

# Comparison Opportunity and Judgment Revision

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**Prior evaluations are frequently challenged and need to be revised. We propose that an important determinant of such revisions is the degree to which the challenge provides an opportunity to compare the target against a competitor. Whenever a challenge offers an opportunity, the information contained in the challenge will carry a disproportionate weight in the revised judgments. We call this proposition the *comparison–revision hypothesis*. In Experiments 1–3, we manipulated comparison opportunity by varying the format of the challenge and examined the weights assigned to different inputs in the revised judgments. The results indicate that prior information about the target receives a greater weight under a noncomparative challenge (which provides information only about the target) than under a comparative challenge (which compares the target with a competitor). In contrast, information presented in the challenge**

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**receives a greater weight under a comparative challenge than under a noncomparative challenge. Interestingly, when presented in a comparative format, the information contained in the challenge received a relatively disproportionate weight even when the attributes presented in the challenge were less important than those on which the prior target evaluations were based. Results from Experiment 4 suggest that, under certain conditions, even a noncomparative challenge from a superior competitor can provide strong comparison opportunity and thus cause greater revisions in the prior evaluations of the target. Specifically, a greater elaboration of the initial target information and a high degree of commensurability between the target and competitor information jointly promote comparison opportunity and thus cause greater revisions of the prior target judgments. Our findings offer important extensions to previous research on the effects of amount and elaboration of prior target information on subsequent judgment revision.** © 1999 Academic Press

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Decision making often calls for the repeated evaluation of targets. Because the information available across judgment episodes may have different evaluative implications, prior evaluations often need to be revised. For instance, an employer who had a positive impression upon reading a job applicant's resume may have a different opinion after interviewing this applicant. Similarly, a consumer who initially liked a new product after seeing its promotional material may revisit this opinion upon an unfavorable review from *Consumer Reports*. This article investigates how revision of a prior evaluation depends on the nature of challenging information.

The amount of judgment revision that a challenge causes clearly depends on the scale value of the challenging information relative to the initial evaluation (Hogarth & Einhorn, 1992; Johar, Jedidi, & Jacoby, 1997). Prior research suggests that the amount of judgment revision is also a function of characteristics of the information underlying the prior evaluation. In particular, evaluative judgments that are initially based on a large amount of information and, independent of the amount, on information that has been well elaborated should be *less* amenable (i.e., more resistant) to subsequent revision (Anderson, 1981; Eagly & Chaiken, 1993; Hogarth & Einhorn, 1992; Petty, Haugtvedt, & Smith, 1995; Wood, 1982).

This article examines an additional determinant of judgment revision: whether the challenging information provides an opportunity for comparing the target with a competitor on one or more attributes. We propose that, everything else being equal, challenges that facilitate comparisons of the target against its competitors induce a greater judgment revision in the direction implied by these comparisons. The opportunity for comparison triggered by certain challenges may mitigate—and sometimes reverse—the previously documented negative relationship between the amount and elaboration of prior information and the degree of subsequent revision. We investigate the interplay

between comparison opportunity and prior information across four experiments covering both consumer judgments and personnel-selection judgments.

### PRIOR INFORMATION AND JUDGMENT INERTIA

Previous investigations have linked judgment revision to the information upon which the *initial* evaluation has been formed. Research drawing on information integration theory stresses that in sequential judgments, the weight attached to a prior judgment—as opposed to new information—is a positive function of the *amount* of information underlying the prior judgment (Anderson, 1981; Hogarth & Einhorn, 1992). As a result, judgments that are based on a large amount of information tend to undergo lesser subsequent revision.

