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Liu, Wendy

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Focusing on Desirability: The Effect of Decision Interruption and Suspension on Preferences

WENDY LIU*

This research examines the phenomenon of interruptions and suspensions in decision making. It is proposed that information processing may change from a bottom-up, data-driven to a top-down, goal-directed mode after an interruption, thereby affecting preferences. In particular, in decisions involving desirability and feasibility conflicts, because desirability is a superordinate goal to feasibility, four studies found that when a decision is interrupted and later resumed, people become more likely to favor highly desirable but less feasible consumption, such as a high-risk, high-reward option or a high-quality, high-price option. A reduced focus on feasibility is found to underlie this effect.

Consumers' decisions are often interrupted or suspended during the course of making them. For example, consider a consumer shopping at an online store: as she ponders a particular purchase, she might be interrupted by a pop-up ad that informs her of the various events happening at the store; alternatively, she may be diverted by a prompt on her computer to check an incoming e-mail. Similarly, a consumer taking a lunch break at the mall may leave a purchase decision in suspension because she needs to go back to work. Later she returns to the store to resume this decision. Thus an intriguing question that arises is whether such interruptions and suspensions in decision making can affect the ensuing choices: when people discontinue their decisions and come back later, do they tend to make different decisions than if they had not been interrupted?

Interruptions have long been of interest in psychological research. Perhaps the best-known effect of task interruption is the Zeigarnik effect (1927). This body of work suggests that people tend to have better memory and stronger motivation for incomplete rather than completed tasks and intentions (Mäntylä 1996; Marsh, Hicks, and Bink 1998; Savitsky, Medvec, and Gilovich 1997; see also Butterfield

[1964] and Goschke and Kuhl [1993] for critical reviews of this literature). Relatedly, recent consumer research shows that framing a task, such as earning a number of frequency reward points for a final prize, as work in progress increases consumers' motivation to earn those rewards (Kivetz, Urminsky, and Zheng 2006; Nunes and Drèze 2006). In addition to task motivation, the broader impact of interruptions on shopping behavior has also been studied. For example, Xia and Sudharshan (2002) investigated how different types of interruption configurations influenced consumers' online shopping time and satisfaction, showing that moderate frequencies of interruptions and interruptions that occur early in the shopping process tend to be better accepted. However, while existing works have focused on the effects of interruptions on people's response to the task, they do not address people's preferences and decisions made within the task. This latter question, namely, the effect of interruptions on preferences, is the focus of the current research.

Specifically, it is proposed that an interruption can lead to changes in preferences by changing the manner of information processing in decision making; in particular, it may make processing less bottom-up data driven and more top-down goal directed, resulting in preferences shifted toward one's primary goal dimension. Current studies examine this possibility in the context of decisions involving conflicts between desirability and feasibility goals. It is hypothesized that when a decision is interrupted, preference may systematically shift toward the more primary goal dimension of desirability. The next sections will develop the theory of this interruption effect and present four experiments that test this effect and its underlying mechanism.

*Wendy Liu is assistant professor of marketing at the Anderson School of Management, University of California, Los Angeles, 110 Westwood Plaza, Suite B-416, Los Angeles, CA 90095-1481 (wendy.liu@anderson.ucla.edu). The author would like to thank Itamar Simonson, Aimee Drolet, and the reviewers for their helpful comments on this project.

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THEORETICAL BACKGROUND

Extensive research in consumer behavior suggests that decision making is often a process of information processing, and preferences are constructed as a result rather than simply retrieved from memory (Bettman, Luce, and Payne 1998). In a comprehensive framework of consumer decision making, Bettman (1979) modeled information acquisition and evaluation at the center of decisions, with the individual's motivation and attention systems playing antecedent roles and interacting with other decision components such as learning and satisfaction. Notably, this model allowed for the course of decision making to be interrupted and further suggested that changes to information processing may occur after an interruption. Following this framework, this research examines the dynamic changes in information processing due to an interruption. It is posited that an interruption may shift processing from a relatively bottom-up, data-driven mode to a more top-down, goal-directed mode.

Bottom-Up, Data-Driven versus Top-Down, Goal-Directed Processing. Cognitive theories generally differentiate between two modes of information processing, namely, bottom-up versus top-down processing (Hauser 1986; Johnson 1984; Park and Smith 1989). The bottom-up mode refers to processing that is driven by the presence of data rather than guided by one's preexisting theories and goals. In contrast, top-down processing is directed by the person's existing knowledge and goal structures. A related distinction exists in research on attention, contrasting involuntary and voluntary attention (Kahneman 1973; Payne and Bettman 2004). Involuntary attention is attention captured by stimuli in the environment, especially those that are novel, potentially threatening, as well as simply perceptually compelling. Voluntary attention, however, refers to selectively devoting attention to information most relevant to one's goals. Thus in a consumer decision, the person can process information in either a bottom-up manner that attends to salient, concrete data or a top-down manner in which attention is guided by one's internal structures.

Previous studies have examined conditions in which bottom-up versus top-down processing is used in decisions. Extant research suggests that bottom-up processing often takes place by default. For example, in visual processing, involuntary attention is automatically aroused by novel stimuli (Berlyne 1960; Kahneman 1973). Relatedly, consumer research demonstrates that people are often sensitive to the specific presentational features of product information (Bettman and Kakkar 1977; Bettman et al. 1998), suggesting bottom-up processing of data at play. However, although bottom-up processing is often engaged, research has also identified conditions in which people rely more on top-down processing. One factor is the salience of a top-down structure. For example, if people have an explicitly articulated goal before entering a decision, they are likely to follow a top-down process of evaluating information against this goal rather than attending to the trade-offs within the data (Park

and Smith 1989). Another determinant is the relative need for piecemeal understanding of new information. For instance, for consumers with strong expertise in a particular domain, when information about a product matches the person's prior category schema, the person may not attend to the detailed information given, but rather rely on his/her category knowledge for efficiency; however, when information is discrepant from prior schema, he/she is likely to process the information in a piecemeal manner (Sujan 1985). Finally, top-down processing is used when bottom-up processing does not yield insight. For example, Johnson (1984) shows that when choosing among products from different categories (e.g., a television and a bike), because the specific attribute information is difficult to compare, people turn to a higher-level goal (fun) to evaluate the data. These results suggest that the use of bottom-up versus top-down processing depends at least in part on the relative salience (and usefulness) of external stimuli versus internal knowledge and goals: when the salience of external information is reduced, the person's preexisting structures may play a bigger role in guiding processing. Building on this insight, this research proposes that an interruption in decision making may also cause processing to become more top-down goal directed and less bottom-up data driven.

