

In Search of Homo Economicus: Cognitive Noise and the Role of Emotion in Preference Consistency

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Understanding the role of emotion in forming preferences is critical in helping firms choose effective marketing strategies and consumers make appropriate consumption decisions. In five experiments, participants made a set of binary product choices under conditions designed to induce different degrees of emotional decision processing. The results consistently indicate that greater reliance on emotional reactions during decision making is associated with greater preference consistency and less cognitive noise. Additionally, the results of a meta-analytical study based on data from all five experiments further show that products that elicit a stronger emotional response are more likely to yield consistent preferences.

The notion of preference consistency lies at the very foundation of understanding, predicting, and influencing consumer behavior. Most marketing activities, such as market research, new product development, marketing communications, and customer relationship management, assume consumers behave in somewhat consistent patterns. For example, if a customer indicates that he or she prefers chocolate to ginger, it is generally assumed that he or she is more likely than not to maintain such a preference in a following purchase occasion. Moreover, even people themselves like to think they are somewhat consistent decision makers (e.g., Bem 1972; Festinger 1957). On a related note, preference consistency is one of the cornerstones of Homo

Economicus and assumed to be characteristic of rational decision makers.

As a way to conceptualize preference consistency, consider a consumer who is faced with a series of binary choices. For each choice pair, this consumer has to evaluate the two alternatives and consider which one he or she prefers. Such a value assessment process is likely to fluctuate from case to case based on the exact information the consumer considers (e.g., the particular facts the consumer retrieves from memory), the context of the choice, as well as the particular computations that the consumer carries out; any of these process components is a potential source of “noise” and thus decision inconsistency. For example, when shopping for a new Canon digital camera, it is possible that consumers might change the aspects of the camera they focus on, the particular information they retrieve from memory, the relative importance weights they assign to the various attributes, or the process of integrating these weights.

As researchers, we often treat such inconsistencies as “noise” and use statistical inference tools that allow us to examine the data while mostly ignoring these fluctuations. Yet, such noise can convey important information about the ability of decision makers to perform good decisions, and, in particular, it can reflect their ability to conceptualize their own preferences. Moreover, from a psychometric perspective, reliability is a necessary condition for validity (Nunnally and Bernstein 1994); this property of classical test theory suggests that a decision is valid only to the extent that it is reliable. In the current work, we focus on one source of

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such inconsistencies or noise in decision making and its relation to preference stability: we explore whether decisions based more on emotional as opposed to cognitive processes are more prone to this kind of error. We propose that relying on one's emotional responses during decision making can promote greater preference consistency.

Dual-System Models

Prior research has established that both the emotional system and the cognitive system contribute to decision making but provide different types of inputs (Damasio 1994; Loewenstein and O'Donoghue 2004) and apply with different force within different decision environments (e.g., see McClure et al. 2004 for the different degrees of relative dominance of the two systems in choosing delayed versus immediate monetary rewards). In general, the emotional system has been characterized as being more holistic, affective, concrete, and passive, while the cognitive system is relatively more analytic, logical, abstract, and active.

This fundamental distinction between cognition and emotion is also evident across a wide array of research programs, including the emotion-cognition dual-process model (see Loewenstein and O'Donoghue 2004 for a recent review), type I versus type II processes (Kahneman and Frederick 2002), associative system versus rule-based system (Sloman 1996), nonverbal processes versus verbal processes (Paivio 1986), hot system versus cold system (Metcalfe and Mischel 1999), reflexive system versus reflective system (Lieberman et al. 2002), experiential system versus rational system (Epstein 1994, 2003), and the "approach/avoidance" versus "true/false" distinction (Zajonc 1998, 591), to name a few. Moreover, neuroscience evidence adds additional support to this distinction by demonstrating the relationship between automatic emotional response and activity in the limbic system (with the amygdala and the anterior cingulate being the prime players) and the relationship between more controlled processes and the front regions (orbital and prefrontal) of the brain (Damasio 1994; LeDoux 1996; Panksepp 2004). It should be noted that while such a dual-system conceptualization is undoubtedly an oversimplification and an imprecise representation of the complex human mind, this emotion-cognition distinction has substantial value in explaining a wide variety of human behavior.

Given this distinction between emotion and cognition and the growing discourse as to their roles in decision making, it is important to ask whether decisions that are based more on emotional inputs or more on cognitive inputs are better, or which approach individuals should adopt in decision making (e.g., should people actively suppress affective reactions when making decisions? See Pham 2007; Vohs, Baumeister, and Loewenstein 2007). Specifically, we ask the following question in the current research: to what extent does relying on one's emotional response during decision making affect the consistency of one's preferences? Following the above discussion of dual-system models and acknowledging that decisions are generated by some combination of emotion

and cognition, our question centers around the relative magnitude of reliance on emotional versus cognitive responses.

Why Might Emotions Hurt Preference Consistency?

Broadly speaking, rational behaviors (calculated, forward looking, self-controlled, value maximizing) are often attributed to the cognitive system, while irrational behaviors (myopic, transitory, lack of self-control, hyperbolic discounting, hot-cold empathy gap) are attributed to the emotional system or to a misalignment between both the emotional and the cognitive systems (Ainslie and Haslam 1992; Loewenstein and Schkade 1999; McClure et al. 2004; Mischel, Cantor and Feldman 1996; Prelec and Loewenstein 1998; Wertenbroch 2003). Given this distinction, a view appertaining to higher matching between the cognitive system and rationality and between the emotional system and irrationality is emerging (see Camerer, Loewenstein, and Prelec 2005 for a general discussion on the relationship between the automatic-controlled and affective-cognitive dichotomies).

These general associations between the cognitive system and rationality, as well as between the emotional system and irrationality, are also congruent with lay beliefs. For example, in one study, we asked a group of 16 economics or psychology PhD students to rate the extent to which they viewed a set of behaviors (long-term planning, impulsivity, self-control, etc.) as rational versus irrational, and another group of 16 economics or psychology PhD students to rate the extent to which they associated the same set of behaviors with the cognitive system or the emotional system. The results showed a high correlation ($r = 0.95$) between the irrationality-rationality ratings and the emotional-cognitive ratings. Behaviors such as long-term planning were associated with rationality and deliberate cognitive thought, while behaviors such as impulsivity were associated with irrationality and emotionality, suggesting that there is a general assumed fit between the cognitive system and rationality and between the emotional system and irrationality. Besides face validity, this intuition also has ecological validity: in a recent study of sequential financial decisions, for example, Shiv and his colleagues (2005) found that people with brain lesions focused in regions related to emotions were less impacted by past gains or losses and consequently made better, "more rational" investment decisions than normal healthy people. Based on all these results, should we then expect preference decisions that involve affective considerations to be less consistent?

