

On the Practical Significance of Hindsight Bias: The Case of the Expectancy–Disconfirmation Model of Consumer Satisfaction

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The implications of the phenomenon of hindsight bias for the expectancy–disconfirmation model of consumer satisfaction are investigated, and the moderating effects of choice (i.e., whether or not a product is selected on the basis of one's expectations regarding the product's likely performance) on the incidence of hindsight bias and on the relationships between expectations, performance, disconfirmation, and satisfaction are considered. A study dealing with consumers' satisfaction with personalized envelopes shows that perceived performance biases people's recall of their foresight expectations in a systematic way (hindsight bias), that hindsight, rather than foresight, expectations are the more potent influence on disconfirmation and satisfaction, and that choice moderates the degree of hindsight bias and the relationships between satisfaction and its antecedents. © 1995 Academic Press, Inc.

INTRODUCTION

Hindsight bias, or the “I-knew-it-all-along” effect, refers to people's tendency to consistently exaggerate in hindsight what could have been expected in foresight. Hindsight bias occurs when hindsight expectations are systematically different from foresight expectations in

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the direction of outcome knowledge. Research has shown that hindsight bias is a robust phenomenon which afflicts judgments in widely differing domains ranging from the truth of almanac questions (Fischhoff, 1975) to outcomes in laboratory markets (Camerer, Loewenstein, & Weber, 1989), from events that have well-defined alternative consequences (Hoch & Loewenstein, 1989) to highly subjective consumption experiences (Pieters & Zwick, 1992). It has been found with both inexperienced and experienced subjects (Arkes, Faust, Guilmette, & Hart, 1988) and even with subjects who were informed that they might be prone to this bias and who tried to avoid it (Fischhoff, 1977).

Based on a meta-analysis of 122 hindsight bias studies, Christensen-Szalanski and Willham (1991) make two important points. First, the overall effect size of hindsight bias is not large so that there are questions about its practical significance. Second, for hindsight bias to be practically relevant, there is a need to demonstrate that it can affect more than just a person's perception of the probability that some event will occur. The present study addresses these points by exploring the ramifications of the hindsight bias phenomenon in the context of consumers' satisfaction judgments.

In the remainder of the paper, we will first argue for the importance of taking into account hindsight bias in satisfaction formation, and we will also discuss its likely effects on the pattern of relationships in the expectancy–disconfirmation model of consumer satisfaction. Next, we will suggest choice (i.e., whether or not a product is actually selected based on one's expectations regarding the product's likely performance) as an im-

portant moderator of both the degree of hindsight bias and its effect on the relationships between satisfaction and its antecedents. These issues are then explored in a study dealing with consumers' satisfaction with personalized envelopes in a simulated mail-order environment. The paper concludes with a discussion of the results and with implications for future research.

HINDSIGHT BIAS AND THE EXPECTANCY-DISCONFIRMATION MODEL OF CONSUMER SATISFACTION

Satisfaction is a key concept in the consumer behavior and marketing literatures which has attracted intense research attention during the last three decades. Satisfying customer needs is a basic premise of the marketing process, and customer satisfaction is generally regarded as a factor that is critical to the success of an organization (Anderson & Fornell, 1994). Since expectations are a central component of models of satisfaction formation, considering the implications of the phenomenon of hindsight bias for satisfaction judgments seems a particularly fruitful area for assessing its practical significance.

Among the theoretical frameworks that have been proposed to explain consumer satisfaction (see Yi, 1990, for a comprehensive review of the literature), the most influential model has undoubtedly been the expectancy-disconfirmation paradigm (e.g., Oliver, 1977, 1980, 1993). In this paradigm and its variants (e.g., Churchill & Surprenant, 1982), consumer satisfaction is viewed as a linear function of prepurchase expectations, perceived product performance, and the degree to which expectations are positively or negatively disconfirmed during consumption. According to the model, satisfaction increases with the level of perceived product performance and the magnitude of consumers' prepurchase expectations. In addition, the comparison of perceived product performance with prepurchase expectations is posited to influence consumers' satisfaction judgments. If performance exceeds expectations (i.e., if there is positive disconfirmation), an increase in satisfaction is hypothesized, whereas if performance

falls short of one's expectations (i.e., if there is negative disconfirmation), a decrease in satisfaction is expected.¹

Implicitly, if not explicitly, the expectancy-disconfirmation model assumes that people have access to their original expectations when they compare a product's performance to prepurchase expectations. The hindsight bias phenomenon suggests that this may *not* be a reasonable assumption to make since knowledge of how the product *actually* performed may distort consumers' memory of how the product was *expected* to perform. In other words, people's recall of their initial (foresight) expectations (i.e., their hindsight expectations) may be biased in the direction of perceived product performance (hindsight bias). Hence, it would seem to be necessary to incorporate hindsight bias into the expectancy-disconfirmation model of consumer satisfaction and to consider the effects of hindsight expectations on the relationships in the model.²

If experience with the product distorts consumers' recall of their foresight expectations, what are the likely effects of this phenomenon on judgments of disconfirmation and satisfaction? Provided consumers do assess whether a product fell short of, met, or exceeded their expectations, disconfirmation will be determined by the discrepancy between hindsight expectations (i.e., expectations as recalled after experience with the product) and perceived performance, rather than by the discrepancy between foresight expectations (i.e., expectations formed prior to experience with the product) and perceived performance. To the extent that foresight and hindsight expectations are reasonably highly correlated (which is probably the case since hindsight effects are generally not large), both might be related to perceived disconfirmation, but hindsight expectations should be the more important influence. In a similar way, if evidence of hindsight bias is found in satisfaction formation, hindsight, rather than foresight, expectations should be the more potent determinant of satisfaction since unbiased foresight expectations are no longer available.

CHOICE BASED ON FORESIGHT EXPECTATIONS AS A MODERATOR OF HINDSIGHT BIAS

In a typical hindsight bias study, subjects are not asked to make decisions and to take actions based on their expressed foresight expectations. Foresight expectations are only assessed as a baseline to be com-

¹ If perceived disconfirmation were an exact function of the difference between prepurchase expectations and perceived performance, only two of the three terms (expectations, performance, disconfirmation) would be needed to account for satisfaction. However, previous research has shown that perceived disconfirmation differs from the algebraic difference between prepurchase expectations and perceived performance (this difference is generally referred to as *inferred disconfirmation*), that perceived disconfirmation is a better predictor of satisfaction than inferred disconfirmation, and that all three terms can have separate effects on satisfaction (cf. Yi, 1990). Note that expectations are thought to have a direct positive (although the empirical evidence on this point is somewhat ambiguous) and an indirect negative (via perceived disconfirmation) effect on satisfaction.