To illustrate, consider a consumer who is contemplating a product choice. The person learns the available information regarding the purchase and evaluates the options. As suggested above, if the situation is relatively novel, processing is likely to be bottom-up and data driven as the person seeks to understand the information. Consequently, the person attends to the data in detail, noticing any salient features within the data. After processing the information under this bottom-up focus, unless an interruption occurs (or difficulty arises; Johnson 1984), the person is likely to continue to deliberate and reach a decision, all the while relying on the current, bottom-up view of the situation.

However, consider the case in which the decision is interrupted. That is, the person learns the available information and is contemplating the choice; at this point, the decision is suspended because of an intervening event. Later the person returns to make the decision. How does this interruption affect the decision? It is likely that upon returning, the person will continue the decision by reviewing the situation. Interestingly, however, the manner of information processing may now be different in this review. Specifically, because the person has already learned the information before, the data appear less novel and thus would attract less involuntary attention. Further, because the person has already acquired a piecemeal understanding of the data, he/she is less likely to feel the need to relearn the information in the same piecemeal manner. Instead, as the focus on information learning is reduced, attention becomes more voluntary, and the person's internal structures may become more prominent and exert greater influence. In particular, because decisions generally involve conflicting goals, the person's inherent goal structure may guide his/her processing of different information. Specifically, information re-

garding the person's high-level, primary goals in the decision may become the focus of one's attention, whereas information pertaining to low-level, secondary goal dimensions may be relatively less attended to. In other words, attention becomes more top-down and selective according to one's goal construal (rather than driven by data) after an interruption, resulting in systematic shifts in preferences. For instance, in the context of decisions involving conflicts between desirability and feasibility attributes, because desirability is a more primary goal dimension than feasibility in people's goal construal (Liberman and Trope 1998), an interruption may lead to greater preference for desirability over feasibility.

Desirability and Feasibility of Actions. Theories of goals generally distinguish between two types of values associated with goal-directed action, namely, desirability and feasibility values (Bagozzi and Dholakia 1999; Kruglanski 1996; Liberman and Trope 1998; Trope and Liberman 2003). Desirability refers to the value of the end state of an action, whereas feasibility refers to the ease or likelihood that the action will achieve the desired outcome. Thus in the language of action identification theory (Vallacher and Wegner 1987, 1989), desirability corresponds to the "why" of an action, namely, the rewards of the action that motivate the person to pursue it, whereas feasibility refers to the "how" of the action, which involves the costs and constraints associated with the action. Therefore, actions can be characterized by varying degrees of desirability and feasibility. For example, a backpacking trip in the mountains may be highly desirable to a person, providing fun and excitement; however, sometimes it may not be very feasible, such as when extensive travel is involved or when the person lacks the physical preparation. Similarly, working for a potentially wildly successful start-up company has high desirability, but if the probability of success is low, the option is also of low feasibility (Sagristano, Trope, and Liberman 2002).

In deciding among different actions, people often have to balance the dual goals of desirability and feasibility. Interestingly, however, despite the equal role of desirability and feasibility in affecting the actual decision outcome, recent research has demonstrated differences in people's psychological representation of them. Specifically, theories of mental representation show that people organize their knowledge around concepts in a hierarchical structure (Medin 1989; Trope and Liberman 2003), whereby certain attributes are identified as high-level, primary features of the concept, whereas others are low-level, secondary information. High-level attributes are generally essential in defining the values and meaning of the concept (e.g., the genetic traits of an animal), whereas low-level features relate to incidental details that do not pertain to the core meaning of the concept (e.g., the specific variations in behavior for an animal). In the case of one's representation of goal-directed action, it is found that because the desirability values of an action define the meaning of the action (why take action), they are represented as the high-level, primary dimension associated with the action. However, although fea-

sibility values describe the specific conditions for the action, they do not identify the meaning of the action and hence are construed as the low-level, subordinate dimension (Liberman and Trope 1998; Trope and Liberman 2003). Consequently, when thinking about an action, people tend to want to identify the desirability values first before the feasibility values (Liberman and Trope 1998; Vallacher and Wegner 1987).

This hierarchical construal of desirability and feasibility values in turn affects how people attend to desirability versus feasibility information. For example, when one is under the mind-set to form a high-level view of an event, he/she focuses on the primary constructs in the situation and hence focuses on desirability; however, when the person wishes to form a close, detailed view of the situation, he/she will attend to the low-level features of feasibility. In particular, research finds temporal distance to be a significant determinant of the level of representation sought (Trope and Liberman 2000, 2003). When making decisions regarding the immediate (far) future, people form low-level (high-level) representations and attend to the feasibility (desirability) of actions. Thus in deciding whether to attend a concert, people may pay much attention to the price of the ticket (feasibility) when the concert is in the near future; however, when the concert is in the distant future, they focus on how much they like the band (desirability) rather than the ticket cost (Liberman and Trope 1998). Similarly, when people are choosing between financial gambles, the amount of winning (desirability) is emphasized over the probability of winning (feasibility) when the payout is in the distant rather than the near future (Sagristano et al. 2002).

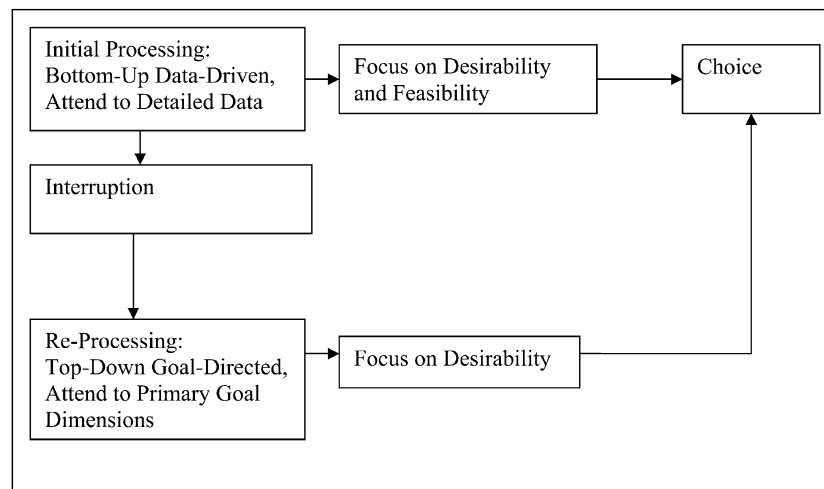
Importantly, this hierarchical relationship between desirability and feasibility goals suggests that the differential processing modes employed in interrupted versus uninterrupted decision making may also affect the relative focus on desirability versus feasibility information. Specifically, bottom-up processing in uninterrupted decisions focuses on concrete data, thereby forming a low-level view that attends to both desirability and feasibility information. In contrast, in top-down processing after an interruption, attention is more selectively directed toward the primary, high-level goal defining the actions. Consequently, focus will shift toward the desirability dimension, thereby affecting the ensuing choice. This effect of decision interruption is presented in figure 1.