Why Would Emotions Generate Greater Preference Consistency?

Despite the general associations between Homo Economicus and the cognitive system and between Homo Psychologus and the emotional system, it is possible that some aspects of behavior generally conceived as "rational" might be better generated by the emotional system, as suggested

by convergent evidence from evolutionary, social, and consumer psychology.

Evolutionary psychologists posit that the emotional system has evolved to carry out fast and accurate evaluations of important judgments and decisions. They have described emotions as a set of “programs” that have been specifically designed to solve evolutionarily recurrent situations or conditions, whether it is to fall in love, to escape from a predator, or to confront an unfaithful spouse. According to this view, such programs have the effect of activating, mobilizing, and coordinating a pool of resources, mental processes, goals, perceptual mechanisms, memory, attention, emotional expressions, and physiology toward the resolution of the adaptive problem at hand (Cosmides and Tooby 2000). Given these roles of the emotional system, it is possible that the emotional system is better attuned to consistently and reliably provide individuals with a reading of their preferences, thus creating higher speed, accuracy, and consistency.

This theorizing of the functions of emotions in evolutionary psychology corroborate Epstein’s (2003) hypothesis on the relative stability of the emotional system compared with the cognitive system: whereas the former system only changes with “repetitive or intense experience,” the latter system changes more rapidly at the “speed of thought” (Epstein 2003, 160). According to Epstein, assessments based on the emotional system tend to be more holistic, while those based on the cognitive system tend to be more analytical; as such, whereas holistic emotional processing might focus more on the gist of the target under evaluation and is hence relatively more consistent from time to time, analytical cognitive processing might be sensitive to fluctuations in any of the elements in the aforementioned preference formation process (e.g., information retrieved, decision weights, integration of information and weights) and hence susceptible to decision inconsistencies.

One source of empirical evidence for the idea that the emotional system might be associated with a higher level of consistency comes from the finding that feeling-based judgments, compared with reason-based assessments, exhibit greater interpersonal consistency (Pham et al. 2001; see also Pham 2004). In a series of experiments, Pham and his colleagues found that participants exhibited greater consensus in their feelings toward news magazine pictures and television commercials than their reason-based judgments (e.g., “This picture is good/bad” and “This picture is valuable/worthless”) of the same stimuli.

Yet further suggestive evidence for the close association between preference consistency and the emotional system comes from findings in social psychology that have challenged the value of conscious thought toward rational decision making. For instance, Wilson and his colleagues (Wilson and Schooler 1991; Wilson et al. 1993) found that deliberating the positives and negatives when evaluating hedonic experiences, such as food or art, can cause people to erroneously focus their attention on nonoptimal criteria and adversely affect the quality of their judgment. Their results showed that participants who selected jams (or post-

ers) under thoughtful deliberation later consumed less of their chosen jam (or were less likely to keep their chosen posters on their walls), compared with those whose selection was based on their immediate gut feelings. More recently, Dijksterhuis (2004) extended this work to examine the relative merits of conscious and unconscious thought in decision making. His experimental results suggest that unconscious thinkers tend to make more accurate judgments than conscious thinkers for very complex decisions. For example, in one of his studies, participants who were asked to think carefully for 4 minutes before choosing their favorite car from a given set of cars made objectively poorer choices (i.e., cars that had significantly fewer positive features) than participants who were distracted for the same amount of time with an anagram-solving task (Dijksterhuis et al. 2006, study 1; see also Nordgren and Dijksterhuis 2009).

Based on these diverse sources of evidence implicating the potentially close association between the emotional system and preference consistency, we hypothesize that a higher degree of reliance on emotional responses during decision making will generate a higher level of preference consistency.

Transitivity as a Measure of Preference Consistency

In designing an appropriate experimental paradigm to test our hypothesis, we noted the correspondence between preference consistency, the center of the current investigation, and *transitivity*—one of the two basic axioms of rational preference relations in economics which provide one set of traditional normative benchmarks for decision quality (Mas-Colell, Whinston, and Green 1995, 6). Transitivity implies that a consumer should have a well-defined preference structure, such that for any set of bundles a , b , and c , if $a \geq b$ and $b \geq c$, it must also be the case that $a \geq c$ (where \geq denotes relative preference).

In our experiments, we used transitivity (or the degree of transitivity violation) as a way to operationalize the preference consistency construct and measure the degree of (in)consistency in people’s preferences over time. Specifically, in each experiment, we took a set of P products and presented participants with all pairwise combinations of these P products (i.e., for eight products, this would mean $7 \times 8/2 = 28$ pairs) in a random order. Based on each participant’s choice pattern, we compute how many times he or she violated transitivity (e.g., $p_x \geq p_y$, $p_y \geq p_z$, and $p_z \geq p_x$, where p_x , p_y , and p_z are products within the set) as a measure of the degree of inconsistency in the participant’s preferences. Obviously, given a large number of pairwise decisions, it is inevitable that decision makers will make random errors during choice and consequently violate transitivity from time to time. Thus, simply demonstrating that such violations exist would be trivial and of negligible theoretical consequence. Instead, our interest here is to use the *degree* of intransitivity to compare whether choices are more consistent when individuals’ relative reliance on their emo-

tional responses is greater. To this end, we used different experimental manipulations aimed at invoking different degrees of relative reliance on emotional reactions when making decisions and examined whether these manipulations affect the transitivity of people's preferences, and hence their preference consistency.

At this juncture, we should note that since May's (1954) and Tversky's (1969) early demonstrations of people's systematic preference intransitivity, there has been substantial research examining the factors that can drive systematic intransitive choices. Thus far, it has been found that people's preferences can be intransitive when driven by their social context (Fishburn 1970), by the use of satisficing heuristics (Gigerenzer 2000) or noncompensatory decision rules (Tversky 1969), and by anticipated regret and counterfactuals (Loomes, Starmer, and Sugden 1991). Intransitive preferences can also occur when information for decision making is missing (Kivetz and Simonson 2000) or costly to obtain (Haines and Ratchford 1987). Given the challenge that intransitivity poses for traditional choice models, several researchers have proposed theoretical revisions to these models to accommodate preference intransitivity (e.g., Clark 1994; Fishburn 1991; Iverson and Falmagne 1985; Kim and Richter 1986; Loomes and Sugden 1983; Sophor and Gigliotti 1993).