² Other expectations in addition to predictive expectations have been discussed in the literature, depending on the comparison standard used (e.g., ideal, desired, or product-norm expectations; cf. Yi 1990). In this paper, we will only deal with the case of predictive expectations since they should be most vulnerable to hindsight bias.

pared with hindsight expectations, after presentation of outcome knowledge. However, in a more interesting scenario, foresight expectations form the foundation for future actions. Such is the case, for example, when consumers make purchase decisions on the basis of their expectations regarding a product's likely quality. Often, performance expectations are based on ambiguous advertising claims, equivocal word of mouth, or actual quality fluctuations in past personal or nonpersonal experiences. The question then arises whether the type of decision a person makes (e.g., to purchase or not to purchase a product) influences the degree to which he or she is susceptible to hindsight bias.

One interpretation of hindsight bias is in terms of the inferences a person makes to comprehend the original evidence in the context of information about the outcome (e.g., Fischhoff, 1975). Reinterpretation, factual restructuring (Svenson, 1991), and retrospective sense making are at least partially due to self-enhancing motives (Campbell & Tesser, 1983). In addition, research on the phenomenon of hindsight bias has found that the bias is especially likely to occur when the outcome has emotional significance (e.g., when it is self-relevant) and when the event is subject to imaginative consideration before its outcome is known (Hawkins & Hastie, 1990). Since a product that was selected based on foresight expectations is more self-relevant to a consumer than one that was originally rejected and hence should generate more sense-making processes, and since a chosen product is also subject to imaginative consideration in the anticipation of delivery, we expected that hindsight bias would be more likely in the former case than in the latter case.

This hypothesis is also consistent with the notion in cognitive dissonance theory that decisions have to be important and irrevocable in order for people to be motivated to attempt cognitive resolutions of dissonance (cf. Eagly & Chaiken, 1993). In line with this thinking, Cohen and Goldberg (1970) and Olson and Dover (1979) have argued that a product has to have some personal relevance in order for disconfirmation effects to be clearly evidenced. In a similar way, Tse, Nicosia and Wilton (1990) have suggested that subjects for whom a product is not self-relevant may not be motivated to engage in the mental activities necessary to restore the psychological balance when an outcome is perceived to be different from preexperience expectations. To the extent that testing a product is more self-relevant for subjects who have chosen the product, the above arguments will suggest a higher level of hindsight bias in this condition.

If subjects who have selected a product based on their expectations regarding the product's likely performance show more evidence of hindsight bias than

subjects who have rejected the product, choice should also moderate the relationship between satisfaction and its antecedents. For consumers who are susceptible to hindsight bias, disconfirmation and satisfaction should be mostly a function of hindsight expectations, whereas foresight and hindsight expectations should be equally good predictors of disconfirmation and satisfaction when there is no hindsight bias.

METHOD

Overview

A study was designed to test the hypothesis that hindsight bias affects the formation of satisfaction judgments and that the degree of hindsight bias is greater when consumers have committed themselves to the product on the basis of prepurchase expectations.

To examine these hypotheses, two factors were manipulated in a between-subjects design: expectations concerning a product's likely performance (low vs high) and actual performance of the product (low vs high). In addition, subjects were asked to make a decision about whether or not they wanted to receive the product or an equivalent amount of money, based on their expectations about the product's likely performance. The decision to choose or not to choose the product (choice) was included in the design as a third factor in addition to the two manipulated variables.

The study consisted of two parts. In the first part, high and low levels of prior expectations were induced and measured. In previous satisfaction studies, expectations have often been assigned to subjects (e.g., Oliver & DeSarbo, 1988; Churchill & Surprenant, 1982; Tse & Wilton, 1988).³ However, if the choice of a product on the basis of prepurchase expectations is to be self-relevant, it is important that subjects feel "responsible" for their expectations (cf. Cooper & Fazio, 1984). Otherwise, a bad choice can be easily justified by blaming the experimenter for providing false information. Hence, in our study, expectations were manipulated indirectly by prompting subjects to form inferences about the product's likely performance from peripheral cues contained in advertising for the product. After indicating their expectations regarding the product's likely performance (foresight expectations), subjects

³ For example, in Churchill and Surprenant (1982) and Tse and Wilton (1988), expectations were manipulated by varying the content of a written evaluation of the product by an independent testing lab. In Oliver and DeSarbo (1988), subjects were told directly what their expectations should be ("Based on your personal research, you feel strongly about the prospect for Stock X. This research suggests that the stock should outperform the S & P 500 by 5 percent on a six-month basis").

could either choose the product or receive an equivalent amount of cash.

In the second, unexpected part of the study, subjects were given an opportunity to evaluate a sample of the product. Subjects received one of two versions of the same advertised product whose performance had been judged by an independent sample to be either low or high. This served as the performance manipulation. All subjects, both those who had and those who had not chosen the product, were asked to rate the product's perceived performance, assess their perceived disconfirmation, and judge their satisfaction. In addition, subjects were asked to recall their foresight expectations as accurately as possible (hindsight expectations).

Subjects

A total of 163 undergraduate students from two universities participated in the study. Subjects were run in groups of 8 to 30 people during 50-min sessions. Subjects in the same session were assigned to the same experimental treatment.

Product

An imaginary brand of customized envelopes, called FIRST CLASS, with a personalized return address printed in the upper left-hand corner, was used as the product stimulus. The product category of customized envelopes was selected for the following reasons: (1) we thought that students would have only moderate experience with this product category; (2) the product was judged to be useful to students in pretesting; (3) the product is cheap enough so students can choose it on the spot; (4) it was easy for us to manipulate the quality of the product; and (5) the product is "personal" so that a possible dissatisfaction cannot be overcome by passing the product on to another consumer as a gift, for example. The last aspect should also stimulate commitment to the choice.

Manipulations

Expectation manipulation. As explained previously, expectations were manipulated indirectly by prompting subjects to form inferences about the product's likely performance from peripheral cues contained in advertising for the product. Specifically, the peripheral cues that were varied included the advertiser's reputation, the production quality of the ad presenting the brand, and campaign features such as the type of advertising agency used, the size of the ad, and the duration and intensity of the campaign (cf. Kirmani, 1990; Goldberg & Hartwick, 1990).

With regard to advertiser's reputation, two descriptions were developed, one suggesting a solid reputation and one suggesting a questionable reputation. Subjects

were sensitized to the importance of this variable by stating that a recent Consumer Reports survey had found substantial variation in the quality of mail-order products. In the solid reputation description, the advertiser, Artistic Cards, Inc., was described as a well-known direct mail-order company located in New York, NY, specializing in customized stationary products. In the questionable reputation description, the advertiser was said to be Office Supply, Inc., a small direct mail-order company located in Bluefield, WV, which specialized in office supplies.

With regard to campaign features, the advertising campaign by Artistic Cards, Inc., for the high expectation group, was described as a 6-month advertising campaign in which:

A half-page ad (11" × 17"), prepared by an advertising agency in New York, will appear in student newspapers across the country, including The Daily Collegian. It is estimated that most people who read these newspapers will see a FIRST CLASS ad 20 times during the six-month campaign.