This research therefore proposes the following hypothesis:

- H1:** In a decision with a desirability-feasibility trade-off, interruption will increase the preference for the high-desirability, low-feasibility option, compared to if the decision is made without interruption.

Evidence for this hypothesis and its underlying mechanism is provided next in four studies.

FIGURE 1
THEORETICAL MODEL



STUDY 1: CHOOSING A HIKING DESTINATION

Overview and Design

Study 1 tests the basic premise that an interruption in decision making may lead to a greater preference for desirability over feasibility (hypothesis 1). To this end, participants are asked to make a hypothetical decision between two destinations for a hiking trip. To identify the desirability and feasibility features, a pretest ($N = 39$) asked participants two open-ended questions—“What are your main goals for selecting a hiking destination?” and “What are the main constraints for selecting a hiking destination?”—aimed at revealing the common desirable end states and difficulties associated with going hiking. Scenery (62% mentioning) and personal challenge (28%) were named as the main goals, whereas physical ability (51%) and travel (28%) were the main constraints. Scenery and travel are thus chosen as the desirability and feasibility attributes (personal challenge and ability are not used because a positive challenge for some may be a physical constraint for others). In particular, park A is described as having scenery with waterfalls and creeks, but it is 70 miles away from home and has limited parking. Park B, however, has scenery with boulders and bushes, but it is 40 miles from home with plenty of parking. A pretest confirmed that park A is of higher desirability whereas park B is of higher feasibility. It is predicted that when people are interrupted (vs. not) during this decision, they would become more likely to choose park A. Thus study 1 has a one-factor design in which the presence (vs. absence) of interruption is manipulated between subjects.

Procedure

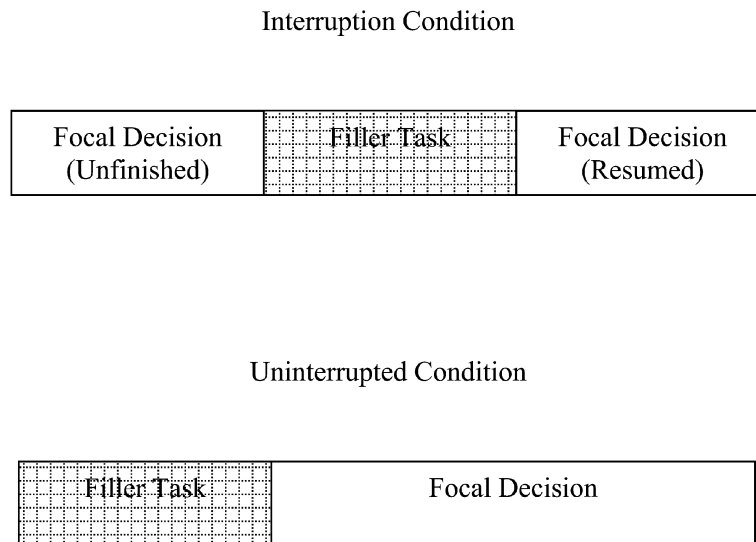
Participants ($N = 128$, mean age = 34, 26% male) were ordinary consumers recruited from all over the country through a Web service to take part in online studies for academic purposes. The 10-minute session consisted of the current hiking study as well as several other unrelated studies. Participants were told at the beginning of the session that the researchers were interested in people’s behavior in multitasking environments. Thus during the session they might be asked to switch between different types of tasks: when they see such instructions, they should simply switch tasks as instructed.

Nested in the unrelated studies, the decision interruption paradigm consisted of two components: the hiking decision and a filler task. The key manipulation was that half of the participants were asked to switch to the filler task during the hiking decision (thus the hiking decision was interrupted) and were later told to resume the decision upon completing the filler task. In contrast, the other half of the participants encountered the same filler task before they started the hiking decision; thus the hiking decision was not interrupted (see fig. 2 for an illustration of the procedures). Therefore, participants in both the uninterrupted and interruption conditions completed the same tasks, but in one case the filler task preceded the decision whereas in the other case the filler task interrupted the decision.

The filler task was a “count backward” procedure used in previous research to keep individuals cognitively occupied (Carlyon et al. 2003). In this study, participants were told to count backward by 7 from 175 to 105, typing down each step as they go. This task was chosen because it was easy to perform yet required concentration and therefore kept participants from thinking about any other issues. The interruption was inserted in the following manner: partici-

FIGURE 2

ILLUSTRATION OF THE DECISION INTERRUPTION PROCEDURE



participants were asked to imagine that they were choosing a destination for a hiking trip during the weekend. The options were presented on the screen with the scenery and accessibility information for each park described in a table. Below the table, participants in the uninterrupted condition were asked, “Which park would you choose?” followed by two radio buttons on which they could indicate their decision. However, participants in the interruption condition read (unexpectedly), “Which park would you choose? Now please stop thinking about this decision for a moment, and switch to the task on the next page” followed by a “continue” button that took them to the next page containing the count backward task. After they finished the counting task, they were taken back to the hiking decision with the same information presented as before, along with the headline “Now please come back to the hiking decision.” This time they made the decision and went on to the next study.

In both conditions, after the participants gave their choices, they were asked two pairs of process questions aimed at examining the focus of attention in each condition: first, “In making the decision, how much did you focus on/emphasize the scenery of the parks?” (combined to form an index of focus on scenery, $r = .95$) and then “How much did you focus on/emphasize the accessibility of the parks?” (combined to form an index of focus on accessibility, $r = .88$). In addition, each participant’s time spent on the decision (in one interval in the uninterrupted condition and two intervals in the interruption condition) was recorded by the computer.

Results

A logistic regression with park choice as the dependent variable, decision interruption as the independent factor, and

gender and age as covariates revealed no significant effect of the covariates (henceforward, nonsignificant covariates will not be mentioned) but a significant effect for interruption: when uninterrupted, 65% of the participants chose park A with better scenery; after an interruption, 84% chose this option ($B = 1.14$, $p = .01$).