The current work differs from these prior work in that we focus not on systematic violations of transitivity (ones that are due to biases in decision making), but on intransitivity attributed to the instability in the way decision makers consider the choices they are facing as they encounter them again and again—an intransitivity that is akin to stochasticity and that leads to diminished predictability of consumer behavior. In choice models, for example, such intransitivity would manifest as larger error terms and lower reliability and predictability.

GENERAL EXPERIMENTAL SETUP

We used the same experimental paradigm—a pairwise choice procedure—across all the five experiments we conducted. In each experiment, we first presented participants with the name, picture, and a short description of all products used in the experiment and asked them to study the products for as long as they wished (the products were electronic gadgets, such as a voice-recording key chain and a pen with a built-in FM tuner; see fig. 1 for a list of the stimuli used in the experiments). After participants had familiarized themselves with all stimuli, they were told that they would see pairs of these products and had to make a choice within each pair according to their preferences. The pairs of products were constructed by taking P products (eight products in experiments 1b and 4, and 10 products in experiments 1a, 2, and 3) and presenting participants with all pairwise combinations of these products (i.e., $P \times (P - 1)/2$; 28 pairs in experiments 1b and 4, and 45 pairs in experiments 1a, 2, and 3) in a random order.

As a measure of preference (in)consistency, we computed the number of transitivity violations participants committed

during the task for a subset of N product options, where N ranged from 3 to P . For simplicity in reporting the results, we focus on violations in the form of three-way preference cycles (e.g., $p_x \geq p_y$, $p_y \geq p_z$, and $p_z \geq p_x$; Kendall and Babington Smith 1940). If there is no error in decision making (or if it is very low), individuals will evaluate the different options in a consistent way every time and will show no (or very few) violations of transitivity in this pairwise choice paradigm. However, if individuals are prone to error in decision making, they will assess their utility very differently every time and will commit many violations of transitivity in this paradigm. Thus, we use the measure of intransitivity to capture the amount of inconsistency in evaluations, arguing that higher levels of observed intransitivity mean that the underlying process is more prone to fluctuating evaluations, inconsistencies, and random errors.

Besides the three-way-cycles measure used in the current research, other measures have been proposed for the degree of intransitivity in a sequence of pairwise choices (see Monsuur and Storcken 1975 and David 1988 for comprehensive reviews). For example, Slater's (1961) i counts instead the minimum number of preference reversals (on the binary level) needed to resolve all intransitivities. The experimental results in the current work are robust to the type of measure, and we adopt the three-way-cycles approach for its simplicity.

To test our research hypothesis, we used four different approaches to manipulate how much participants depend on the emotional system during choice drawing upon findings from the extant literature on the general two-system model, and compare the individual transitivity scores across the different experimental conditions. In experiments 1a and 1b, we manipulated how the stimuli were presented during the choice task (pictorial vs. verbal) based on prior research that has demonstrated that pictures trigger more emotional processing than words or symbols (Hsee and Rottenstreich 2004; see also Epstein 2003, and Lieberman et al. 2002). In experiment 2, we adapted a manipulation used by Shiv and Fedorikhin (1999) whereby color photos of the products generate greater emotional reactions than black-and-white versions of the same photos. In experiments 3 and 4, we kept the form of the choice stimuli constant, and instead manipulated participants' trust in their feelings and their cognitive capacity during choice, respectively. Prior research has demonstrated that individuals who trust their feelings more have a greater propensity to rely on their emotional system during decision making (Avnet and Pham 2007; Stephen and Pham 2008); however, choice under high cognitive load limits cognitive ability, thus generating a greater degree of reliance on emotional reactions than choice under low cognitive load (Lieberman et al. 2002; Siemer and Reisenzein 1998). Finally, we pooled together all the data from these five experiments in a meta-analytical study and examined how the nature of the products—the degree to which they generate greater affective response in consumers—can influence their contribution toward greater preference consistency. We next describe the procedures and report the re-

FIGURE 1
EXPERIMENTAL STIMULI



The FM Pen



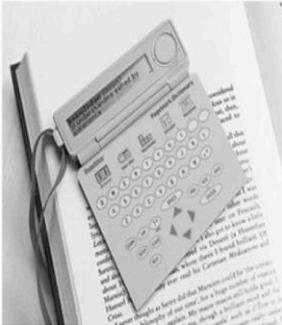
Quick-Release Micro Light Keychain



Voice Recording Keychain with LED



Super-Bright LED Clip Light



Pagemark Dictionary



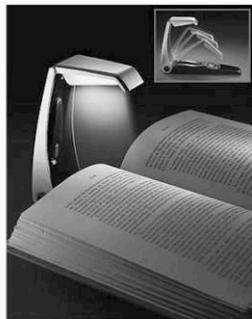
"Talking Pictures" Photo Album for 24 pictures and 24 messages



Voice Recording Pen



LED Multi-tool



"Bright As Day!" Daylight Spectrum Booklight



Chrome Key Organizer With Ultra-Bright Dual LED Torch

NOTE.—The eight products in the top two rows were used in all the experiments. The additional two products in the bottom row were also used in experiments 1a, 2, and 3. (Color version available as an online enhancement.)

sults of all five experiments and the meta-analytic study in detail.

EXPERIMENT 1A: PICTURES VERSUS NAMES

Overview and Method

In the first experiment, we attempted to influence the extent to which participants relied on their emotional response during choice using a characteristic distinction of the emotional system from the cognitive system—while the emotional system is more experiential and concrete (i.e., encoding reality in concrete images, metaphors, and narratives), the cognitive system is more logical and abstract (i.e., encoding reality in abstract symbols, words, and numbers; Epstein 2003; Lieberman et al. 2002). Drawing upon this distinction, we manipulated the manner in which the visual stimuli were represented. After studying the information (name, picture, and description) of all products as described in the general procedure for an unlimited amount of time, participants were randomly assigned to one of two conditions: in the names condition, the pairs of products were presented in terms of their names, while in the pictures condition, the pairs of products were presented in terms of their pictures (Hsee and Rottenstreich 2004).

We conducted the experiment with the assistance of a commercial Web-based survey research company. A total of 534 online respondents participated and in return were entered into a sweepstakes to win a variety of prizes.