Similarly, some research in the attitude literature suggests that initial attitudes that are based on a large amount of relevant, proattitudinal information tend to be more resistant to counterattitudinal messages (Haugtvedt, Schumann, Schneier, & Warren, 1994; Wood, 1982). Specifically, if a person possesses a large amount of attitude-relevant information in memory at the time of encountering a challenge, he or she has a greater arsenal of arguments to draw upon to defend his or her prior attitudes (Haugtvedt et al., 1994; Wood, 1982). Other research suggests that, even when the amount of initial information is held constant, conditions that enhance sheer *elaboration* of the initial information also increase attitudinal resistance (Haugtvedt & Wegener, 1994; Petty & Cacioppo, 1986; Petty et al., 1995). Attitudes that are based on well-elaborated information tend to be more internally consistent and thus held with greater confidence (Eagly & Chaiken, 1995; Petty et al., 1995).

Although both amount and elaboration of prior information should generally decrease subsequent revision, we propose that judgment revision will also be determined by whether the challenge facilitates comparisons between the target and its competitors. As explained below, under strong opportunity for comparisons, the negative relationship between amount and elaboration of prior information and judgment revision observed in prior research may be attenuated or even reversed.

### THE ROLE OF COMPARISON OPPORTUNITY IN JUDGMENT REVISION

#### *Comparison Opportunity*

Challenges of equal negativity (i.e., scale value) may vary in the degree to which they facilitate comparisons between the target and potential competitors. Some challenges allow for easy comparisons between the target and potential competitors along judgment-relevant dimensions; other challenges do not. Prior research that investigated the effects of the amount of attitude relevant information available (Haugtvedt et al., 1994; Wood, 1982) and elaboration (Haugtvedt & Wegener, 1994) considered only one type of challenge—counterattitudinal information about the target with no reference to any competitor. Such challenges, by their very nature, offer very little opportunity to

compare the target with any other object. Challenges provide strong opportunity for competitive comparisons whenever two conditions are met: (1) the judge has *joint access* to both target and competitor information on judgment-relevant dimensions and (2) the two sets of information are *commensurable*.

The first condition—joint access to target and competitor information—can be met in several ways. First, the challenge may explicitly provide information about both the target and its competitors. That is, both target and competitor information would be *externally* available for judgment updating. This is the case, for instance, in comparative advertisements and in many equity-analysis reports. Second, the challenge may only provide information only about the competitor, but the judge can pit this information against information about the target that is highly available in memory. The competitor information would be externally available during judgment updating, whereas the target information would be internally available. For instance, consumers may compare newly revealed information about a superior competitor brand with their recollection of the target brand's attributes.

The second condition—commensurability of the target and competitor information—refers to the degree to which *side-by-side* examination of the target and competitor information allows the detection of superiority relations among the alternatives in terms of one or more attributes. Commensurability therefore depends on whether the alternatives are described along common as opposed to unique attributes (Slovic & MacPhillamy, 1974). It also depends on the format of the supplied information. Certain information formats may hinder comparisons even though the alternatives are described along common dimensions. For instance, an advertisement for Car X that may emphasize the benefit of high gas mileage by specifying the number of miles per gallon (mpg) that the car offers, whereas another advertisement for Car Y may promote the same benefit without providing a specific mpg value ("Excellent MPG"). Although both cars are described along a common dimension, commensurability would be low because side-by-side comparison of the two claims would not unambiguously reveal the superiority of one car over the other.

Therefore, commensurability is the sole determinant of comparison opportunity in stimulus-based decisions, where information about all alternatives is readily available at the time of judgment. However, in most judgment revision situations, memory plays a significant role because the judge needs to recall information that was learned previously (Alba, Hutchinson, & Lynch, 1991; Weber, Goldstein, & Barlas, 1995). In such situations, along with commensurability of the target and competitor attributes, an accurate recall of the values of the target's attributes is necessary for a competitor challenge to promote comparison.

#### *The Comparison–Revision Hypothesis*

We propose that the challenges that foster comparisons between a target and potential competitors increase people's tendency to revise their judgments of the target. Whenever such comparisons are made—whether explicitly or

implicitly—their evaluative implications (e.g., “Candidate A’s interview was much poorer than Candidate B’s”) will carry a disproportionate weight in the revised judgment of the target. We call this principle the *comparison–revision hypothesis*.