The advertising campaign by Office Supply, Inc., for the low expectation group, was described as a 1-month advertising campaign in which:

A one-eighth page ad (4" × 11"), prepared by a local advertising agency, will appear in student newspapers across the country, including The Daily Collegian. It is estimated that most people who read these newspapers will see a FIRST CLASS ad 2 times during the one-month campaign.

With regard to the ad's production quality, the high quality ad was in black and red ink, professionally developed, and relatively large. The low quality ad was in black ink, cheap looking, and relatively small.

The wording of both ads was identical, and the ads did not contain any real product information pertaining to the quality of the envelopes. Hence any differences in expectations concerning the product's likely performance can be uniquely attributed to quality inferences made by subjects based on information about the advertiser, the ad campaign, and the production quality of the ad.

Performance manipulation. Actual performance of the product was manipulated by the quality of the envelope and the appearance of the sample return address. In the low manipulated performance condition, the envelope was white and ordinary-looking, relatively small, and the sample return address was printed with a dot-matrix printer. In the high manipulated performance condition, the envelope was off-white, larger in size, and the sample return address was printed with a laser printer.

Procedure and Measures

In the first part of the session, subjects received a packet of material and were asked to read and follow the attached instructions at their own pace. The intro-

duction explained that a mail-order company was planning to add customized envelopes branded FIRST CLASS to their line of products to be included in the Fall catalog. Since students were one of the target audiences for this product, the company had asked the researchers to conduct an advertising study. Information about the ad campaign in terms of agency, media, duration, ad size, and frequency was provided, and subjects were also instructed to examine a finished copy of the ad. This was our (indirect) manipulation of expectations. After they had inspected the ad, subjects were asked questions about the cost of the campaign and the effort the advertiser was investing in the campaign (rated on 7-point scales with endpoints of below average–above average and very little effort–a lot of effort), and whether they thought the ad was appealing, well-designed, and good (again rated on 7-point scales with endpoints of unappealing–appealing, poorly designed–well designed, and bad–good). These ratings served as direct measures of the quality of the advertising campaign, on the basis of which subjects were thought to form expectations about the performance of the advertised product.

Next, subjects indicated their expectations about the likely performance of seven attributes of the customized envelopes, based on the ad, the ad campaign, and what they knew about the company. These ratings were used as our measure of foresight expectations. The attributes were selected on the basis of pretests and included the following: print quality, paper quality, letter clarity, envelope style, ink quality, letter legibility, and overall quality. A typical question was: "I think the Print Quality of FIRST CLASS will probably be. . .," and responses were collected on 7-point scales anchored by low–high and poor–good, as appropriate.⁴

At the end of the first part of the session, subjects were thanked for their participation and were told that:

As a reward for your participation, Artistic Cards, Inc. (Office Supply, Inc.), is offering you a free gift of ten personalized envelopes. This gift has a market value of \$2.00. If, however, you are not interested in this free gift, you may choose to receive \$2.00 in cash.

⁴ During pretesting, we discovered that the specific wording of the expectation question can affect the standard of comparison adopted by subjects. For example, when the question was worded as, "Please indicate on the following scales what your expectations are toward each of the features of FIRST CLASS listed below. . .," several subjects, in a posttest interview, indicated that they interpreted the question to mean what I deserve to get. This is in line with one of the meanings of the word "expect" in Webster's Dictionary: 4b. to consider reasonable, due, or necessary, 4c. to consider bound in duty or obligated. The measure used in our study assesses predictive expectations more explicitly.

Subjects then indicated their choice by marking the appropriate space on the questionnaire. Based on their choice, subjects were classified into either the envelope choice condition or the \$2.00 choice condition. One subject did not indicate a choice, hence his/her data were dropped from further analysis.

After about half an hour, during which time they engaged in an unrelated study, subjects were unexpectedly invited to participate in the second part of the experiment. As in the first part, subjects received a packet of material and were asked to read and follow the attached instructions at their own pace. The instructions stated that subjects would have a chance to inspect the actual product, and they were invited to experience the product by "mailing" a one-page letter. Subjects received either a high quality or low quality envelope, and this served as our manipulation of performance.

After testing the product, subjects completed a questionnaire in which they rated the product's perceived performance, tried to recall their initial expectations (hindsight expectations), indicated their perceived disconfirmation with the product, and judged their satisfaction. Subjects at one university completed the questions in the order described, while at the other university subjects rated their satisfaction immediately after testing the product.⁵ The postexperience questionnaire contained questions about the same seven attributes of FIRST CLASS that were used in measuring foresight expectations in the first part of the session.

More specifically, subjects were asked to evaluate the perceived performance of the envelopes using 7-point scales anchored by low–high and poor–good, as appropriate (e.g., low quality print–high quality print). We assessed hindsight expectations by using the same scales that we had employed to measure foresight expectations. Subjects were told that we wanted to know to what extent they were able to remember their initial expectations and they were reminded to try to recall their previous answers as accurately as possible. Then, subjects rated their perceived disconfirmation based on how well the product had met their expectations on each of the seven attributes. These judgments were made on 7-point scales anchored by "It is worse than I expected" (1) and "It is better than I expected" (7), with a midpoint of "It is just as I expected." Finally, subjects rated their satisfaction with all seven attributes on 7-point scales anchored by "Completely Dissatisfied" (1) and "Completely Satisfied" (7). After all subjects had completed the study, they were debriefed.

⁵ Order as well as the interaction of order with all other relevant variables was found to be nonsignificant. Hence, we will not discuss this variable any further.

RESULTS

Table 1 presents the number of subjects in the cells created by the two experimental manipulations (manipulated expectation: low vs high; manipulated performance: low vs high) and the measured variable of choice (envelope vs \$2.00). We will first present the results for the manipulation checks, then report the evidence on the incidence of hindsight bias, and finally investigate the relationships between foresight and hindsight expectations, perceived performance, perceived disconfirmation, and satisfaction.

Manipulation Checks

Expectation manipulation. Subjects' expectations about the product's performance were manipulated indirectly by manipulating the quality of the advertising for the product. In order for the expectation manipulation to be successful, subjects first have to perceive differences between the two advertising campaigns. Table 2 presents the means and standard deviations of subjects' perceptions of the cost and effort spent on the advertising campaign, as well as their evaluations of the ad's quality. As expected, the hypothesis of no campaign and ad quality treatment effect was rejected both overall [$F(5,155) = 4.76, p < .001$, based on a multivariate analysis of variance] and for all evaluated features (see Table 2 for the univariate analyses). Subjects exposed to the high ad and campaign quality information judged the campaign to be more costly and to require more effort on the part of the advertiser, and they evaluated the quality of the ad to be higher than subjects exposed to the low ad and campaign quality information.