Results

A comparison of the number of three-way intransitivity errors participants made in the names and pictures conditions was performed using the unpaired sample *t*-test. Participants in the pictures condition made significantly fewer transitivity violations ($M_{pic} = 2.7$, $SD = 4.7$) than those in the names condition ($M_{names} = 4.6$, $SD = 6.3$), ($t(532) = 4.08$, $p < .001$). In addition, they spent significantly less time to make their choices ($M_{pic} = 142.0$ sec. vs. $M_{names} = 199.0$ sec.), ($t(532) = 4.32$, $p < .001$). There was, however, no difference in the amount of time participants between conditions took to study the 10 given products ($M_{pic} = 149.2$ sec. vs. $M_{names} = 143.1$ sec.), ($t(532) = .58$, $p = .56$).

Discussion

In experiment 1a, we found preliminary support for the thesis that preference consistency is associated with greater reliance on emotional responses. When the stimuli were richer in affect, participants made significantly fewer intransitivity errors. While this result is consistent with our account, it suffers from two major shortcomings: first, although pictures (vs. words) may indeed have generated a higher degree of emotional processing, they could also have facilitated participants' memory of their prior choices, hence increasing transitivity; second, because the choices that par-

ticipants made were inconsequential, it is hard to regard any of their choices as truly erroneous. We thus designed experiment 1b to address these two issues while replicating our general finding.

EXPERIMENT 1B: CONSEQUENTIAL PICTURES AND/OR NAMES

Overview and Method

Experiment 1b replicated experiment 1a in a laboratory setting with two important differences. First, in addition to the names condition and the pictures condition, we added a third condition in which both the names and pictures of the product options were available at the choice stage. Arguably, this new (combined) condition presents more information than pictures or words alone; thus, if the ease-of-recall account were sufficient to explain our results in experiment 1a, participants ought to be most transitive in this combined condition. However, if our hypothesis is true, then the inclusion of the names of the products (with their pictures) should activate semantic cognitive processing and render this condition no different from the names-only condition, given that we hypothesize that it is the cognitive processing that adds noise to the decision process. Second, choices were consequential as participants had the chance to receive one of their product choices, hence making the experiment incentive compatible. Specifically, participants were told that at the end of the experiment, one of the 28 pairs of products would be picked at random and they would be entered into a lottery to win the product they picked in this pair.

A total of 75 students recruited at the MIT Stratton student center participated in this experiment and were randomly assigned to one of the three conditions: names-only, pictures-only, and names-and-pictures. They were each paid \$1 for their participation and were told they would be entered into a lottery to win one of the products they chose.

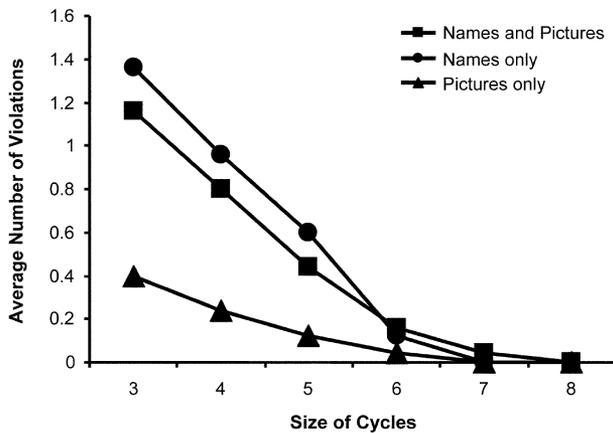
Results

The results paralleled closely those of experiment 1a: participants in the pictures-only condition who chose between products presented in the form of pictures made significantly fewer intransitivity errors ($M_{pic-only} = .4$, $SD = 1.0$) than those in the names-only condition who chose between products presented in the form of names ($M_{name-only} = 1.4$, $SD = 1.7$), ($t(48) = 2.51$, $p = .02$). In addition, when the product pairs were displayed in terms of both types of information (picture and name), the number of violations ($M_{name-&-pic} = 1.2$, $SD = 1.4$) were similar to those in the names-only condition ($t(48) = .46$, $p = .65$), but greater than those in the pictures-only condition ($t(48) = 2.20$, $p = .03$). (This result pattern continued to hold when we tested for differences in the number of larger cycles across conditions, as shown in fig. 2.)

Overall, these results (overall ANOVA: $F(2, 72) = 3.37$, $p = .04$) suggest that alternative accounts that speak to the

FIGURE 2

COMPARISON OF THE AVERAGE NUMBER OF INTRANSITIVITY CYCLES (EXPERIMENT 1B)



product pictures’ being a better memory retrieval cue may not be sufficient to explain our results. The availability of product names (in addition to the pictures) was sufficient to deteriorate choice consistency. Given that different modes of stimuli presentation generate different degrees of emotional/cognitive processing, the current results suggest that preference consistency is more closely associated with affective processing than more controlled cognitive processing. Furthermore, there was no significant difference across the three conditions in the amount of time participants took to study the products prior to choice ($M_{pic-only} = 113.7$ sec. vs. $M_{name-only} = 114.7$ sec. vs. $M_{name-&pic} = 104.2$ sec.), ($F(2, 72) = .14, p = .87$) or the amount of time they took to choose their preferred products ($M_{pic-only} = 100.5$ sec. vs. $M_{name-only} = 118.1$ sec. vs. $M_{pic-only} = 98.2$ sec.), ($F(2, 72) = 1.5, p = .23$).

Discussion

Consistent with the hypothesis that greater reliance on emotional responses contributes toward a higher degree of preference consistency, the results of this experiment show that manipulations (i.e., color images of products) designed to tap automatic emotional processes to a greater extent than controlled cognitive processes can generate higher levels of preference consistency than manipulations (i.e., names of products) designed to tap cognitive processes to a greater extent than emotional processes. While the levels of preference consistency differed across the experimental conditions, it is also worthwhile to obtain a sense of the overall magnitude of consistency observed in this experiment. One approach is to consider the following: if the participants had chosen at random in this experiment, they would have made an average of about 14 intransitivity cycles (computed based on a simulation of 10,000 participants who made random choices). Clearly, this quantity is much higher than anything

we found; in comparison with this benchmark, the overall level of intransitivity in experiment 1b was rather low.

The manipulation of pictures versus names used in the first two experiments is consistent with our proposed account, but it is also clear that there are many differences between pictorial information and textual information. Though we have managed to rule out some potential alternative explanations (particularly with the combined names-and-pictures condition), a different approach for testing the main hypothesis would provide useful converging evidence. Experiment 2 was designed to test the hypothesis using a different manipulation of the extent to which different stimuli-display modes evoke emotional responses.