Various streams of research are consistent with the hypothesis that information that invites competitive comparisons will receive a disproportionate weight in judgment revisions. First, research on comparative advertising suggests that comparative messages receive greater attention than their noncomparative counterparts (Pechmann & Stewart, 1990). Information that invites comparisons may thus be more salient. Second, some attribute values (e.g., “Dictionary A has 10,000 entries”) may be hard to evaluate without a reference point. An opportunity to compare across alternatives (e.g., “Dictionary B has 20,000 entries”) increases these attributes’ “evaluability” and therefore their weight in judgments and choices (Hsee, 1996; Slovic & MacPhillamy, 1974). In general, competitive information increases the diagnosticity of attributes by hinting to the range of possible values of these attributes or by providing a “local context” (e.g., Goldstein, 1990; Mellers & Cooke, 1996; Pham, 1996). Third, competitive comparisons offer compelling reference points that may deviate significantly from the reference points people originally used in their initial evaluations. The change of reference points can be a potent trigger of judgment revisions (Hsee & Leclerc, 1998; Tversky & Shafir, 1992). Finally, recent research suggests that in judgment and choice, people have a natural tendency to assess the mapping of features across alternatives. Information that is conducive of this mapping (called structural alignment) should receive greater weight (Markman & Medin, 1995).

#### *Predictions and Research Agenda*

In summary, we argue that the extent of judgment revision that follows a challenge depends not only on the characteristics of prior evaluation such as amount and elaboration of the prior information, but also on whether the challenge promotes an opportunity for comparison between the target and its potential competitors. A strong opportunity for comparison exists whenever both competitor and target information is accessible at the time of the challenge and this information is commensurable. Whenever comparisons between the target and its competitors are encouraged, these comparisons will carry a disproportionate weight in the revised judgments.

We tested the comparison–revision hypothesis in four experiments. The first experiment shows that challenges that explicitly invite a comparison between the target and a competitor decrease people’s reliance on prior target information in their revised judgments. This finding qualifies the previously documented negative relationship between the amount of prior information and the extent of revision. We attempted a conservative test of this prediction by using a challenge that provides information on less important dimensions than those that were used in the initial description of the target. The second experiment shows that challenges that explicitly invite comparisons between

the target and a competitor are indeed weighted more heavily in judgment revision than challenges that do not invite such comparisons. The third experiment suggests that the findings of Experiment 1, which focus on consumer decision making, generalize to an employee selection decision. The fourth experiment shows that challenges that *implicitly* invite comparisons by supplying superior competitor information may also prompt significant revision provided that (1) the competitor information is commensurable with the target information that was previously learned and (2) people have adequate memory for the prior target information. This experiment also shows that the previously documented negative relationship between elaboration of prior information and subsequent judgment revision (e.g., Haugtvedt & Wegener, 1994) can be reversed under conditions that enhance opportunity for comparison.

### EXPERIMENT 1

Prior research has shown that initial learning of a high amount of attitude-relevant and consistent target information and availability of such information at the time of revision decrease subsequent judgment revision upon challenge (Haugtvedt et al., 1994; Wood, 1982). This experiment tests the prediction that this relationship is moderated by opportunity for comparison. The format of challenge—a comparative format in which the target is compared to a competitor on a set of attributes or a noncomparative format in which counterattitudinal information is provided about the target but no competitor is mentioned—served as the manipulation of opportunity for comparison. As explained earlier, comparative challenges will increase the weight of the information contained in the challenges and decrease the weight of the prior target information even when the challenge consists of less important claims than those that constituted the prior target information. A corollary prediction is that judgment revision will depend on memory for the prior target information under a noncomparative challenge (providing little opportunity for comparison), but not under a comparative challenge (providing high opportunity for comparison).