Next, the focus of attention during the decision was examined. There were three possibilities consistent with the proposed shift in focus toward desirability after interruption: (a) increased attention on desirability, (b) decreased attention on feasibility, and (c) both. Results revealed that the second was the case. An analysis of covariance with focus on scenery as the dependent variable, interruption as the independent factor, and gender and age as covariates showed that interruption did not have a significant effect on the amount of focus given to scenery ($M_{\text{unint}} = 5.74$, $M_{\text{int}} = 5.97$; $F < 1$). However, interruption did lead to a significant decrease in attention to accessibility ($M_{\text{unint}} = 4.53$, $M_{\text{int}} = 3.98$; $F(1, 124) = 4.04$, $p = .05$). This result is consistent with the proposed switch to a top-down mode of processing after interruption, whereby attention becomes selectively focused on the primary goal dimensions but the secondary dimensions are overlooked. Therefore, as theorized, an interruption changed the relative focus between desirability and feasibility; in particular, the locus of the effect is a reduced attention to feasibility. Further, adding focus on accessibility to the original binary logistic regression on choice showed that with both this term and interruption included in the model, focus on accessibility turned out to be a significant predictor of choice ($B = -1.42$, $p < .0001$); in contrast, the previously significant effect of interruption became nonsignificant ($B = .64$, $p = .26$). Thus the reduced focus on accessibility fully mediated the effect

of decision interruption on preference (Baron and Kenny 1986).

Finally, I examined the decision time in each condition. When uninterrupted, participants spent on average 28 seconds on the decision; when interrupted, participants spent 22 seconds prior to the interruption and another 10 seconds upon returning to the decision. The total time did not differ significantly between conditions (28 vs. 32 seconds; $F(1, 123) = 1.05, p = .31$). Further, when decision time was used as a covariate in the regression, interruption remained a significant predictor of choice ($B = 1.13, p = .01$), but time did not have a significant effect ($B = -.002, p = .52$). These results suggest that decision interruption did not affect the overall amount of processing people gave to a decision; however, it created a discontinuation in processing, which changed preferences.

Discussion

Study 1 provided initial evidence for the decision interruption effect: when trading off desirability and feasibility, people became more likely to choose the high-desirability, low-feasibility consumption after an interruption. Further, this effect was driven by a reduced focus on the feasibility dimension.

However, this finding notwithstanding, questions remain regarding the results. Most notable, even though desirability and feasibility are contrasted in the situation, an alternative account of the interruption effect may be that after an interruption, participants chose on the basis of which attribute they considered to be more important rather than processed according to their implicit goal construal. Thus if goal construal primacy and subjective importance coincide, the nature of the effect is indeed muddled. However, previous research in construal level theory shows that goal construal level and judgment of importance are conceptually distinct, and in many situations they can diverge whereby the feasibility dimension is deemed more important (Trope and Liberman 2003). Thus studying such situations can help disentangle the two accounts and provide evidence that the shift in preference relies on goal-directed processing. To this end, study 2 is conducted.

STUDY 2: REWARD VERSUS RISK

Overview and Design

The objective of study 2 is to tease apart the role of goal construal and attribute importance and to generalize the decision interruption effect to another context, namely, the conflict between risk and reward. Previous research shows that when one is choosing between an option that has a small probability for a large reward and another with a large probability for a small reward, the level of reward is a desirability dimension because it defines the meaning of the action, whereas the probability of the reward is a feasibility dimension since it relates to when the reward can be realized. Consequently, when people are under a mind-set to focus

on primary goal dimensions, such as when thinking about a distant future, they tend to emphasize reward over risk and choose the high-risk option (Sagristano et al. 2002). Therefore, this research proposes that an interruption may similarly lead to a focus on the primary goal of reward and, hence, greater risk taking.

H2: In a decision involving risky options, interruption will increase the preference for the high-risk, high-reward option.

Also important, despite the primacy in goal construal of reward compared to risk, reward may not be perceived as more important than risk. Normatively, both dimensions contribute equally to the final outcome of the decision. Further, because of people's general tendency for risk aversion, risk may even be subjectively perceived as a more important dimension than reward—a conjecture confirmed in the pretests below.

In this study, the risk-reward trade-off is operationalized in two decisions. In the first, participants are asked to choose between two financial gambles. Option A has a 70% chance of winning \$40 (30% chance of not winning anything), whereas option B has a 40% chance of winning \$120. As a conceptual replication, in the second decision, participants are told they are purchasing a printer and are choosing between two options differing by print quality (reward) and reliability (risk, defined as the chance of malfunction). Both attributes are presented on a 1–10 scale, where 1 = bad and 10 = good. Printer A is lower in risk (print quality = 8, reliability = 9), and printer B is higher on reward (print quality = 9, reliability = 8).

A pretest ($N = 35$) examined the perception of importance between reward and risk. When asked “When taking on a gamble [in the above ranges of attribute values], how important is the amount of winning?” and “How important is the probability of winning?” (1 = not at all, 7 = very much), a within-subject t -test showed a significant difference whereby people considered the probability of winning more important than the amount of winning ($M_{\text{amount}} = 4.66, M_{\text{prob}} = 5.60; t(34) = 3.05, p = .004$). Similarly, for printers (in the above attribute ranges), people assigned greater importance to printer reliability ($M = 6.26$) than to print quality ($M = 5.69; t(34) = 2.07, p = .05$). Thus if after an interruption people think about attribute importance, they should be more likely to choose the low-risk option. However, if attention becomes goal directed, they would be more likely to choose the high-risk option. Therefore, study 2 has a one-factor (interruption: absent, present) design with two within-subject replications.

Procedure

Participants ($N = 99$, mean age = 21, 46% male) were college students at Stanford University. They were paid \$5 to participate in a study on “multitasking behavior” in a computer lab. The session consisted of the two target decisions and other unrelated tasks. The interruption paradigm

for each decision was similar to that used in study 1: after participants were given the information about the decision, half of them received an instruction to switch tasks and later to resume the decision. One departure from study 1 was how the interruption was introduced. One potential concern with the study 1 procedure was that because the interruption instruction appeared on the same page as the decision description (at the end of the description), there is a chance participants in the interruption condition may have first noticed this instruction even before starting the decision, thereby making the interruption expected rather than unexpected. This expectation for interruption in turn may have played a role in the effect. In study 2, this concern is addressed by controlling the timing of the introduction of information and interruption. Specifically, information for a decision was built on the screen gradually (a new line was added every 5 seconds on the basis of a pretest of reading speed). After the last sentence ("Which option would you choose?") appeared, those in the uninterrupted group were also given the buttons they could click for their choice, and they could take as long as they liked to indicate an answer. However, those in the interruption condition were automatically taken to a new screen that instructed them to work on a filler task (counting backward); after the filler task, the target decision automatically reappeared and participants took their time to finish the decision. Thus in study 2, all participants spent an equal amount of time learning about the options before an interruption was introduced for half of them. However, both groups took as long as they wished to make a decision. The interruption manipulation was counterbalanced within subjects such that if the financial decision was interrupted for a participant, the printer decision was not, and vice versa. The financial decision always preceded the printer decision, but they were spaced apart by unrelated studies. The decision time was recorded by the computer.