Given the success of the manipulation on the advertising quality measures, we investigated whether we had also succeeded in inducing different levels of foresight expectations. Only if the manipulation is successful in creating the hypothesized differences in foresight expectations can it be called an expectation manipulation. Table 3 presents the results for mean foresight expectations and associated standard deviations. As expected, the hypothesis of no expectation treatment effect was rejected both overall [$F(7,155) = 9.00, p < .001$] and for all evaluated features (see Table 3).⁶ High campaign and ad quality led to higher foresight expectations than low campaign and ad quality for all attributes (see entries under ALL). Thus, the manipulation of campaign and ad quality was successful as a (indirect) manipulation of subjects' expectations about the product's likely performance. We are thus justified

⁶ In the sequel an "overall" analysis refers to MANOVA on the seven evaluated attributes and not to ANOVA on the overall mean. The latter analyses are presented in the tables.

TABLE 1
Number of Subjects per Condition

Manipulated expectation	Manipulated performance	Choice	
		Envelope	\$2.00
Low	Low	20	18
	High	20	23
High	Low	30	12
	High	23	16

in referring to the advertising quality manipulation as an expectation manipulation.

It might be expected that subjects who had chosen the envelope would have higher foresight expectations than subjects who had chosen the \$2.00. Table 3 also presents mean foresight expectations by choice condition. Subjects in the envelope choice condition did indeed have higher foresight expectations than subjects in the \$2.00 choice condition. However, in a two-way (manipulated expectation by choice) multivariate analysis of variance the effect of choice on foresight expectation was nonsignificant [$F(7,152) = 1.49, n.s.$] and the interaction of manipulated expectation and choice [$F(7,152) = 0.27, n.s.$] was also nonsignificant. Therefore, choice was not confounded with manipulated expectation. The hypothesis of no expectation treatment effect was again rejected as above [$F(7,152) = 7.98, p < .001$].

Performance manipulation. Table 4 presents mean perceived performance ratings and associated standard deviations as a function of manipulated performance level. The hypothesis of no performance treatment effect was rejected both overall [$F(7,154) = 61.65, p < .001$] and for all evaluated attributes (see Table 4). The high performance manipulation induced higher ratings of perceived performance than the low performance manipulation for all attributes.

Again, it might be expected that subjects who had chosen the envelope would provide higher perceived performance ratings than subjects who had chosen the \$2.00. Table 4 shows that this is true for most attributes. However, in a two-way (manipulated performance by choice) multivariate analysis of variance the effect of choice on perceived performance was nonsignificant [$F(7,151) = 0.612, n.s.$], as was the interaction of choice with manipulated performance [$F(7,151) = 0.725, n.s.$]. Thus, choice was not confounded with manipulated performance.

Evidence for Hindsight Bias

Hindsight bias occurs if experience with a product systematically distorts consumers' recall of foresight expectations in the direction of perceived product performance. Three things have to be demonstrated in or-

TABLE 2
Manipulation Checks—Campaign and Ad Quality Evaluations

Evaluation of	Campaign and ad quality (expectation) manipulation				Univariate ANOVA	
	Low		High			
	Mean	(SD)	Mean	(SD)	<i>F</i>	Pr > <i>F</i>
Cost	4.02	(1.48)	4.64	(1.34)	6.95	0.0092
Effort	3.65	(1.49)	4.38	(1.46)	8.57	0.0039
Design	3.23	(1.52)	4.10	(1.27)	14.50	0.0002
Appeal	2.95	(1.49)	3.47	(1.43)	4.19	0.0423
Goodness	3.36	(1.43)	4.02	(1.27)	8.99	0.0031

Note. H_0 for ANOVA: Mean (Low) = Mean (High), $df = (1,159)$.

der to provide convincing evidence of hindsight bias: (1) perceived product performance has to differ significantly from foresight expectations so that there is a potential for hindsight bias to occur; (2) consumers' recall of their initial expectations after a disconfirmation experience (i.e., hindsight expectations) has to deviate reliably from their foresight expectations; and (3) hindsight expectations have to exhibit a systematic shift toward perceived product performance. Our hypothesis is that hindsight bias as defined by conditions one to three is more likely to occur in the envelope choice group. In the sequel we will show that even though both choice groups reported similar patterns of disconfirmation, only the envelope choice group shows systematic shifts of hindsight expectations in the direction of perceived performance, compared with foresight expectations.

Perceived disconfirmation. Table 5 presents mean attribute-specific perceived disconfirmation as a function of manipulated expectation, manipulated performance, and choice.⁷ Subjects' perceived disconfirmation responses were subjected to a three-way (manipulated expectation by manipulated performance by choice) multivariate analysis of variance. Only the effects of manipulated expectation and manipulated performance were significant [expectation: $F(7,146) = 6.44, p < .0001$; performance: $F(7,146) = 29.48, p < .0001$]. No other effects were found to be significant. In particular, there was no effect of choice [$F(7,146) = 0.81, n.s.$]. The results of the corresponding univariate analyses are reported in Table 5. A superscript next to a cell entry indicates that the value is significantly different from 4 (the midpoint of the scale labeled "it is just as I expected") at the .05 (*a*) or .10 (*b*) level. For simplicity, all statistical comparisons are based on two-

⁷ All analyses in this section were also performed with inferred rather than perceived disconfirmation scores. Inferred disconfirmation was computed as the algebraic difference between foresight expectations and perceived performance. The results were identical to the ones reported in the body of the paper.

tailed tests, but the interesting directional effects are obvious given the significance of the less powerful two-tailed tests.

Table 5, and the MANOVA reported above, confirm what can be observed by comparing Tables 2 (foresight expectations) and 3 (perceived performance). Perceived performance was judged to be worse than expected in the low manipulated performance condition for both levels of manipulated expectation and for both choice groups, overall and for almost all attributes (see Table 5). That is, even subjects who were in the low manipulated expectation condition perceived the performance of the low manipulated performance envelope to be worse than expected. Conversely, perceived performance was judged to be better than expected in the high manipulated performance condition for both levels of manipulated expectation and for both choice groups, overall and for almost all attributes (see Table 5). That is, even subjects who were in the high manipulated expectation condition perceived the performance of the high manipulated performance envelope to be better than expected. Furthermore, given that choice and the interactions of choice with manipulated expectation and performance were nonsignificant in the MANOVA reported above, it is clear that the pattern and magnitude of disconfirmation reported by the two choice groups is similar. This means that the potential for hindsight bias was the same in both choice groups. Furthermore, the results suggest that if hindsight bias is to occur, hindsight expectations should be higher than foresight expectations in the high manipulated performance condition and lower in the low manipulated performance condition (for both manipulated expectation conditions). Before looking at the difference between foresight and hindsight expectations, however, we will briefly analyze the effects of the manipulations on hindsight expectations.