#### *Method*

*Overview.* The stimuli were reconstructed on the basis of information contained in two published articles (Haugtvedt et al., 1994, and Schumann, Petty, & Clemons, 1990). While the target brand name and several product claims were adopted from these articles, we constructed the print ads and the embedding materials after a series of pretests. We also adopted the general procedure followed by Haugtvedt et al. (1994). Participants in this experiment formed initial evaluations of a target brand based on either a high or low amount of positive information, i.e., product claims. A pretest had determined that the selected claims were homogenous in terms of importance (see Appendix A). Participants were subsequently exposed to information that challenged the target. To manipulate the opportunity for comparison, two types of challenge were used. In the noncomparative condition, the challenge consisted of negative

information about the target that did not make any comparative reference to a competitor. In the comparative condition, the challenge consisted of the same negative information about the target phrased in a comparative format. As explained below, another pretest ensured that the two types of challenge were equally negative (i.e., had equivalent scale values).

*Participants, design, and procedure.* Participants in this study, as well as in the other studies, were undergraduate business students who received course credits in exchange for their participation. A total of 102 participants were randomly assigned to one of four conditions of a 2 (amount of information)  $\times$  2 (type of challenge) between-subjects design. Data from four participants who did not return for the second session were excluded. The experiment was administered in two sessions separated by 2 days. The amount of information was manipulated in the first session, and the comparison climate was manipulated in the second session.

Participants were told that they would be evaluating a TV cartoon program. Because the project was still in its early stages, the pilot test would be conducted with a print version of the program's storyboard presented in a booklet. Participants were also told that in order to simulate the experience of watching TV, there would be ads scattered at intervals through the booklet. Each booklet consisted of a series of panels taken from a comic book among which three pods of advertisements were inserted. Each pod contained two advertisements, one for the target product (a pen called Omega) and one for a filler product (a supermarket brand). After reading the booklet, participants completed a questionnaire assessing initial evaluations of the target brand and the filler brand. The questionnaire also measured participants' confidence in their evaluation.

When participants returned after 2 days, they read a *Consumer Reports*-type document (the challenge) which conveyed negative information about the target brand and neutral information about the filler brand. After reading this document, participants were administered another questionnaire which again measured their (postchallenge) evaluations of the target and filler brands and the perceived negativity of the information contained in the challenge. After obtaining the postchallenge evaluations of the target, we assessed subjects' memory for the target brand information presented during the first session.

*Amount of information.* In the high-information condition, participants were exposed to a total of nine claims (see Appendix A) distributed across three executions of the target ad. In the low-information condition, participants were exposed to only three claims (a subset of the nine claims provided in the high-information condition) which appeared in the third execution (the first two executions contained the brand name and the spokesperson). These initial claims in both conditions were in a noncomparative format.

*Type of challenge.* Participants in the noncomparative challenge condition received information that portrayed the target brand in a negative light. The report stated, for instance, that "Packages in which the Omega 3 pens were

shipped were difficult to open if the instructions were not carefully followed.” In the comparative challenge condition, the same information was presented by comparing the target brand with a competitor brand called Elegance. For instance, the report stated that “Compared to those of the Elegance, the packages in which the Omega 3 pens were shipped were more difficult to open if the instructions were not carefully followed.”

It is important to note that the noncomparative and comparative challenges were calibrated in such a way that the challenges would portray the target brand in an equally negative light. In a pretest ( $n = 28$ ), two groups of participants received either the comparative or the noncomparative version of the challenging information. They then evaluated the target pen on a scale of 1 (*bad*) to 9 (*good*) only on the basis of information contained in the challenge. There was no difference between the ratings of the two groups ( $M_{\text{noncomparative}} = 2.81$  and  $M_{\text{comparative}} = 2.67$ ,  $F < 1$ ). This assumption was also validated by a confounding check discussed below<sup>1</sup>. Further, in order to have a conservative test of the effects of comparison climate, based on another pretest ( $n = 63$ ), we selected challenging claims that were perceived to be less important than those contained in the initial information (see Appendix A for the claims and their importance ratings).<sup>2</sup>

*Dependent variables.* In both sessions, evaluative judgment of the target brand was measured on two 9-scales anchored by *negative–positive* and *unfavorable–favorable* ( $r = .84$ ). Confidence in evaluation was measured on a 9-point scale anchored by *not at all confident* and *extremely confident*. Perceived negativity of the challenge was also measured on a 9-point scale (*not at all negative* to *extremely negative*). In order to examine the underlying processes, memory for the target brand information (presented during the first session) was measured through free recall. Each recall item was coded as accurate/inaccurate by two judges who were blind to the objectives of the experiment and to the experimental manipulations (agreement = 90%; disagreements resolved by one of the authors).