EXPERIMENT 2: COLOR VERSUS BLACK-AND-WHITE PICTURES

Overview and Method

Previous research has shown that the vividness of pictorial information influences the degree of emotionality experienced by consumers (Loewenstein 1996; Mischel and Moore 1973; Shiv and Fedorikhin 1999). In experiment 2, we used a similar approach to manipulate the vividness and emotionality of the product options by presenting participants either color pictures or black-and-white (B&W) pictures of the products in the choice task.

A total of 88 students recruited at Princeton participated in this lab experiment. After participants had familiarized themselves with the 10 products (in the same unhindered manner as before), each picture being represented by a name, a picture, and a short description, they proceeded to make a sequence of 45 pairwise choices. Participants were randomly assigned to one of two conditions: half the participants were presented with the names and color pictures of the 10 products; the other half were presented with the names and pictures of the same products, but the pictures were in B&W. To examine whether the different presentation modes of the pictures affect the participants’ perception of how much information they were obtaining from the pictures, at the end of the choice task, we asked all participants to complete a postchoice survey in which they had to rate, on a scale of 1 (not at all) to 7 (very well), how well they thought each of the given pictures adequately represented the corresponding product described. As in experiment 1b, participants were told that they would be entered into a lottery to win one of the products they chose. Based on the previous experiments, we hypothesize that participants who were presented with the color pictures of the product options would exhibit greater preference consistency and more transitive choices than those in the B&W condition.

Results

An analysis of the number of intransitivity errors participants made between the two conditions revealed that participants who saw the black-and-white pictures during the choice task committed twice as many transitivity violations

($M_{b\&w} = 2.2$, $SD = 2.74$) as participants who were presented with the color pictures instead ($M_{color} = 1.1$, $SD = 1.86$), ($t(86) = 2.05$, $p = .04$). The participants in the B&W condition also took marginally more time both to study the products ($M_{b\&w} = 123$ sec. vs. $M_{color} = 98.5$ sec.), ($t(86) = 1.92$, $p = .06$) and to make their choices ($M_{b\&w} = 120$ sec. vs. $M_{color} = 109.7$ sec.), ($t(86) = 1.66$, $p = .10$) than those in the color condition. Furthermore, the results of the postchoice representation survey revealed that participants across the two conditions did not report any significant difference in how adequately they thought the pictures represented the products (for each of the 10 products: $p = .25$ to $.95$; for the total ratings of all 10 products: ($M_{b\&w} = 49.6$, $SD = 8.7$ vs. $M_{color} = 49.1$ sec., $SD = 8.9$), ($t(86) = .29$, $p = .77$)).

Discussion

The results of this experiment continue to implicate the close association between relying on emotional reactions and preference consistency. In this experiment, instead of manipulating the type of information participants saw during choice (names vs. pictures), we focused on eliciting different degrees of emotional reactions during decision making by manipulating the vividness of the stimuli presented to participants. The results of the postchoice survey also suggest that this difference in preference consistency cannot be adequately explained by any potential difference in the perceived amount of product information obtained through the different presentation modes. Participants did not seem to discern any significant difference in objective product information between the two conditions; rather, the color versus B&W pictures elicited different degrees of emotional reactions in participants. This finding also renders alternative accounts such as differential memory recall or differential processing fluency less likely.

EXPERIMENT 3: TRUST IN FEELINGS

Overview and Method

So far, we have manipulated the manner in which the choice stimuli were presented to participants in order to evoke different degrees of emotional responses in participants. One way to test our hypothesis more directly is to explicitly manipulate the cognitive state of participants when making decisions while keeping the choice stimuli constant across conditions. To this end, we used a method by Avnet and Pham (2007; see also Stephen and Pham 2008) to manipulate participants' situational trust in their emotions and thus their reliance on affect as information during decision making. If reliance on emotional reactions indeed generates greater preference consistency, then participants who trust their feelings more should exhibit more consistent preferences (regardless of the presentation format of choice stimuli) and make fewer intransitivity errors than those who trust their feelings less during decision making. Conversely, participants who trust their feelings less might display different

degrees of preference consistency depending on how much emotional response the choice stimuli generate.

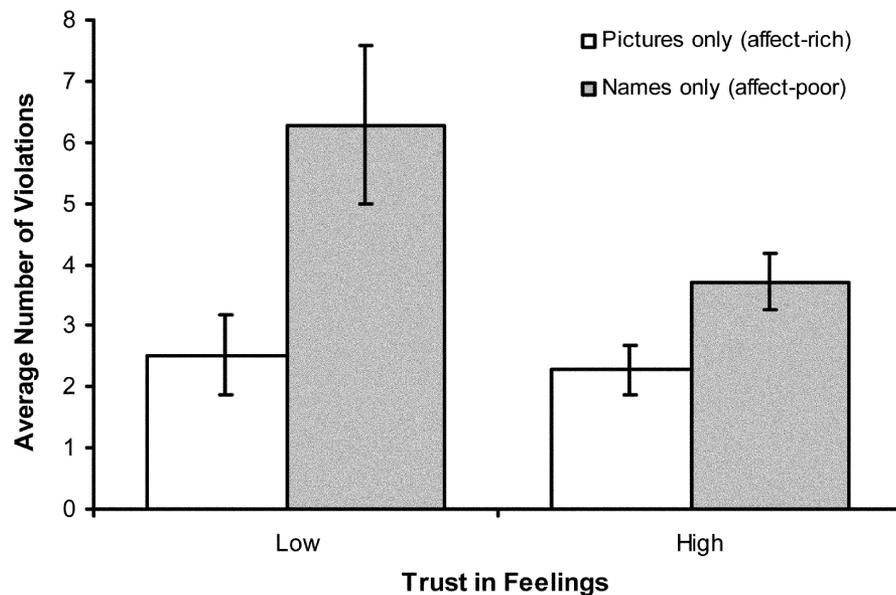
This experiment was conducted as two purportedly separate online studies. (Participants' response to a postexperiment survey question indicated that they were not aware of the relationship between these two online studies.) In the first study, participants were asked to describe either two (high-trust) or 10 (low-trust) past situations in which they trusted their feelings to make a decision and it turned out to be the right decision. This manipulation is based on the premise that participants who had to describe two situations would find the task relatively easy, whereas those who had to describe 10 situations would find the task relatively difficult (Schwarz et al. 1991); this experienced ease or difficulty of retrieving two versus 10 instances, respectively, would then result in respondents' perceiving that such instances are common versus uncommon, thus generating higher (two) versus lower (10) trust in their feelings when making subsequent decisions. In the second study, participants were given the same general two-stage binary choice task as used in all earlier experiments. However, as in experiment 1a, half the participants saw the products presented in terms of pictures during the choice stage, while the other half saw the products presented in terms of names. We predict that while high-trust participants would demonstrate a similar degree of choice consistency regardless of whether the products were presented in terms of names or pictures, low-trust participants would be more affected by the presentation format of the products: in particular, when the products were represented in terms of pictures instead of names, low-trust participants would be more likely to rely on their feelings when choosing between the products and demonstrate greater consistency.