Results

Results in both the financial and printer decisions were supportive of hypothesis 2. A logistic regression with financial choice as the dependent variable, interruption as the independent factor, and age, gender, and ethnicity as covariates revealed a significant effect for interruption ($B = .92, p = .04$): choice of the high-risk gamble increased from 48% to 71% when the decision was interrupted. Similarly, choice of the high-print quality, low-reliability printer increased from 32% to 53% when interrupted ($B = 1.13, p = .04$).

Next, the recording of decision time was analyzed. In corroboration of study 1 results, both groups spent a similar amount of time in reaching a decision (time spent after the point of interruption: financial decision: $M_{\text{unint}} = 8.3$ seconds, $M_{\text{int}} = 7.4$ seconds; $F < 1, p = .71$; printer decision: $M_{\text{unint}} = 7.1$ seconds, $M_{\text{int}} = 6.8$ seconds; $F < 1, p = .83$). Further, in each decision, when decision time was added as a covariate in predicting choice, interruption remained a significant factor ($p < .04$), but decision time was not a significant predictor ($p > .30$).

Discussion

Despite the fact that risk was perceived to be a more important attribute than reward, across two decision contexts, decision interruption led to greater choice of the high-risk option. Therefore, goal construal level rather than attribute importance likely underlies the decision after interruption.

Thus the first two studies provided converging support for the effect of decision interruption on a preference for desirability. Further, study 1 showed evidence that a shift in focus mediated the effect. After an interruption, people tended to selectively attend to the desirability attribute but did not focus as much on the lower-level dimension of feasibility. However, an important question still remains regarding the mechanism of the effect, namely, what is the impetus for this shift in focus? It is posited that this shift occurs as a result of a change in the person's processing mind-set: from bottom-up data driven to top-down goal directed. The next study seeks to provide evidence for this process. Specifically, if the interruption effect relies on a departure from the bottom-up mode toward a top-down mode after the interruption, a manipulation that reintroduces the bottom-up mode of processing when the person resumes from interruption may eliminate the interruption effect. In other words, if after the interruption people are prevented from switching to a top-down, goal-directed mode as they naturally would have been, the interruption effect would be "undone." Study 3 tests this possibility.

STUDY 3: ELIMINATING THE DECISION INTERRUPTION EFFECT

Overview and Design

The objective of study 3 is to examine whether explicitly instructing people to adopt a bottom-up, data-driven processing mode after an interruption would eliminate the decision interruption effect, thereby providing evidence for the change in processing mode underlying the effect. To this end, this study looks at another case of a desirability-feasibility trade-off, namely, price-quality conflicts in consumer purchases. When faced with a decision between a high-quality, high-price (HQHP) and a low-quality, low-price (LQLP) option, consumers are often sensitive to the feasibility dimension of price and hence choose to sacrifice desirability (quality). However, if an interruption in the decision reduces the focus on feasibility, it may lead to greater choice of the HQHP option.

H3: In a purchase decision involving a price-quality trade-off, interruption will increase the preference for the high-quality, high-price option.

In this study, participants are asked to imagine that they are purchasing a new set of bed linen for themselves. Specifically, they can choose between a high-quality sheet set with 350-count premium cotton, costing \$79, and another one with 250-count standard cotton, costing \$39. Half of

the participants are interrupted during this decision. Importantly, in addition to the interruption manipulation, a second factor is introduced; namely, half of the participants are given an instruction on how to process the information: "For this decision, please first form a concrete, detailed view of the information and then make the decision." Thus this instruction directs participants to focus on learning the external information by following its specific details, thereby processing the information in a bottom-up manner. A pretest showed that indeed this instruction creates a bottom-up focus in processing: 42 participants were shown the bed linen decision with this instruction and were asked, on a 5-point scale (1 = not at all, 5 = very much), "To what extent does the instruction ask you to (1) focus on each piece of information given to you closely" and to check against top-down processing (and undifferentiated responding) and "(2) focus on the information that's more closely linked to your goals for the decision." A within-subject *t*-test showed that indeed participants understood the instruction to have a bottom-up focus on data ($M_1 = 4.26$) and to be neutral on having a top-down focus on data ($M_2 = 2.90$; a significant difference between the two items, $t(41) = 5.64$, $p < .0001$).

When this instruction is coupled with the uninterrupted condition, it is given up-front at the beginning of the decision. When it is coupled with the interruption condition, it is given upon resuming the decision (but not before the interruption). Upon resuming, participants read, "Now please come back to the previous decision. In particular, please first form a concrete, detailed view of the information, and then make the decision." Therefore, in the interruption-with-instruction condition, participants process as usual before the interruption; but after the interruption, they are forced to process in a bottom-up, data-driven mode (again) rather than being able to turn to a top-down, goal-directed mode in reprising the decision. This intervention therefore eliminates the effect of the interruption.

H4: The effect of decision interruption is eliminated if after an interruption people are induced to still rely on a bottom-up mode of processing.

Thus study 3 has a 2 (interruption: absent vs. present) \times 2 (detail-focus instruction: absent vs. present) design. I predict an interaction effect between interruption and detail-focus instruction. When the detail-focus instruction is absent, interruption will increase the preference for the HQHP option, supporting hypothesis 3; however, the interruption effect will be eliminated when the detail-focus instruction is given (comparing the interruption-with-instruction condition to either the uninterrupted-with-instruction condition or the regular uninterrupted condition). As further support, I also predict that the uninterrupted-with-instruction condition will be similar to the regular uninterrupted condition, consistent with the theory that when uninterrupted, people process with a bottom-up data focus by default, regardless of whether an explicit instruction is given.