Hindsight expectations. Table 6 presents mean attribute-specific hindsight expectations as a function of manipulated expectation, manipulated performance,

TABLE 3
Manipulation Checks—Means and Standard Deviations of Foresight Expectations

Attribute	Choice	Expectation manipulation				Univariate analysis	
		Low		High		<i>F</i>	Pr > <i>F</i>
		Mean	SD	Mean	SD		
Print quality	Envelope	4.10	1.35	5.25	1.09	20.40	0.0001
	\$2.00	3.71	1.19	4.82	1.19	14.63	0.0003
	ALL	3.90	1.28	5.10	1.14	39.04	0.0001
Paper quality	Envelope	4.58	1.13	4.83	1.27	1.01	0.3167
	\$2.00	4.24	1.20	4.71	1.30	2.39	0.1270
	ALL	4.41	1.17	4.79	1.27	4.12	0.0439
Letter clarity	Envelope	4.45	1.40	5.57	1.14	18.08	0.0001
	\$2.00	3.76	1.43	5.18	1.09	19.84	0.0001
	ALL	4.10	1.45	5.43	1.13	44.31	0.0001
Envelope style	Envelope	4.73	1.26	5.13	1.16	2.60	0.1101
	\$2.00	4.32	1.23	4.79	0.88	3.00	0.0878
	ALL	4.52	1.26	5.01	1.08	7.78	0.0059
Ink quality	Envelope	4.40	1.32	5.26	1.24	10.47	0.0017
	\$2.00	3.95	1.30	4.75	1.08	7.17	0.0093
	ALL	4.17	1.32	5.09	1.21	22.24	0.0001
Letter legibility	Envelope	4.68	1.49	5.77	1.05	17.38	0.0001
	\$2.00	4.22	1.54	5.36	0.91	12.28	0.0008
	ALL	4.44	1.52	5.63	1.02	35.21	0.0001
Overall quality	Envelope	4.45	1.47	5.25	0.98	9.81	0.0023
	\$2.00	3.88	1.35	4.61	1.20	5.34	0.0240
	ALL	4.16	1.43	5.02	1.10	19.75	0.0001
Overall mean	Envelope	4.48	0.99	5.29	0.87	17.67	0.0001
	\$2.00	4.01	1.05	4.89	0.85	13.52	0.0005
	ALL	4.24	1.04	5.15	0.88	37.59	0.0001

Note. H_0 for ANOVAs: Mean (High) = Mean (Low); $df = (1,91)$, $(1,67)$, and $(1,159)$ for envelope, \$2.00, and ALL, respectively.

and choice. Foresight expectations are also included for comparison purposes.

Subjects' hindsight expectations were subjected to a three-way (manipulated expectation by manipulated performance by choice) multivariate analysis of variance. All three main effects were significant. As expected, the hypothesis of no effect of manipulated expectation was rejected [$F(7,148) = 8.185, p < .0001$]. For all attributes, hindsight expectations were higher in the high manipulated expectation condition than in the low manipulated expectation condition. More importantly, and consistent with the existence of a memory bias, the hypothesis of no effect of manipulated performance was rejected [$F(7,148) = 5.44, p .0025$]. For all attributes, mean hindsight expectations were higher in the high manipulated performance condition than in the low manipulated performance condition. Also as expected, due to the slightly higher foresight expectations in the envelope choice group, the hypothesis of no choice effect was rejected [$F(7,148) = 2.056, p < .0518$]. For all attributes, mean hindsight expectations were higher in the envelope choice group than in the \$2.00 choice group.

In addition to the three main effects, the interaction

between manipulated performance and choice was (marginally) significant [$F(7,148) = 2.011, p < .0690$]. For all attributes (except overall quality), the difference between the hindsight expectations of the low and high manipulated performance conditions was larger in the envelope choice group than in the \$2.00 choice group. The overall differences were 0.58 and 0.33 in the low manipulated expectation condition and 0.33 and 0.26 in the high manipulated expectation condition, for the envelope and \$2.00 choice groups, respectively (see last row in Table 6). All of these means are significantly different from zero (except for the last value of 0.26), and the difference scores in the envelope choice condition are significantly larger than the difference scores in the \$2.00 choice condition (at the .05 level). No other effects were found to be significant in the above MANOVA.

The foregoing results suggest that a memory bias occurred in both choice conditions (since hindsight expectations were generally affected by the performance manipulation), although the effects were somewhat stronger in the envelope choice condition than in the \$2.00 choice condition. However, as discussed previously, in order to provide clear evidence of hindsight

TABLE 4
Manipulation Checks—Means and Standard Deviations of Perceived Performance

Attribute	Choice	Manipulated performance				Univariate analysis	
		Low		High		F	Pr > F
		Mean	SD	Mean	SD		
Print quality	Envelope	2.50	1.40	5.93	1.14	163.62	0.0001
	\$2.00	2.37	1.16	5.54	1.35	105.19	0.0001
	ALL	2.45	1.31	5.74	1.26	267.15	0.0001
Paper quality	Envelope	3.54	1.49	6.21	0.83	108.99	0.0001
	\$2.00	3.50	1.66	5.87	1.00	54.23	0.0001
	ALL	3.53	1.54	6.05	0.93	163.44	0.0001
Letter clarity	Envelope	3.66	1.65	6.35	0.84	93.32	0.0001
	\$2.00	3.70	1.56	5.82	1.07	44.79	0.0001
	ALL	3.68	1.61	6.10	0.99	135.61	0.0001
Envelope style	Envelope	2.52	1.50	6.09	1.06	169.87	0.0001
	\$2.00	2.47	1.59	5.67	1.38	79.61	0.0001
	ALL	2.50	1.53	5.89	1.24	244.91	0.0001
Ink quality	Envelope	2.16	1.28	6.14	1.08	256.51	0.0001
	\$2.00	2.37	1.16	5.59	1.46	98.02	0.0001
	ALL	2.24	1.23	5.88	1.30	334.04	0.0001
Letter legibility	Envelope	4.10	1.36	6.47	0.70	105.83	0.0001
	\$2.00	3.93	1.41	5.90	1.21	38.63	0.0001
	ALL	4.04	1.37	6.20	1.01	131.21	0.0001
Overall quality	Envelope	2.62	1.16	6.07	0.88	254.00	0.0001
	\$2.00	2.63	1.10	5.68	1.16	120.91	0.0001
	ALL	2.63	1.13	5.89	1.04	370.63	0.0001
Overall mean	Envelope	3.01	1.00	6.18	0.73	294.83	0.0001
	\$2.00	3.00	1.01	5.72	1.06	117.23	0.0001
	ALL	3.01	1.00	5.96	0.92	387.84	0.0001

Note. H₀ for ANOVAs: Mean (High) = Mean (Low); df = (1,91), (1,67), and (1,159) for envelope, \$2.00, and ALL, respectively.

bias (as opposed to other types of memory biases), hindsight expectations have to differ systematically from foresight expectations in the direction of perceived performance. In the next section, we show that this is consistently so only in the envelope choice condition.