#### *Plan of Analysis*

In the present experiment as well as in the subsequent experiments, the main dependent variables were (1) the proportion of participants who revised their judgments, i.e., the probability of revision, and (2) the amount of change from the prior evaluations (prior evaluation to postchallenge evaluation). In each experiment, we submitted the former to a binary logit analysis and the

<sup>1</sup> It remains possible that these pretests may have lacked the power to uncover a significant difference in negativity between the two challenge formats. Note, however, that the confounding check in Experiment 1 had a power of approximately 0.90 to detect a “medium effect” of  $F = 0.25$  (Cohen, 1988) at  $\alpha = 0.05$ . The observed  $F$  was approximately 0.057, and this suggests that there was very little difference between the two formats of challenge in terms of perceived negativity.

<sup>2</sup> The means of perceived importance of claims used in the initial (high amount of) information and the challenge were 8.83 and 7.76 respectively [ $F(1, 61) = 21.04$ ,  $p < .01$ ]. Thus, the challenge claims were clearly less important than those used in the initial information.



latter to a between-subjects ANOVA. In some experiments, the proportion of participants who revised their judgments was 100% in at least one experimental cell. In such cases, we use, as an alternative dependent variable, the proportion of participants who revised their judgments by at least 1 scale unit.

### Results

*Manipulation and confounding checks.* Another pretest ( $n = 30$ ) ensured that the low and high information groups were equal in terms of judgment persistence when they encountered no challenge (amount of change:  $M_{\text{low}} = .15$  and  $M_{\text{high}} = .19$ ;  $F < 1$ ). The two groups also did not differ in terms of proportion of participants who revised their judgments ( $\chi^2(1) < 1$ ). Participants in the main experiment were asked to rate the perceived negativity of the challenges. Consistent with pretest results, the comparative and noncomparative challenges did not differ in terms of perceived negativity ( $M_{\text{noncomparative}} = 3.68$  and  $M_{\text{comparative}} = 3.54$ ;  $F < 1$ ). Thus, the two types of challenge had equal scale values in terms of their evaluative implications for the target. The number of attributes recalled at Time 2 provides a check for the amount of information manipulation. An ANOVA testing the effects of amount of information, type of attack, and their interaction revealed only a main effect of amount of information,  $F(1, 94) = 18.67$ ,  $p < .001$ . As expected, participants in the high-information condition recalled more attributes ( $M = 1.21$ ) than those in the low-information condition ( $M = 0.48$ ).

*Confidence at Time 1.* Confidence in the initial judgment was greater in the high-information condition ( $M = 5.25$ ) than in the low-information condition ( $M = 4.62$ ;  $F(1, 96) = 3.88$ ,  $p < .05$ ). The initial evaluations thus appear to have greater strength in terms of confidence in the high-information condition than in the low-information condition. However, as reported below, the apparent strength of these initial evaluations did not necessarily predict the degree of revision across conditions.

*Likelihood of revision.* Table 1 presents the proportion of participants who

**TABLE 1**  
**Experimental 1 (Pen): Effects of Amount of Target Information and Format of Challenge**

Dependent measure	Noncomparative challenge		Comparative challenge		Pretest	
	Low info	High info	Low info	High info	Low info	High info
Initial judgment	5.24	5.54	5.04	5.73	5.30	5.15
Confidence at Time 1	4.39	5.13	4.81	5.38	**	**
Postchallenge judgment	3.33	4.69	3.76	3.94	5.15	4.96
Judgment revision	1.91	0.85	1.28	1.79	0.15	0.19
Proportion of judgment revision by more than 0 units	87%	58%	70%	83%	27%	20%
	(20/23)	(14/24)	(19/27)	(20/24)	(4/15)	(3/15)

