WTP for a product, causing lower WTP among participants who were made to feel disgust compared to control participants. Therefore, uncertainty does not just magnify the effects of positive affect on approach behavior, it also accentuates the effects of negative affect on avoidance behavior. The results of this study additionally suggest that uncertainty increases the influence of general positive versus negative affect (e.g., good mood vs. bad mood, pleasant vs. unpleasant music) as well as the influence of specific emotions such as disgust.

A third issue is whether uncertainty increases only the reliance on affect that is somewhat tangential to the judgment to be made ("peripheral" or "incidental" affect) or rather increases the reliance on affect in general, whether peripheral or more central to the judgment at hand. The affective inputs examined in our studies varied from some that were clearly peripheral and incidental to the target (the music soundtrack in study 1, participants' affective states in studies 5 and 6) to others that were more central and integral to the target (the view and aesthetic of the apartments in studies 3 and 4), or somewhere in between (the TV screen picture in study 2). The similarity of the results across studies suggests that the phenomenon does not depend on the centrality of the affect input.

Some Open Questions about the Boundaries

Other potential boundaries of the phenomenon remain open to further investigation. First, our studies mostly involved hypothetical judgments and decisions whose stakes were effectively low. One may therefore wonder whether the results observed here would hold under conditions where the stakes are higher. Would states of uncertainty prompt consumers to rely on their feelings when deciding on a million-dollar house? This is hard to tell without further empirical evidence. On the one hand, one could argue that when the stakes are very high, uncertainty may lead consumers to adopt a more "rational" mindset, thereby reducing their reliance on affect. On the other hand, one could alternatively argue that high stakes combined with high uncertainty are especially threatening to the self and may encourage people to rely more on what "feels right" to them.

A related issue is that in all our studies the source of uncertainty (a priming manipulation) was divorced from the judgment or decision to be made. As indicated in our conceptualization, uncertainty is often intimately linked to the decision to be made (e.g., when deciding whether to buy insurance or deciding whether to seek medical treatment). An important question then is whether uncertainty that is integral to the decision at hand has a similar effect on the reliance on affect. This would be an important avenue for future research.

Another unresolved issue is whether the effects observed in our studies would extend to the reliance on affect that is itself associated with uncertainty. Some emotions such as anxiety, fear, hope, and surprise tend to be associated with cognitive appraisals of uncertainty (Ellsworth and Smith 1988a, 1988b). It is possible that uncertainty would decrease the reliance on feelings associated with these particular emotions—another important avenue for future research.

Explaining the Phenomenon

Although this paper focused on documenting the phenomenon itself, its robustness, and its boundaries rather than its precise underlying process, our findings do provide some information about possible explanations of the phenomenon.

Uncertainty increases the reliance on all available information. An alternative interpretation of some of our results, especially those of study 1, is that uncertainty increased the effect of affective inputs on judgment not because it encourages the reliance on affect in particular, but because it encourages reliance on *all* available information. While this explanation is plausible with respect to study 1, it cannot account for the finding that in both studies 2 and 5 uncertainty increased the influence of the particular affective input that was manipulated (the attractive picture on the screen in study 2 and the level of disgust in study 5) but did not increase the influence of the nonaffective attributes that were manipulated independently. This explanation is further contradicted by the results of study 6, where uncertainty increased the influence of participants' mood states but actually decreased the influence of a nonaffective heuristic cue. Therefore, uncertainty does not encourage reliance on all information, but reliance on affective information in particular.

Uncertainty induces more heuristic processing. Because affective inputs such as the pleasantness of a musical soundtrack, the attractiveness of a picture, and the pleasantness of a preexisting mood state are often regarded as peripheral cues, it is tempting to interpret some of our results as showing that uncertainty induces more heuristic processing. Interpreted this way, our results would seem to conflict with previous findings showing that conditions of uncertainty tend to promote less heuristic and more systematic processing (Tiedens and Linton 2001; Vaughn and Weary 2003). This apparent inconsistency can be explained. Conceptually, the

reliance on affect versus nonaffective inputs is independent from the notion of heuristic versus systematic processing. An increased reliance on affect does not necessarily indicate an increased reliance on heuristic processing, nor does an increased reliance on heuristic processing necessarily imply an increased reliance on affect. Study 6 shows that when affective inputs are manipulated orthogonally from nonaffective heuristic cues, uncertainty increases the influence of the former but decreases the influence of the latter. The increased reliance on affect under uncertainty documented here is therefore *independent* from the increased systematic processing under uncertainty documented in previous research.