Of note, this predicted elimination of the interruption ef-

fect may also help to rule out an additional alternative explanation for the decision interruption effect. Namely, the increased preference for the high-desirability option after an interruption may be due to an increase in the person's reference level for goal achievement (Kahneman and Tversky 1979; Novemsky and Dhar 2005). That is, the initial consideration of a highly desirable option in the choice set may have led the person to adapt to a higher reference point for desirability after the interruption. Consequently, the high-desirability option becomes more attractive because the low-desirability option has now fallen below the new reference. However, if this reference-update mechanism were at play, the detail-focus instruction would not be able to eliminate the interruption effect because people would still choose on the basis of the increased reference.

Procedure

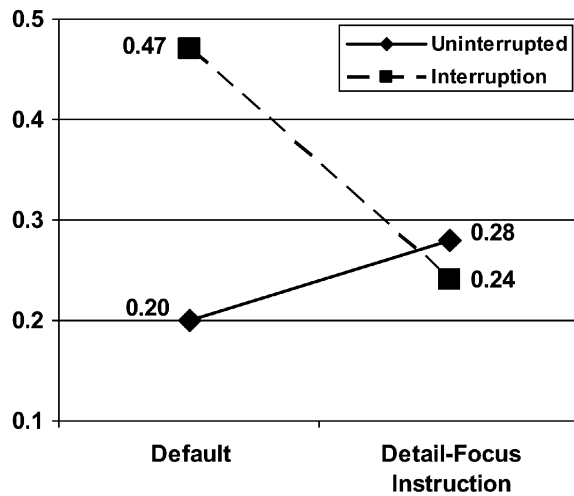
Participants ($N = 167$, mean age = 32, 35% male) were ordinary consumers recruited from all over the country through a Web survey service as in study 1. The 10-minute session consisted of the current study as well as several other unrelated studies. The interruption procedure was similar to that used in study 1. For greater generalizability, the filler task in this study used a different exercise than previous studies, namely, word generation. Specifically, participants were asked to generate five words starting with the letter *N*, five words starting with *D*, and five words starting with *K*. After participants completed the filler task and bed linen choice, they went on to other unrelated portions of the session.

Results

A logistic regression with choice of the HQHP option as the dependent variable, the factors of detail-focus instruction and interruption and their interaction term as the independent variables, and gender and age as covariates revealed no significant main effect for interruption ($p = .67$) and a marginally significant effect for detail-focus instruction ($B = .96$, $p = .06$; $M_{w/o\ instr} = 34\%$, $M_{w/instr} = 26\%$). Importantly, however, as predicted, there was a significant interaction effect for detail-focus instruction and interruption ($B = -1.45$, $p = .05$). The likelihood of purchasing the HQHP option in each condition is graphed in figure 3. Planned contrasts were conducted next.

When no instruction for detail focus was given, interruption led to greater choice of the HQHP option (the premium cotton sheets), supporting hypothesis 3 ($M_{unint} = 20\%$, $M_{int} = 47\%$; $\chi^2(1) = 7.46$, $p = .01$). However, when the detail-focus instruction was given, interruption did not have an effect on preferences ($M_{unint\ w/instr} = 28\%$, $M_{int\ w/instr} = 24\%$; $\chi^2 < 1$). The interruption-with-instruction condition was also not different from the regular uninterrupted condition ($\chi^2 < 1$), suggesting that the effect of interruption was completely "undone" by the instruction (hypothesis 4). Additionally, as predicted, the regular uninterrupted condition was not different from the uninterrupted-with-instruction

FIGURE 3
STUDY 3 RESULTS



condition ($\chi^2 < 1$), supporting the theory that those in the uninterrupted condition already processed in a bottom-up, data-driven mode, making the explicit instruction immaterial.

Discussion

Consistent with hypothesis 3, study 3 found that an interruption increased the preference for the HQHP option in a price-quality decision. However, as posited in hypothesis 4, this effect was eliminated when the interruption was accompanied by an instruction to still adopt a bottom-up focus on data when resuming the decision. These results therefore support the theorized mechanism underlying the interruption effect, namely, a departure from a bottom-up, data-driven to a top-down, goal-directed mode in processing. Further, study 3 results are not amenable to a reference-update explanation: if goal reference were changed, an instruction to focus on data would not eliminate the change in preference.

In the next study, I consider an interesting implication of the decision interruption effect, thereby bringing additional support for the proposed mechanism. Specifically, if, as theorized and demonstrated in study 1, an interruption decreases the focus on the secondary goal dimension of price, then people may become less sensitive to varying price levels when decisions are interrupted. Thus study 4 examines the effect of decision interruption on price sensitivity.

STUDY 4: DECISION INTERRUPTION AND PRICE SENSITIVITY

Overview and Design

The objective of study 4 is to examine whether after an interruption people exhibit less price sensitivity. To test this proposition, participants are asked to consider a rental car

decision when they are on vacation in Florida. Specifically, they can either rent a regular midsize sedan for \$50 per day or upgrade to a convertible for a higher price. In one condition, the upgrade costs \$10 extra per day, whereas in a second condition, the upgrade costs \$20 extra per day. Further, half of the participants are interrupted when making the decision but the other half are not. It is predicted that because of the reduced attention to feasibility due to interruption, those in the interrupted condition will become less sensitive to the level of extra cost than those who are not interrupted. Therefore, in the interruption condition, I expect there to be relatively little change in the likelihood of renting the upgraded car whether the surcharge for the upgrade is \$10 or \$20; in contrast, in the uninterrupted condition, because people are focused on price, there will be a large difference in response to a high versus low price for the upgrade.

H5: In a price-quality decision, interruption will decrease price sensitivity.

Further, the change in price sensitivity would imply a moderating effect of price level on the interruption effect. Specifically, because of decreased attention to feasibility, an interruption will generally shift preferences toward the HQHP option. However, this effect should be particularly pronounced when the extra price for higher quality is high. Interestingly, the effect may be muted, or even reversed, when the price for high quality is very low compared to the consumer's expectation. Specifically, as theorized, consumers processing information in a bottom-up manner respond to each salient feature in the data. Thus if a price for the HQHP option is much below expectation, such a surprise is likely to produce a large favorable response; in fact, it may even become the reason to purchase this option. However, interrupted individuals process in a top-down manner; consequently, they are focused on the primary goal of desirability (what it means to have a convertible) rather than the implications of a particular price point. Thus they are less likely to take note of the "good deal" as a reason for an upgrade. Consequently, the use of good price as an added reason for an upgrade might result in a reversal of the interruption effect whereby purchase of the HQHP option is greater in the uninterrupted condition. In the current study, a pretest shows that people's price expectation for the upgrade is \$35; thus while \$20 may be somewhat attractive, \$10 for the upgrade is indeed a very low price. Therefore, I predict that an interruption will lead to more choice of the upgrade compared to the uninterrupted condition, but only when the price of the upgrade is relatively high at \$20; when the price is very low at \$10, the effect is muted or even reversed such that the uninterrupted group may be more likely to upgrade.