\*\* Not measured.

revised their judgments for each experimental condition. These categorical data were submitted to a two-factor (amount of information  $\times$  type of challenge) binary logit analysis. The interaction between amount of information and comparison climate was significant (Wald  $\chi^2(1) = 5.15, p < .03$ ). A follow-up analysis by challenge type revealed that the amount of initial information significantly reduced the probability of revision under noncomparative challenge (Wald  $\chi^2(1) = 4.39, p < .04$ ) but not under comparative challenge (Wald  $\chi^2(1) = 1.16, p > .28$ ). Under comparative challenge, the probability of revision was high regardless of the amount of prior information.

*Judgment revision.* The difference between pre- and postchallenge judgments of the target brand (judgment revision) served as the key dependent variable. Judgment revisions were submitted to a two-way (amount of information  $\times$  type of challenge) between-subjects ANOVA (see Table 1 for evaluation and confidence means). The analysis revealed a significant two-way interaction [ $F(1, 94) = 5.33, p < .03$ ]. This interaction indicates that the relationship between the amount of information and judgment revision following the challenge depended on the type of challenge. The effect occurred in spite of the initial evaluation being higher in the nine-claims condition than in the three-claims condition [5.64 vs 5.14,  $F(1, 94) = 3.36, p < .07$ ]. Follow-up analyses revealed that the simple effect of amount of information was significant under noncomparative challenge [ $F(1, 94) = 5.71, p < .03$ ], indicating that (downward) judgment revisions were lower in the high-information condition ( $M = 0.85$ ) than in the low-information condition ( $M = 1.91$ ). This simple effect replicates previous results in the literature (e.g., Haugtvedt et al., 1994; Wood, 1982). However, the simple effect of the amount of information was not significant under comparative challenge [ $F(1, 94) = 1.19, p > .27$ ]. Consistent with our predictions, the amount of prior information did not appear to decrease subsequent judgment revision when the challenge was comparative. This effect occurs because the high opportunity for comparison provided by the challenge decreases the relative weight placed on prior information. A mediation analysis was conducted to document this interpretation.

*Mediation analysis.* If comparative challenges decrease the relative weight of previous information in judgment revision, the amount of prior target information that participants can recall at the time of the challenge should be a better predictor of judgment revision in the noncomparative challenge condition than in the comparative challenge condition. The mediation role of recall of target information was assessed as suggested by Baron and Kenny (1986). Within each challenge condition, judgment revisions were submitted to a one-way ANCOVA with claim recall as an additional predictor. In the noncomparative challenge condition, claim recall had a significant effect on (lack of) judgment revision [ $F(1, 93) = 6.20, p < .01$ ]. Moreover, inclusion of claim recall in the model renders the effect of amount of information nonsignificant ( $F < 1$ ). Thus, in the noncomparative challenge condition, recall of previous target information mediated the effects of amount of information on lack of judgment revision. In contrast, in the comparative challenge condition, claim recall did

not have any influence on judgment revision ( $F < 1$ ). Therefore, we conclude that in this condition, prior target information did not have much weight on the degree of judgment revision.

### *Discussion*

The results of Experiment 1 extend previous research by showing that the relationship between the amount of prior information and subsequent judgment revision depends on the opportunity for comparison induced by the challenge. We found that when the challenge did not foster comparisons, the amount of target information that participants had learned indeed decreased the probability and degree of judgment revision. This finding replicates previous results (e.g., Haugvedt et al., 1994; Wood, 1982). However, when the challenge explicitly promoted comparisons between the target and a competitor, the amount of target information that participants had learned did not affect the degree of judgment revision. This is noteworthy considering that not only did the challenge pertain to attributes that were less important than the previously learned target information, but also, in the high-initial-information condition, less challenge information than initial information was presented. Participants in the noncomparative condition were apparently more inclined to rely on the previously learned target information, whereas participants exposed to the comparative challenge were less inclined to do so. The mediation analysis of claim recall supports this interpretation.