Hindsight vs foresight expectations. For each subject and for all attributes, we computed difference scores between foresight and hindsight expectations. These difference scores were then subjected to a three-way (manipulated expectation by manipulated performance by choice) multivariate analysis of variance. The hypothesis of no effect of manipulated performance was rejected [$F(7,148) = 3.387, p < .0022$], as was the hypothesis of no performance by choice interaction [$F(7,148) = 3.936, p < .0005$]. No other effects were significant. Given these results, we performed separate multivariate analyses of variance on the difference scores for each combination of manipulated performance and choice, collapsing over both levels of manipulated expectation. *F* values in Table 7 are for the null hypothesis that the vectors of difference scores across all attributes are uniformly zero. The results of

the corresponding univariate analyses are reported in Table 6. A superscript in the low manipulated performance column indicates that the mean difference score is significantly less than zero at the .05 (*a*) or .10 (*b*) level. Similarly, a superscript in the high manipulated performance column indicates that the difference score is significantly greater than zero at the 0.05 (*a*) or .10 (*b*) level.

In the low manipulated performance, envelope choice conditions, hindsight expectations are significantly lower than foresight expectations. Similarly, in the high manipulated performance, envelope choice conditions, hindsight expectations are significantly higher than foresight expectations (see Table 7). These inequalities are true for all attributes and the differences are almost always significant (see Table 6). Given the results for disconfirmation, these findings show clear evidence of hindsight bias for the envelope choice group. The same cannot be said for the \$2.00 choice group. As shown in Table 7, hindsight expectations tend to be lower than foresight expectations in the low manipulated performance condition, but there is no evidence of hindsight bias in the high manipulated performance condition. In fact, as indicated in

TABLE 5
Perceived Disconfirmation by Manipulated Expectation, Manipulated Performance, and Choice

Attribute	Manipulated expectation	Choice			
		Envelope		\$2.00	
		Manipulated performance		Manipulated performance	
		Low	High	Low	High
Print quality	Low	3.16 ^a	5.15 ^a	3.44 ^a	5.61 ^a
	High	1.93 ^a	4.68 ^a	2.42 ^a	4.56 ^a
Paper quality	Low	3.53 ^b	5.20 ^a	3.94	5.61 ^a
	High	2.13 ^a	4.91 ^a	2.75 ^a	4.75 ^a
Letter clarity	Low	3.79	5.25 ^a	3.94	5.70 ^a
	High	2.40 ^a	4.55 ^a	2.75 ^a	4.56 ^a
Envelope style	Low	3.00 ^a	4.85 ^a	3.33 ^b	5.39 ^a
	High	1.90 ^a	4.77 ^a	3.00 ^a	4.25
Ink quality	Low	3.11 ^a	5.25 ^a	3.61	5.35 ^a
	High	1.90 ^a	4.55 ^a	2.42 ^a	4.44 ^a
Letter legibility	Low	3.68	5.10 ^a	4.00	5.35 ^a
	High	2.87 ^a	4.68 ^a	3.08 ^a	4.56 ^a
Overall quality	Low	3.11 ^a	5.70 ^a	3.22 ^a	5.43 ^a
	High	1.77 ^a	4.91 ^a	2.50 ^a	4.94 ^a
Overall mean	Low	3.34 ^a	5.21 ^a	3.64 ^a	5.49 ^a
	High	2.13 ^a	4.72 ^a	2.70 ^a	4.58 ^a

Note. Superscripts indicate that the mean is different from 4 (the midpoint of the scale labeled "it is just as I expected") and thus that disconfirmation (either positive or negative) occurred, with ^a $p < .05$ and ^b $p < .10$.

Table 6 the hindsight expectations of the \$2.00 choice group were frequently lower than foresight expectations in the high manipulated performance condition, even though subjects in this condition experienced significant positive disconfirmation.

Recall that we found that subjects in the low manipulated performance condition reported negative disconfirmation regardless of expectation manipulation and in both choice groups. Similarly, we found that subjects in the high manipulated performance condition reported positive disconfirmation regardless of expectation manipulation again in both choice groups. This means that hindsight expectations should be biased upward (relative to foresight expectations) in the high manipulated performance condition and downward in the low manipulated performance condition. The envelope choice group consistently exhibited this pattern, while the \$2.00 choice group did not. Although the hindsight expectations of subjects in the \$2.00 condition also deviated from foresight expectations, the shift was generally downward regardless of the nature of the disconfirmation. We will speculate in the discussion section about what these findings may indicate.

Hindsight Bias, Choice, and the Expectancy-Disconfirmation Model of Consumer Satisfaction

In this section, the effects of hindsight bias on perceived disconfirmation and satisfaction and the moder-

ating effects of choice on the pattern of relationships in the expectancy-disconfirmation model of satisfaction are analyzed. Our goal is to show that perceived disconfirmation and satisfaction are better predicted by considering hindsight rather than foresight expectations, particularly in the envelope choice condition. We use regression analysis to test the nonnested hypothesis (Cox, 1961) that a better fit is achieved with hindsight rather than foresight expectations. Specifically, we employ the Davidson and McKinnon (1981) modification of the artificial nesting approach (*J* test) to test this hypothesis.

To simplify the analysis, all multiple-item measures were averaged and the resulting composites were used in all subsequent analyses. This is justified because reliability analyses showed that all attribute-specific measures of foresight and hindsight expectations, perceived performance, perceived disconfirmation, and satisfaction achieved very high levels of internal consistency, as indicated by coefficient alphas greater than 0.9.

Perceived disconfirmation. The top half of Table 8 presents standardized regression coefficients and *t* values for the regressions of perceived disconfirmation on perceived performance and either foresight expectations or hindsight expectations, by choice condition. As hypothesized, replacing foresight expectations with hindsight expectations significantly improved the fit of the model in the envelope choice group from an ad-

TABLE 6
Mean Hindsight and Foresight Expectations by Manipulated Expectation, Manipulated Performance, and Choice

Attribute	Expectation manipulation	Choice					
		Foresight	Envelope		Foresight	\$2.00	
			Hindsight by manipulated performance			Hindsight by manipulated performance	
			Low	High		Low	High
Print quality	Low	4.10	3.80 ^a	4.30 ^a	3.71	3.22 ^a	3.74
	High	5.25	5.00 ^a	5.57 ^a	4.82	4.83	4.94 ^a
Paper quality	Low	4.58	4.50 ^a	4.75 ^a	4.24	4.11 ^a	4.13
	High	4.83	4.82	5.04 ^a	4.71	4.75	4.75
Letter clarity	Low	4.45	3.95 ^b	4.70 ^a	3.76	3.22 ^a	3.78
	High	5.57	5.23 ^a	5.65 ^a	5.18	4.67 ^a	4.94
Envelope style	Low	4.73	4.65 ^a	4.95 ^a	4.32	4.33	4.09
	High	5.13	4.80 ^a	5.15	4.79	4.25 ^a	5.00 ^a
Ink quality	Low	4.40	3.65 ^a	4.60 ^a	3.95	3.56 ^a	3.78
	High	5.26	5.20 ^b	5.39 ^a	4.75	4.50 ^a	4.88 ^a
Letter legibility	Low	4.68	4.10 ^a	4.75 ^b	4.22	3.33 ^a	3.87
	High	5.77	5.13 ^a	5.78	5.36	4.83 ^a	4.88
Overall quality	Low	4.45	4.05 ^a	4.70 ^a	3.88	3.39 ^a	4.13 ^a
	High	5.25	5.07 ^a	5.26	4.61	4.58	4.88 ^a
Overall mean	Low	4.48	4.10 ^a	4.68 ^a	4.01	3.60 ^a	3.93
	High	5.29	5.04 ^a	5.37 ^a	4.89	4.63 ^a	4.89