Uncertainty induces negative-mood regulation. Given that uncertainty tends to be psychologically aversive, one could argue that it induces negative-mood-alleviating preferences and behavior. Studies 3A–C's findings that uncertainty skews preferences toward options that are affectively superior over options that are functionally superior could be seen as consistent with this explanation. However, other results seem inconsistent with a negative-mood-regulation explanation. First, none of the manipulations of uncertainty used in our studies was found to affect participants' moods, which is consistent with previous research on primed uncertainty (e.g., McGregor et al. 2001; Rosenblatt et al. 1989; van den Bos and Miedema 2000; van den Bos et al. 2005). For mood regulation to be activated, people typically need to be aware that their affective state has been altered (Andrade 2005), which was ostensibly not the case in our studies. Second, in study 4 we found that the effect of uncertainty on the relative preference for affectively versus functionally superior options was independent of the valence of the uncertainty-producing situation, which also undermines a mood-regulation interpretation. Finally, study 5's finding that uncertainty increases the effects of disgust does not fit a standard mood-repair interpretation.

Uncertainty encourages reliance on information that is linked to the self. As a tentative explanation, we suggest that the phenomenon identified in this paper arises from the self-threatening nature of the psychological state of uncertainty, which encourages a reliance on inputs that are intimately linked to the self and have high subjective validity, affect being the prototypical example of such inputs. More direct tests of this explanation relative to other plausible explanations await future research.

An Adaptive Response?

Independent of the exact process explanation at a micro-theoretical level, one may wonder at a macro-theoretical level whether the tendency to rely on affect under states of uncertainty is purely irrational, or rather if it is the product of evolutionary adaptation. While we do not have a definite answer at this point, various streams of research have us lean toward the latter interpretation. First, research on the neurobiology of stress—a close correlate of psychological uncertainty—shows that stress releases a family of neuromodulators that facilitate the functioning of brain structures that are phylogenetically older and associated with the processing of affective information (e.g., the amygdala, hippocampus, striatum, and posterior cortices; see Arnsten 1998, 2009 for reviews). Such findings suggest that the reliance on affective inputs under states of uncertainty may have evolutionarily ancient roots.

Second, a growing body of work in evolutionary biology and evolutionary psychology, known as life-history theory (LHT), suggests that many organisms across species are particularly sensitive to unpredictability in the harshness of their ecological environment (e.g., scarcity of resources, predator threat, intra- and inter-species competition). According to LHT, high environmental unpredictability triggers the development of distinct patterns of traits and behaviors that reflect the organism's or species' strategic adjustment to this unpredictability (see

Ellis, Figuerero, Brumbach, and Schlomer 2009, for a review). Faced with high unpredictability in the harshness of their environment, many species (and individuals within species) appear to develop a "faster" life-history strategy that entails, among other things, earlier reproduction, higher number of reproductive partners, greater number of offspring, and lower parental investment in these offspring. Consistent with the general tenets of LHT, recent studies indicate that people who faced resource scarcity during their childhood were more likely to prefer to have children sooner when primed with mortality cues (Griskevicius, Delton, Robertson, and Tybur 2011); they were also more likely to take risks and succumb to temptation when primed with resource scarcity (Griskevicius et al. 2012). This line of research suggests that a long history of exposure to uncertainty may have encouraged the evolutionary development of a set of distinct strategic orientations, which a reliance on affect in judgment may be a part of.

Why would humans have developed a strategy of reliance on affect under states of uncertainty? A plausible explanation comes from recent work suggesting that rather than being arbitrary "noise," subjective feelings are in fact metasummaries of the vast amount of information that individuals encode continuously about their surrounding environment, whether consciously or unconsciously (Clore and Parrott 1994; Greifeneder, Bless, Pham, 2011; Koriat and Levy-Sadot 1999). Hence, affective (and other) feelings may provide a privileged window on everything that the individual tacitly "knows" about the world, which should be especially valuable when there is uncertainty. Indeed, recent studies suggest that in natural environments (outside the lab) reliance on feelings may improve people's ability to predict a variety of future outcomes (Pham, Lee, and Stephen 2012). Therefore, another promising avenue for future research would be to study the possible "rationality" of the reliance on affect under states of uncertainty.

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