The differential inclination to rely on prior information cannot be attributed to a change in the scale value of the challenge. The results from a pretest and from a confounding check show that the comparative version of the challenge was *not* more negative than the noncomparative version of the challenge. Instead, the differential inclination to rely on prior information appears to reflect the greater “evaluability” of the challenging information when it was framed in a comparative format (Hsee, 1996). We offer that the greater evaluability of the comparative challenge led participants to assign a relatively greater weight to the challenging information. This interpretation is explicitly tested in Experiment 2.

## **EXPERIMENT 2**

This experiment tests the prediction that comparative challenges are weighted more strongly in judgment revision than are noncomparative challenges. As in Experiment 1, participants who had formed a favorable prior evaluation of the target were exposed to either a comparative challenge or a noncomparative challenge. Unlike in Experiment 1, it is the number of pieces of information contained in the challenge that varied across conditions. If challenging information receives a greater weight when presented in a comparative format than when presented in a noncomparative format, the number of pieces of information contained in the challenge should have a greater influence on judgment revision in the former case than in the latter.

### Method

A total of 114 participants were assigned to one of four conditions of a  $2 \times 2$  between-subjects design. The first factor manipulated the type of challenge (noncomparative vs comparative), while the second factor manipulated the number of pieces of information contained in the challenge (2 vs 5). In the first session, all participants were exposed to nine claims about the target (as in the high information condition of Experiment 1) and expressed their initial judgments. Two days later, participants were exposed to either a noncomparative challenge or a comparative challenge, as in Experiment 1. Within each type of challenge, the number of pieces of information was varied. Participants in the “weak challenge” condition received two pieces of challenging information, whereas participants in the “strong challenge” condition received five pieces of challenging information. The remainder of the procedure was the same as in Experiment 1.

### Results and Discussion

The first dependent measure was the proportion of participants who revised their judgment at least by 1 scale unit (see Table 2). It was submitted to a two-way binary logit analysis with type and strength of the challenge as predictors. Although the interaction was not significant (Wald  $\chi^2(1) = 1.83, p > .17$ ), the simple effects of challenge strength within each type of challenge were in the predicted direction. Specifically, in the comparative challenge condition challenge strength had a marginally significant influence on likelihood of revision by 1 unit or more (Wald  $\chi^2(1) = 3.77, p < .06$ ). However, in the noncomparative challenge condition, challenge strength did not significantly influence the likelihood of revision by 1 unit or more (Wald  $\chi^2(1) = 0.17, p = .68$ ).

The analysis pertaining to the dependent variable of magnitude of judgment revision revealed a marginally significant type of challenge  $\times$  strength of challenge interaction [ $F(1, 101) = 3.69, p < .06$ ; see Table 2 for the means]. Follow-up tests show that when the challenging information was in a noncomparative format, the number of pieces of information contained in the challenge did not significantly influence the degree of judgment revision [ $F(1, 101) = 1.65, p >$

**TABLE 2**  
**Experiment 2 (Pen): Effects of Amount of Challenging Information and Format of Challenge**

Dependent measure	Comparative format		Noncomparative format	
	Low info	High info	Low info	High info
Initial judgment	6.95	6.96	6.66	6.83
Postchallenge judgment	5.20	3.91	5.46	5.21
Judgment revision	1.75	3.05	1.20	1.62
Proportion of judgment revision by 1 unit or more	67% (18/27)	89% (25/28)	67% (17/26)	70% (17/24)

.30]. Mean judgment revision was 1.21 and 1.63 for the weak and strong challenges, respectively. However, when the challenge was phrased in a comparative format, the number of pieces of information contained in the challenge had a strong effect on judgment revision [ $F(1, 101) = 17.05, p < .001$ ]. The stronger challenge (with a higher number of pieces of information) produced greater judgment revision ( $M = 3.05$ ) than did the weaker challenge ( $M = 1.75$ ).