Note. A superscript in the low performance column indicates that the mean difference score (hindsight-foresight) is significantly less than zero at the .05 (a) or .10 (b) level. Similarly, a superscript in the high performance column indicates that the difference score is significantly greater than zero at the 0.05 (a) or .10 (b) level.

justed R² value of 0.69 to 0.79. This improvement is statistically significant using Davidson and McKinnon's (1981) *J* test ($Z = 1.89, p < .029$, one-sided). In contrast, foresight and hindsight expectations were equally adequate to predict perceived disconfirmation in the \$2.00 choice group. The improvement from an adjusted R² value of 0.75 to 0.76 was not significant.

Satisfaction. The bottom half of Table 8 presents standardized regression coefficients and *t* values for the regression of satisfaction on perceived performance, perceived disconfirmation, and either foresight expectations or hindsight expectations, again by choice condition. As in the case of perceived disconfirmation and consistent with our hypothesis, replacing foresight with hindsight expectations significantly improved the fit of the model in the envelope choice group from an adjusted R² value of 0.84 to 0.91. This improvement is statistically significant using the *J* test ($Z = 1.69, p < .045$, one-sided). In contrast, replacing hindsight with foresight expectations did not improve the fit of the model in the \$2.00 choice group. In fact, expectations (either foresight or hindsight) and perceived disconfirmation did not contribute to the fit of the model in the \$2.00 choice group, and perceived performance was sufficient to predict satisfaction. Although this pattern of results was not expected a priori (i.e., that expectations and disconfirmation would not be related signif-

icantly to satisfaction in the \$2.00 condition), the findings are nonetheless consistent with our hypothesis that a provision for hindsight bias only has to be made when a consumer has chosen the product.

Because different variables were found to determine satisfaction in the envelope and \$2.00 choice conditions, we explicitly tested whether the effects of the various antecedents of satisfaction differed by choice condition. A regression analysis with choice as the moderating variable showed that choice interacted with perceived performance [$t(152) = -2.62, p < .005$], hindsight expectations [$t(152) = 2.26, p < .05$], and marginally with disconfirmation [$t(152) = 1.83, p < .07$] when hindsight expectations were used as the measure of expectation. No significant moderating effects of

TABLE 7
Multivariate Analysis of Variance Results for Difference Scores (Hindsight-Foresight) by Manipulated Performance and Choice

Manipulated performance	Choice	<i>F</i>	<i>df</i>	<i>Pr > F</i>
Low	Envelope	3.285	(3,35)	0.032
	\$2.00	3.171	(3,16)	0.053
High	Envelope	4.467	(3,28)	0.011
	\$2.00	1.197	(3,25)	0.331

TABLE 8

Regression Analyses for Perceived Disconfirmation and Satisfaction by Choice (Standardized Regression Coefficients and *t* Values in Parentheses)

Dependent variable	Choice	Perceived performance	Foresight expectation	Hindsight expectation	Perceived disconfirmation	R2 [Adj]
Perceived disconfirmation	Envelope	0.86 (15.76 ^a)	-0.31 (-5.67 ^a)	-0.39 (-7.79 ^a)		0.70 ^a [0.69]
		0.90 (18.10 ^a)				0.79 ^a [0.79]
	\$2.00	0.80 (11.25 ^a)	-0.45 (-6.28 ^a)	-0.54 (-8.80 ^a)		0.76 ^a [0.75]
		0.84 (13.68 ^a)				0.77 ^a [0.76]
Satisfaction	Envelope	0.79 (11.60 ^a)	0.00 (0.08)	0.14 (3.29 ^a)	0.19 (2.80 ^a)	0.85 ^a [0.84]
		0.63 (8.78 ^a)				0.91 ^a [0.91]
	\$2.00	0.86 (14.57 ^a)	0.06 (1.44)	0.06 (1.27)	0.12 (1.38)	0.92 ^a [0.92]
		0.85 (12.35 ^a)				0.92 ^a [0.92]

^a $p < .05$

choice emerged when foresight expectations were included in the model.

DISCUSSION

This study shows that hindsight bias has important implications for the expectancy–disconfirmation model of satisfaction and thus attests to the practical significance of the phenomenon. As expected, experience with the product distorted people's recall of their foresight expectations in the direction of perceived product performance, but consistently so only if a person had originally chosen the product over an equivalent amount of money. It is important to emphasize that unlike studies that investigate the effects of choice per se (e.g., judgment vs choice), the important variable to consider with regard to hindsight bias is the exact nature of the choice. Both the envelope and the \$2.00 groups in our study exercised choice, but it was the alternative that was chosen which affected the magnitude of the hindsight bias.

We should also note that performance affected hindsight expectations in both choice groups in the direction predicted by the hindsight bias phenomenon. That is, in both choice groups mean hindsight expectations were generally higher in the high manipulated performance condition than in the low manipulated performance condition. Ignoring foresight expectations, we might have concluded that both choice groups exhibited hindsight bias. However, when foresight expectations, hindsight expectations, and performance are compared simultaneously, a clear pattern of hindsight bias emerges in the envelope choice group, and no consistent evidence of hindsight bias is apparent in the \$2.00 choice group.

While hindsight bias is typically described as the "I-knew-it-all-along" phenomenon, other interpretations can be given to the memory bias exhibited by the \$2.00

choice group (cf. Mark & Mellor, 1994). Note that mean hindsight expectations in this group were at most as high as foresight expectations regardless of performance level. Subjects in this group might have used the nature of their choice (i.e., not to choose the envelope) as a cue for reconstructing their expectations, reasoning that "I didn't choose the envelope because I didn't expect it to be of high quality," in line with Bem's (1972) self-perception theory in which people infer their attitudes from their behavior. This type of reasoning, combined with the usual hindsight bias, might explain the pattern of results in the \$2.00 choice group. Of course this raises the question why such an effect did not take place (or at least was not large enough to eliminate hindsight bias) in the envelope choice group? Here we can only speculate that the process of using one's own behavior as a retrieval cue in reconstructing foresight expectations takes place only when other cues are weak or ambiguous (cf. Chaiken & Baldwin, 1981). For subjects in the envelope choice group actual performance of the product may have been more salient than their choice, whereas for subjects in the \$2.00 choice group choice was more salient than perceived performance, explaining the above findings. Support for our conjecture can be found in Svenson and Benthorn's (1992) findings that postdecision changes in the overall attractiveness of decision alternatives were highly selective in that only the nonchosen alternatives were affected (i.e., the envelope in the \$2.00 choice group).