A total of 208 individuals recruited from an online panel participated in this experiment. (Six participants were excluded from the analysis because the amount of time they took to complete the task was more than three SDs away from the average time based on a logarithmic transformation of the completion time; including these participants within the data set, however, did not change the general result pattern.) Each participant was randomly assigned to one of the four conditions in the 2 (trust in feelings: high vs. low) \times 2 (product representation: pictures vs. names) between-subjects design and stood a chance to win one of the chosen products in a lottery after the experiment.

Results

The number of intransitivity errors that participants made in the binary choice task was submitted to a two-factorial (trust in feelings \times product representation) ANOVA. As shown in figure 3, the results revealed a statistically significant main effect of product representation ($F(1, 198) = 13.92$; $p < .001$), a significant main effect of trust in feelings ($F(1, 198) = 4.04$, $p = .05$), and a marginally significant interaction between the two independent factors ($F(1, 198) = 2.73$, $p < .10$). Most central to the objective of this experiment, planned contrasts revealed that whereas high-trust par-

FIGURE 3
COMPARISON OF THE AVERAGE NUMBER OF INTRANSITIVITY CYCLES (EXPERIMENT 3)



NOTE.—Error bars denote standard errors.

ticipants did not differ significantly in the number of intransitivity errors that they made regardless of whether the products were presented in terms of pictures ($M = 2.27$, $SD = 3.06$) or names ($M = 3.72$, $SD = 3.55$), ($F(1, 198) = 2.54$, $p = .11$), low-trust participants made significantly fewer intransitivity errors when the products were presented in terms of pictures ($M = 2.52$, $SD = 4.36$) compared with names ($M = 6.28$, $SD = 8.19$), ($F(1, 198) = 13.92$, $p < .001$).

In contrast, ANOVAs comparing the amount of time participants across conditions took to make their choices revealed only a significant main effect of product representation ($F(1, 198) = 11.83$, $p < .001$), with participants taking less time to complete the task when pictures ($M = 111.88$ sec., $SD = 45.21$ sec.) were presented instead of names ($M = 138.44$ sec., $SD = 57.80$ sec.). Neither the main effect of trust in feelings or the interaction effect between the two independent factors on decision time was significant (both p 's $> .44$). The amount of time participants took to study the products before choice was also not significant across conditions (all p 's $> .37$)

Discussion

In addition to conceptually replicating our previous findings involving different ways in which the choice stimuli were represented, experiment 3 adds an important insight into the processes underlying preference consistency: by encouraging trust in feelings, we can induce greater emotional processing and increase preference consistency, es-

pecially when products are not presented in a way that naturally engenders affective processing. This approach seems to contradict potential lay advice to inhibit one's feelings in order to generate more consistent preferences.

One alternative explanation to the results is that, compared with participants who had to recall only two previous incidents, those who had to recall 10 previous incidents experienced greater cognitive depletion and hence were less careful with their decisions, thereby making more intransitivity errors. This account seems inadequate at explaining the observed transitivity pattern since participants who were asked to recall 10 previous incidents did not take a significantly different amount of time on average to make their choices compared with those asked to recall only two previous incidents ($p = .55$). Nonetheless, in the next experiment, we directly manipulated participants' cognitive capacity and hence their *relative* reliance on their emotional processing.

EXPERIMENT 4: COGNITIVE CAPACITY

Overview and Method

In this experiment, we used the same general procedure as in the earlier experiments, first presenting participants with the names, pictures, and descriptions of the products for study and then asking them to choose within pairs of these products (represented by both their names and pictures). As in experiment 3, the choice stimuli did not vary in how they were presented to participants across conditions.

Instead, to induce different degrees of relative reliance on emotional reactions, we used a cognitive load manipulation that has been widely adopted in the psychology literature (Shiv and Fedorikhin 1999; Trope and Alfieri 1997; see also Gilbert, Pelham, and Krull 1988): half the participants in the experiment were asked to memorize a three-digit code (low-load condition) during the choice task, while the other half were asked to memorize a 10-digit code (high-load condition). The pretext for the code recall was that participants had to reproduce the correct code at the end of the choice task to enter a lottery to win one of the products they had selected.

Based on prior research (Lieberman et al. 2002; Siemer and Reizenstein 1998), we expected participants in the high-load condition—whose cognitive capacities were constrained by the requirement to memorize a long numeric code—to rely *more* on their emotional responses when choosing their preferred products. Thus, if preference consistency is indeed associated with a greater reliance on emotional reactions, then participants in the high-load condition should make fewer intransitivity errors than those in the low-load condition. However, if preference consistency is associated with cognitive processing instead, then we would see the opposite pattern of results.

Forty students at MIT participated in this study in exchange for the opportunity to win one of the products they chose in the choice task. The students were randomly assigned to one of the two experimental conditions.

Results

An unpaired-sample *t*-test revealed that the high-load participants committed significantly fewer transitivity violations ($M_{\text{high}} = .7$, $SD = 1.03$) than the low-load participants ($M_{\text{low}} = 1.9$, $SD = 2.49$), ($t(38) = 1.99$, $p = .05$). There was, however, no significant difference between the two conditions in the amount of time participants took to study the products prior to choice ($M_{\text{low}} = 89$ sec. vs. $M_{\text{high}} = 78$ sec.), ($t(38) = .46$, $p = .65$), nor the amount of time they took to choose the products ($M_{\text{low}} = 85.3$ sec. vs. $M_{\text{high}} = 85.3$ sec.), ($t(38) < .01$, $p > .99$).