Therefore, study 4 has a 2 (interruption: absent vs. present) \times 2 (price for upgrade: high vs. low) design. I predict an interaction effect between interruption and price level such that the interruption effect (i.e., increased preference for an upgrade) will be strong when the price for an upgrade

is high, but the effect may be eliminated or reversed when the price is low. In addition, price sensitivity will be lower when the decision is interrupted.

Procedure

Participants ($N = 262$, mean age = 32, 27% male) were ordinary consumers recruited from all over the country through a Web survey service as in study 1. The 10-minute session consisted of the current study as well as several other unrelated studies. The interruption procedure was similar to that of study 3. Half of the participants were assigned to the interruption condition in which they were asked to switch to the filler task during the rental car decision, whereas the other half completed the corresponding filler task before they started the rental car decision. The filler task was again word generation. After completing the filler and car choices, participants went on to unrelated studies.

Results

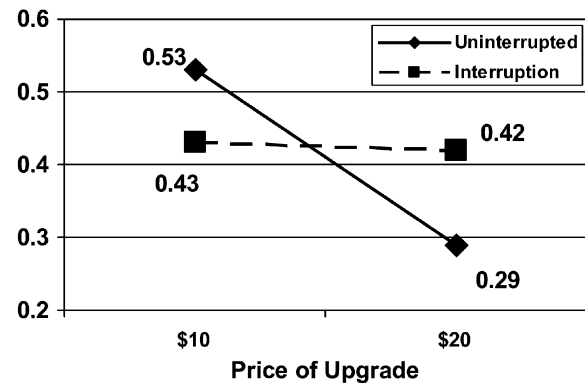
A logistic regression with choice of the HQHP option as the dependent variable, the factors of price and interruption and their interaction term as the independent variables, and gender and age as covariates revealed no significant main effects for interruption ($p = .11$) or price level ($p = .97$). However, as predicted, there was a significant interaction effect for price and interruption ($B = 1.00$, $p = .05$). The likelihood of purchasing the HQHP option in each condition is graphed in figure 4. To understand the interaction effect, two contrasts—one at each price level—were conducted comparing the uninterrupted and interruption conditions. It is found that when the price for the rental car upgrade was high at \$20, consistent with study 3, those in the interruption condition were significantly more likely to purchase the upgrade ($M_{\text{unint}} = .29$, $M_{\text{int}} = .42$; $\chi^2(1) = 5.42$, $p < .025$). However, when the price of the upgrade was low at \$10, interrupted participants were actually directionally less likely to purchase the upgrade than the uninterrupted group ($M_{\text{unint}} = .53$, $M_{\text{int}} = .43$; $\chi^2(1) = 2.66$, $p < .15$). Therefore, as predicted, an interruption led to greater choice of the HQHP option, but only when the price differential was relatively large; the effect was directionally reversed when the price for the upgrade was very small.

Further, to provide direct evidence for price sensitivity, a second pair of contrasts were conducted. In the uninterrupted condition, price had a significant effect on the likelihood of choosing the HQHP option: when the price was low, people were very willing to choose it; when the price was high, people were not willing to upgrade ($M_{\$10} = .53$, $M_{\$20} = .29$; $\chi^2(1) = 16.29$, $p < .005$). In contrast, when the decision was interrupted, people's choices were not significantly influenced by whether the price was high or low ($M_{\$10} = .43$, $M_{\$20} = .42$; $\chi^2 < 1$). Thus hypothesis 5 was supported.

Discussion

Consistent with study 3, study 4 found that in a price-quality trade-off, interruption increased the preference for

FIGURE 4
STUDY 4 RESULTS



the HQHP option. However, this effect was moderated by the price level: it occurred only when the additional cost for higher quality was relatively high, but not when the cost was low. This pattern was due to a decreased sensitivity to price when the decision is interrupted. Thus study 4 provided further evidence for the selective focus on desirability and reduced attention to feasibility after an interruption.

GENERAL DISCUSSION

This research examines the effect of interrupting a decision on preferences. It is proposed that decision interruption can cause the person's information processing to change from a bottom-up, data-driven to a top-down, goal-directed mode, resulting in a greater preference for the primary goal dimension of desirability over the secondary goal of feasibility in options. Evidence for this effect was found in several decision contexts. For example, in the choice of a hiking destination, an interruption increased the choice of a park with good scenery but poorer accessibility. Similarly, in decisions with risk, interruption resulted in more choices of the high-risk, high-reward option, even though risk is considered a more important attribute than reward. Two more studies on price-quality trade-offs showed that an interruption can also increase the purchase of a high-quality, high-price option by reducing price sensitivity. Process insights showed that the effect of interruption was driven by a reduced focus on feasibility, due to a shift in processing from a bottom-up, data-driven to a top-down, goal-directed mode.

By focusing on the phenomenon of decision interruption, this research contributes to the theory of decision making and preference construction in important ways. First, this research highlights the distinct stages people may go through in making a decision and the dynamic changes that may occur during extended decision-making processes. In particular, when a decision is interrupted, a new stage of information processing is introduced as a result of this reset; namely, a distinct stage of reconstructing the decision occurs and leads to a more top-down view of the information. More

broadly, the notion of “mental resets” warrants deeper research. One interesting direction to explore is the metacognitive states involved in such resets. For example, the interruption effect may rely on a metacognitive recognition that “this is a problem I have previously looked at, so now I don’t have to process it bottom-up again”; however, another possibility is that the reset is automatically prompted by a “stop-go-again” sequence. One way to tease this apart may be to introduce new information after the interruption. If the metacognitive recognition is at play, the notice of new information may cause people to return to a bottom-up mindset even after interruption. However, if the reset in mindset occurs directly as a result of a break, a top-down process will still take place after interruption.

A second area of contribution by this research regards multistage decision making. Current studies complement a recent stream of works showing that the outcomes of decisions may be changed when decisions are broken into multiple stages. For example, research on the “screening effect” (Chakravarti, Janiszewski, and Ülkümen 2006) shows that asking people to first screen a set of options using a certain criterion (e.g., must meet a minimum level of picture resolution in digital cameras) can lead to reduced weighting of this attribute in the subsequent stage of choosing among the options that have passed the initial screening. In another line of research by Maimaran and Simonson (2007), it is found that first asking people to choose a category and then choose within the category can lead to bolder choices (e.g., choosing an extreme option). However, unlike these studies and the literature on sequential choice (Dhar and Simonson 1999; Drolet 2002), this research makes a novel contribution by suggesting that even without a prior choice, the mere introduction of a discontinuation in decision making may affect people’s preferences. Further, the effect occurs through a change in general processing orientation rather than changes in the use of specific content or decision rules.