In addition to pointing to the importance of considering hindsight effects in satisfaction formation, our study also shows how the expectancy–disconfirmation paradigm of satisfaction has to be modified in order to take into account hindsight bias. If experience with a product distorts consumers' recall of their foresight expectations, assessments of perceived disconfirmation should be based on a comparison between perceived performance and hindsight expectations, *not* a compar-

ison between perceived performance and foresight expectations, as previous research has generally implicitly assumed. Similarly, satisfaction should primarily be a function of hindsight, rather than foresight, expectations because only the former are available at the time the judgment is made (see Schul, 1992, for a related argument).

The effects of choosing the envelope on the incidence of hindsight bias and its moderating effects on the pattern of relationships in the expectancy-disconfirmation model raise the question of what psychological process underlies these findings. Selection of the product in the context of our study is similar to a decision to purchase a product based on one's expectations regarding the product's likely performance, and we would argue that the commitment to the product resulting from such a decision should lead to greater personal relevance of the task of evaluating the product and judging satisfaction. The finding that consistent hindsight bias occurred primarily in the envelope choice condition, in which the task was self-relevant to subjects, may thus be interpreted as evidence for the notion that motivational factors are implicated in the production of the bias. We have no direct evidence on this point, however, and future research will have to investigate the underlying process in more detail.⁸

Neither foresight nor hindsight expectations, nor perceived disconfirmation, were found to be significant determinants of satisfaction in the \$2.00 choice group (see Churchill & Surprenant, 1982, for similar results). Although our hypothesis that no special provision for hindsight bias is needed in this case turns out to be correct, the reason is different from what we hypothesized. The results indicate that, rather than foresight and hindsight expectations being equally good predictors of satisfaction, neither expectations nor disconfirmation are needed to explain satisfaction in this group. One explanation for this finding might be that subjects in the \$2.00 choice group were not motivated to engage in the cognitive activities necessary to restore their psychological equilibrium when an experience was perceived to be different from preexperience expectations

(cf. Tse *et al.*, 1990). A second possibility is that subjects in this group did not consider preexperience expectations to be relevant for judging their satisfaction with the product. Further research is needed to determine the exact nature of this effect. Note, however, that one cannot explain the lack of an effect of expectations on satisfaction by hypothesizing that subjects in this group were not motivated to retrieve their original expectations, because subjects in all conditions were explicitly instructed to try to recall their foresight expectations as accurately as possible.

As in previous research, the magnitude of the hindsight bias was not large. In the context of our study, this is not surprising. First, we used a within-subjects design, and there is evidence that significantly larger effects can be found in between-subjects designs (Campbell & Tesser, 1983). Second, the process of inferring expected performance based on information about advertising for the product might have demanded a high level of cognitive effort, reducing the expected strength of hindsight bias (Creyer & Ross, 1993). Third, the formation of foresight expectations and subjects' subsequent attempt to retrieve them were separated by less than an hour, and subjects were specifically reminded to recall their prior expectations as accurately as possible. Yet, despite the numerically small magnitude of the bias, this study shows that hindsight bias can affect other variables such as disconfirmation and satisfaction.

Choice, by its very nature, was not a manipulated factor in our experiment. Rather, subjects' assignment to the two choice conditions was based on self-selection. We included this factor in the design to simulate consumers' decisions to purchase or not purchase a product based on their expectations regarding the product's likely performance. Because of the dependence of choice on expectations, the two factors are not independent of each other. Indeed, 57% of subjects in the envelope choice group came from the high expectation condition, whereas only 40% of subjects in the \$2.00 choice group were from the high expectation condition. This difference is also reflected in the mean foresight expectations reported in Table 3. However, as shown in the section on manipulation checks, mean foresight expectations were not significantly different between the two choice groups once differences due to the expectation manipulation were taken into account and, most importantly, the interaction between the expectation manipulation and choice was nonsignificant. Thus, choice was not significantly confounded with the expectation manipulation in our study.

It could be argued that the fact that perceived disconfirmation and satisfaction are better predicted by hindsight than by foresight expectations is not surprising since hindsight expectations, perceived disconfir-

⁸ As pointed out by an anonymous reviewer, in the literature on postdecisional attitudinal effects of cognitive dissonance there is an experimental paradigm that is similar to the one used in this study. In this paradigm (e.g., Brehm, 1956), subjects are asked to make a choice between two alternatives that initially were rated similarly. After their decision, they are presented with both the chosen and the nonchosen alternative and asked to reevaluate both. The usual result is that the evaluation of the chosen alternative increases, while the evaluation of the nonchosen alternative decreases. This result is usually attributed to postdecisional selectivity biases and attempts by the decision maker to bolster his or her choice (see Eagly and Chaiken, 1993, for a discussion). The motivational nature of this explanation is consistent with the present arguments.

mation, and satisfaction were assessed in close proximity, whereas about 30 min separated the solicitation of foresight expectations from the assessment of the other measures. That is, disconfirmation and satisfaction ratings could simply reflect the impact of the information that is most accessible in memory at the time of judgment, usually the information that has been used most recently (cf. Feldman & Lynch, 1988; Schwarz & Strack, 1991). There are three problems with this argument. First, it does not account for the fact that hindsight expectations were better predictors of disconfirmation and satisfaction only in the envelope choice group. Second, the fact that expectations and disconfirmation did not influence satisfaction in the \$2.00 choice group shows that making these constructs accessible in people's mind by asking questions about them does not necessarily mean that they will be incorporated into judgments of satisfaction. Third, the point we wanted to make was not that expectations naturally influence satisfaction, either directly or via assessment of disconfirmation, but that if they do, the relevant standard is people's hindsight expectations, not their foresight expectations. There is no reason to believe that unbiased foresight expectations are available if hindsight expectations are not solicited. But if experience with a product distorts consumers' memory of their foresight expectations, then prepurchase expectations cannot possibly influence disconfirmation and satisfaction.

In conclusion, our findings attest to the practical significance of the phenomenon of hindsight bias by showing its relevance to an important area of research, the formation of satisfaction on the basis of preconsumption expectations and the degree to which they are confirmed or disconfirmed by actual experience with the product. Our study indicates that the expectancy-disconfirmation model of satisfaction has to be modified to take into account hindsight expectations and it also suggests that whether or not a consumer chooses the product determines whether a special provision for hindsight bias is needed.

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