Discussion

Consistent with our hypothesis, we found that participants whose cognitive capacity was constrained were *more* consistent in their choices. In accordance with prior research, participants in the high-load condition had to rely more on emotional as opposed to cognitive processes than their low-load counterparts when selecting between each pair of products. That participants in the high-load condition made fewer intransitivity errors provides further support for our claim that preference transitivity is associated more closely with reliance on emotional reactions than with deliberate cognitive thought. Put differently, cognitive processes are more prone to stochastic noise. Note that an alternative account based on cognitive depletion, as discussed in experiment 3, can be effectively ruled out here given that participants in

the high-load condition, despite being cognitively more depleted than participants in the low-load condition, actually made fewer, not more (as the alternative account would predict), intransitivity errors.

A META-ANALYTICAL STUDY: THE ROLE OF PRODUCT TYPES

Our data from the five experiments allow for an even stronger test of our hypothesis. If indeed, as we claim, the choice inconsistencies we observe in our experiments were driven by the cognitive system's greater susceptibility to decisional noise (or "cognitive noise") compared with the emotional system, then this effect should be larger for products that generate little emotional reaction than for products that generate greater emotional response. In other words, if we could classify the products themselves based on the extent to which they generate emotional responses in people, then we expect those products that elicit a greater emotional reaction to generate greater preference consistency.

To test this hypothesis in the most conservative manner, we took all product choices (across all of our experiments) and asked the following question: are products that generate a stronger emotional reaction less likely to belong to intransitivity cycles than products that generate a more cognitive response? To answer this question, we presented the same product information (i.e., names and pictures) that was available to all of our experimental participants to an independent group of 30 university students and asked them to rate on a 10-point scale the extent to which each of the products was "functional/useful" and the extent to which the product was "exciting/cool." The correlation between the two scores for each product was $r = .89$ ($p = .0004$). Nevertheless, for each product, the average difference between these two measures represented the extent to which the product elicited a greater emotional versus cognitive reaction. We then analyzed whether being "more exciting than useful" (METU) indeed predicted a smaller likelihood for a product to belong to an intransitivity cycle.

A random-effects probit regression analysis of the likelihood of a product to belong to an intransitivity cycle on the product's METU measure as an independent variable, and controlling for individual heterogeneity, revealed that the stronger is a product's emotional relative to cognitive appeal (i.e., greater METU), the *less* likely is the product to belong to an intransitivity cycle ($p < .001$; see table 1, model I). (Adding interaction terms between product attributes and specific within-experiment manipulations into the regression equation did not produce any reliable effects; the same basic result pattern also held when alternative methods were used to account for participant heterogeneity.) Interestingly, although decision times across conditions (within the individual experiments) were not always significantly different and could not fully explain the observed difference in preference consistency between conditions, consistent with a theory that making emotionally-based choices is somewhat faster, adding decision time as a predictor in the

TABLE 1

RESULTS OF INDIVIDUAL-SPECIFIC RANDOM-EFFECTS
PROBIT REGRESSIONS PREDICTING INTRANSITIVITY

Predictor	Model I	Model II
Intercept	1.508** (.038)	1.510** (.039)
METU	-.078** (.015)	-.077** (.015)
Decision time		7.45e-07* (3.63e-07)
<i>n</i> / # of groups	40,300 / 939	40,300 / 939

NOTE.—Standard errors are presented in parentheses below parameter estimates.

* $p < .05$.** $p < .001$.

regression (see table 1, model II) revealed a small yet significant effect such that longer decision times for a product were associated with a greater likelihood of transitivity violation ($p < .05$). However, differences in decision time did not mediate the role of product emotionality in fostering transitivity, as the METU independent variable remained statistically significant after controlling for decision time ($p < .001$).

We thus find that not only did more “emotion-laden” conditions within experiments result in greater choice consistency as shown in the previous five experiments, preferences for products that evoke a stronger emotional reaction across conditions also tend to be more consistent. This finding lends further support to the differential roles of emotional processing and cognitive processing in generating consistent preferences. Again, we find that with greater reliance on emotional response comes a higher level of transitivity and greater preference consistency.

GENERAL DISCUSSION

We arrive at the truth, not by the reason only, but also by the heart. (Blaise Pascal)

As the canonical symbol of rational decision making, Homo Economicus has generally been depicted as a supra-rational, self-interested breed that possesses immense foresight and cognitive abilities (and perhaps, consequently, an oversized and active cortical system) but at the same time, “devoid of emotions.” In this work, we investigated one important property of Homo Economicus—transitivity—and its relation to our emotional system and cognitive system. Our examination of transitivity in the current work was not aimed to test the validity of rational choice models or economic theory. Instead, we used this very central concept in economics as an apparatus to examine the consistency in which individuals decide among their choices. Beyond its theoretical value, consistency is at the core of marketers’ ability to forecast and predict consumer behavior.

The results of five experiments—in which we manipulated the visual form of the choice stimuli and the mental

state of the decision maker—consistently demonstrate that the predictability of behavior relies more on emotion than what common conceptions of decision making might suggest. Using a pairwise choice task and different experimental manipulations designed to activate different degrees of reliance on emotional versus cognitive reactions, we found that participants’ preferences were more consistent and less susceptible to cognitive noise when they chose between products presented in the more affective mode of pictures instead of the less affective mode of names (experiments 1a, 1b, and 3); when they chose between products presented in the more affective mode of color photos instead of the less affective mode of black-and-white photos (experiment 2); when they made their choices with a higher degree of trust in their feelings (experiment 3); and under higher cognitive load (experiment 4), as well as when they were making choices among products that naturally engender greater emotional than cognitive response (product meta-analysis). Together, these results imply that preference consistency is greatly benefited by affective responses. From a methodological perspective, these results also highlight the importance of examining the consistency of individuals’ choices over time as an indication of decision quality, rather than treating choice variations and inconsistencies merely as “noise.”

The ongoing discourse regarding the role of emotions in decision making presents a complex set of evidence pointing both for and against their merits in decision making. A closer analysis of the various sets of findings, including the results presented here, suggests that there are some situations in which relying on one’s emotions may be the right strategy, but other situations in which such reliance may be detrimental for decision making (Vohs et al. 2007). For instance, there are various degrees of emotional reactions, ranging from attention toward affective information (even automatically) to violent mood swings, which may have different effects on the quality of the decision making process. In the same vein, Baumeister, DeWall, and Zhang (2007) distinguished between “automatic affect” (i.e., quick reactions of liking and disliking) and “conscious emotions” (i.e., complete emotional experiences imbued with conscious feelings and cognitive interpretations). (See also Camerer, Loewenstein, and Prelec 2005 for a discussion of the distinction between automatic emotions and controlled emotions.) In this work, we focus on the former rather than the latter type of emotional processes; nevertheless, this distinction is important here because it cautions us when generalizing our results to the realm of very conscious or very strong emotional states.