Another key distinction made salient by the current studies is the internal versus external focus of attention in the construction of preferences. Whereas involuntary attention is directed at stimuli that are perceptually concrete and compelling, and thus externally driven, voluntary attention is internally guided toward information pertaining to one’s primary goal dimensions. Thus the switch from external to internal control of attention due to interruption may lead to a broader set of consequences. For example, interruption may affect how people respond to contextual information. Under an external focus, people may be more susceptible to contextual features that are perceptually salient; however, under an internal focus, people may be more prone to use internal feelings or rules for deciding. If this were the case, one might find interruption to reduce the influence of certain contextual cues, such as attraction and asymmetric dominance (Huber and Puto 1983; Simonson and Tversky 1992) and framing of references (Kahneman and Tversky 1979). However, interruption may not reduce, and could potentially increase, context effects that depend on internal feelings,

such as the feeling of conflict, hence increasing the compromise effect (Simonson and Tversky 1992). More broadly, the distinction between internal versus external focus in processing also speaks to recent research on the depletion of one’s internal control in decision making: the ability for an individual to exert internal control may be a limited resource; when this resource is depleted, people exhibit greater dependence on external context (Pochepstova et al. 2007). Therefore, an interesting question is whether an interruption may counter the effect of ego depletion in certain situations, not only by creating a restorative break but also by introducing a natural tendency to engage in self-directed processing after interruption. These broader implications of changes in processing due to interruption merit further investigation.

Limitations and Future Research

This research also has a number of limitations that may be addressed in the future. First, although evidence is found for the change in processing mode as the mechanism underlying the decision interruption effect, it is also possible that other mechanisms are at play. One intriguing possibility is that different systems of cognition may be involved pre- versus postinterruption, or even during interruption. For example, research by Dijksterhuis et al. (2006) suggests that people may engage in nonconscious processing even when their (conscious) attention is diverted to focus on other tasks. Their research shows that after a period of diversion, the quality of people’s decisions is improved in that the decisions conform better to normative standards, and people are more satisfied with their choices. Thus if nonconscious processing also puts greater weight on desirability over feasibility, it may contribute to the interruption effect.

Another possibility is that after an interruption, people differentially engage in system I versus system II processing (Sloman 1996). Research suggests that people may possess two systems of cognition: system I processing is said to be “intuitive” in that it involves the use of well-rehearsed pattern matching and associations, whereas system II is a slower process that relies on reasoning and computations. Thus an interesting question is whether the focus on desirability after an interruption relies on system I (intuition) or system II (reasoning), which also has implications for whether the shift in focus is conscious or automatic. Further, neural imaging evidence suggests that distinct neural mechanisms are involved in the anticipation of gains and losses (Kuhnen and Knutson 2005). To the extent that desirability usually embodies gains whereas feasibility involves losses, it is worthwhile to examine whether the pattern of neural activation changes after an interruption, in particular, whether the anticipation of gains becomes more sensitive whereas the anticipation of losses becomes desensitized.

A second limitation of this research is that the present studies focused on relatively simple decisions involving trade-offs between two attributes. More research is needed to investigate the effect of interruption in more complex decision problems involving more options and richer infor-

mation. It appears that two possibilities exist: the effect of an interruption may be stronger in complex situations because there is potentially a greater difference between a top-down, big-picture view and a bottom-up, detailed view; however, it is also possible that the interruption effect might be weakened because in such complex situations it may be difficult to decide on the basis of a bottom-up view. Thus even without interruption, people spontaneously try to abstract a top-down view of the situation in order to make a decision (Coupey 1994; Johnson 1984). Further, in certain situations it is also possible that people may start with a top-down process but later switch to a bottom-up process. Thus the effect of an interruption may change depending on the nature of the default process.

Third, this research studied the effect of relatively short, simple, and neutral types of interruptions (e.g., counting backward, generating words). Therefore, the effect of interruption found in this research can be seen as a “mere interruption effect” that relies on the “restart” in discontinuous decisions. However, more research is needed to examine the effect of other types of interruptions and their underlying mechanisms. For example, research may look at interruptions of different durations and interruptions that affect people’s cognitive and affective resources.

Further, future research might look at people’s goal structures more broadly. For example, research suggests that consumer goals are organized in a hierarchical manner ranging from high-level life goals to low-level projects (Huffman, Ratneshwar, and Mick 2000). Thus it would be interesting to examine whether interruptions may lead to greater preference for pursuing high-level rather than low-level consumption goals as well as different kinds of goals, such as hedonic versus utilitarian goals. In particular, a utilitarian attribute may be viewed as a feasibility goal in itself (facilitating other goals but having no value in and of itself) or merely a constraint that needs to be met; therefore, the effect of decision interruption may be different for purely utilitarian consumption.

Finally, it may be important to consider the effect of interruptions on other cognitive and affective processes such as sensory experiences (Shiv and Nowlis 2004), creativity and artistic expressions, as well as the effect of interruptions at a macro level, for example, whether a multitasking lifestyle may ultimately affect people’s general level of success and life satisfaction (Kahneman 1999; Schwarz and Strack 1999).

Managerial Implications

In addition to its theoretical interest, this research also has important managerial implications. The dichotomy of desirability and feasibility is at the center of many everyday decisions. For the consumer, one often needs to trade off quality and affordability. For the manager, business opportunities can often be characterized by their potential payoff and chance of success. This research shows that the decisions of consumers and managers may be influenced by the dynamic course of decision making. For marketers, this re-

search has implications for designing shopping procedures. For example, the use of interrupters such as pop-up ads or simply asking a consumer to wait during a decision may have a significant effect on what people eventually purchase and their price sensitivity. Similarly, breaking a decision into multiple stages, such as an initial stage of learning and a later stage of deciding, may lead to different choices than a single-stage decision. Additionally, depending on whether the shopping experience is generally continuous or discontinuous, marketers may decide whether to use a “quality lure” (e.g., enhanced features) or a “price lure” (“Sale!”) as a promotion strategy. In particular, a low-price promotion may lose some of its effectiveness if the decision is suspended since people no longer focus on price after a break in the decision.

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