Our experimental findings also extend the stream of research on preference transitivity: in addition to other antecedents that have already been identified, preference transitivity can be impaired by too much deliberate cognitive thinking. Our results are also consistent with the evolutionary account that our emotional processes might have been adapted to perform common and important tasks effectively and efficiently (Cosmides and Tooby 2000; Damasio 1994).

To the extent that transitive preferences are objectively “better” and more optimal than intransitive preferences, our results join other prior work that demonstrate the positive roles emotions play in decision making (Bechara et al. 1997; Damasio 1994; Davidson et al. 2000; Dijksterhuis 2004; Loewenstein and Lerner 2002; LeDoux 1996; Peters and Slovic 2000; Pham et al. 2001; Wilson and Schooler 1991). In particular, whereas Pham and his colleagues (2001) demonstrated that feeling-based processes (compared with reason-based processes) lead to more stable and consistent judgments across individuals, our results show that emotional processes can also contribute toward greater preference stability and consistency within individuals.

Alternative Accounts

Alternative accounts bear the burden of explaining why we observed greater preference consistency in conditions that induced more emotional and/or less cognitive processing across all the experiments and analyses presented. One such possible account for our experimental results in general is that different experimental manipulations, or the different circumstances under which participants had to make their product choices, changed the type of decision strategies participants used, and that some of these strategies somehow increase internal preference consistency. It should be noted that to the extent that these latter strategies involve more emotional processing (and hence less cognitive processing), they are essentially the rationale for our argument. Therefore, for this alternative account to be valid, the manipulations must have led to different types (and not degrees) of cognitive processing.

For example, in experiment 4 where we manipulated the degree of cognitive capacity under which participants had to choose their preferred products, one might argue that participants under higher cognitive load could have used a simplifying noncompensatory decision strategy, which in turn could have resulted in the greater degree of transitivity observed. However, Tversky's (1969) transitivity findings with gamble choice would lead us to predict the opposite result: if a simplifying or lexicographic decision strategy was indeed used by participants under high cognitive load, then we would expect participants under low cognitive load to have greater attentional capacity to use a more optimizing, more compensatory strategy in making their choices, and thus be more, not less, consistent in their choices! (See also Gigerenzer 2000 for examples of intransitivity caused by the use of satisficing, noncompensatory decision strategies.) Moreover, the timing results that we found in this experiment—that there was no significant difference in how long participants took to choose across both conditions—further challenge the validity and adequacy of this alternative account in explaining our results. Furthermore, we also designed the experimental procedure such that participants were provided with full information of all products at the outset and were given as much time to familiarize themselves with the products as they wanted before being assigned to one of the experimental conditions. Thus, we do

not expect participants to make vastly different choices among the products in any of the experiments (which had identical product assortments).

To test this alternative account more directly using the choice data from the experiments, we examined whether there was a change in participants' overall preference ordering among the given products across conditions, assuming that a change in decision strategy would lead to a change in preference structure. We can infer a participant's preference order by computing his or her Kendall score for each product (i.e., the number of times the participant chooses the product in preference to the other products in the set), and rank order his or her Kendall scores for all the products (Cook and Kress 1992). (In other words, there is a set of P Kendall scores for each participant, where P is the number of products in the given set.) To compare participants' preference structure between conditions in each experiment, we submitted participants' Kendall scores to a MANOVA, using the specific experimental manipulation as the independent factor. The MANOVA results (using Wilks's lambda) revealed no significant difference in product preference order across conditions in any of the experiments.

Together, these results support our proposed account as a valid parsimonious explanation for the experimental results—participants who rely on more intuitive, emotional processing rather than deliberative, cognitive processing tend to exhibit greater preference consistency.

Future Research

In this research, we measured preference consistency by computing the number of transitivity violations among all pairwise choices of a product set. There are no doubt other ways to measure consistency, and it would be worthwhile to design and conduct further experiments based on other measures of consistency. Other potential factors, such as choice context (e.g., Amir and Levav 2008) or the consideration of specific product attributes (e.g., Lee, Bertini, and Ariely 2008) that could influence the degree of emotional or cognitive processing and in turn preference consistency can also be further explored.

One important way to extend the results is to implement a design with greater temporal distance between consecutive pairwise choices, for example, getting participants to make one pairwise choice a day over an extended period of time, and examining whether the same transitivity patterns we observed across different emotional versus cognitive decision making scenarios persist. Another possible area for future research stems from an application of Piaget's (1969) theory of cognitive development in developmental psychology. Piaget proposed four stages of cognitive development, which includes a stage (III) for concrete operations (approximately at ages 7–11) when children master logic and develop “rational” thinking. Piaget's work suggests that age could be a factor that moderates the degree of transitivity of an individual's choices. As such, it would be worthwhile and interesting to examine how adults compare with children in terms of their degrees of preference consistency. At a

more rudimentary (neural) level, while our experimental results point toward the close association between the emotional system and preference consistency, further experiments involving the direct examination of individuals' neural activities during choice and decision making under varying conditions are imperative if we are to identify the precise neural substrates associated with consistent preferences.

Practical Implications

Our results suggest that marketers who study consumer preferences may improve their methods by using affect-rich stimuli. For example, a conjoint analysis that includes pictures in addition to descriptions in its choice stimuli may do a far better job at tapping the more consistent components of consumer preferences. Moreover, the emotional system's contribution to stable preferences suggested by our findings points toward yet another advantage in emotional approaches to persuasion: it may be important to tap consumers' emotional systems when assessing their consumption satisfaction as this approach might yield better predictions of their future choices. Finally, our results have one other practical implication if we were to consider an important difference between brick and mortar shopping and Internet shopping: the former affords consumers a richer affective shopping experience and may lead to greater preference consistency over time. As our results suggest, the degree to which a shopping Web site provides rich affective cues might have a great influence on consumer preference consistency.

For the consumer, contrary to lay perceptions, attending to one's emotional responses may prove to be very valuable in understanding one's inherent preferences (Simonson 2008). It is possible consumers would be much happier with choices based more on their emotional reaction. For example, if one buys a house and relies on very cognitive attributes such as resale value, one may not be as happy actually living in it, as opposed to a person who attends to his or her emotional reaction to the house prior to purchasing it. Indeed, our results suggest that the heart can very well serve as a more reliable compass to greater long-term happiness than pure reason.

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