Overall, there was evidence that the negative information contained in the challenge was weighted more strongly in the revised evaluations when the challenge explicitly invited comparisons (comparative format) than when it did not (noncomparative format). Together with the results of Experiment 1, these results indicate that challenges framed in a comparative format decrease the weight attached to prior target information and increase the weight attached to information conveyed by the challenge itself. This is consistent with the comparison–revision hypothesis that, when there is high opportunity for comparisons, the evaluative implications of these comparisons carry a disproportionate weight in judgment revisions.

### EXPERIMENT 3

The first two experiments examined judgment revision in the consumer–decision domain. One could argue that the effects of comparison opportunity are particular to consumer settings, where comparative advertisements are pervasive. The purpose of this experiment was to examine the role of comparison opportunity and amount of information in another domain, that of personnel selections. The results were expected to replicate (and generalize) those of Experiment 1: The amount of information would reduce subsequent revision under a noncomparative challenge but not under a comparative challenge.

#### *Method*

Participants in this experiment were asked to evaluate a candidate for a management consultant position based on some initial attribute information (see Appendix B). They subsequently received additional, negative information about the target (the challenge), and their evaluations of the target were then reassessed. The experiment was conducted during a classroom lecture with the same design as in Experiment 1. Eighty-five participants were assigned to one of four conditions of a  $2 \times 2$  design. The first factor manipulated the amount of initial information (high or low) participants received for the prior evaluation at the beginning of the lecture. The second factor manipulated the format of the challenging information (comparative or noncomparative) that participants received at the end of the lecture (90 min later). As in Experiment 1, the challenge pertained to three attributes that were somewhat less important than the prior information. Results from a pretest ( $n = 22$ ) indicated that the average importance of the prior information attributes was 7.01 on an 11-point scale, whereas the average importance of the challenge attributes was 6.0,  $F(1, 20) = 9.67, p < .01$ . In the noncomparative condition, the challenge

claims referred only to the candidate (e.g., “[Mr. X] was 10 minutes late for his job interview”). In the comparative condition, the same claims were made in comparison with another candidate (“[Mr. X] was 10 minutes late for his job interview, while Mr. Y was on time”). As in Experiment 1, another pretest ( $n = 24$ ) ensured that the challenging information was perceived to be equally negative in the two conditions ( $M_{\text{noncomparative}} = 2.16$ ,  $M_{\text{comparative}} = 2.02$ ;  $F < 1$ ). Prior and postchallenge evaluations were both measured on two 9-point scales anchored by *very unfavorable*–*very favorable* and *bad*–*good*. Participants were also asked to recall the initial information after they had reported their postchallenge evaluations.

### Results

As predicted, the results closely replicated those of Experiment 1. A two-way (amount of information  $\times$  type of challenge) categorical analysis of the proportion of participants who revised their judgment at least by 1 scale unit revealed a significant amount-of-information  $\times$  type-of-challenge interaction (Wald  $\chi^2(1) = 5.29$ ,  $p < .03$ ). As expected, amount of prior information decreased the likelihood of subsequent revision under a noncomparative challenge (Wald  $\chi^2(1) = 4.64$ ,  $p < .03$ ), but not under a comparative challenge (Wald  $\chi^2(1) = 1.28$ ,  $p > .25$ ). A two-way ANOVA of the amount of judgment revision revealed a similar interaction [ $F(1, 81) = 3.95$ ,  $p < .05$ ; see Table 3 for the means]. Under a noncomparative challenge, judgment revision was greater in the low-information condition than in the high-information condition [ $F(1, 81) = 5.33$ ,  $p < .05$ ]. However, under a comparative challenge, the two information conditions did not differ in terms of judgment revision ( $F < 1$ ).

Additional results indicate that the effect of amount of information in the noncomparative challenge condition was mediated by recall of the initial information. Recall was higher in the high-information condition ( $M = 2.35$ ) than in the low-information condition ( $M = 1.05$ ),  $F(1, 81) = 10.7$ ,  $p < .01$ . When recall was included as a covariate in an ANCOVA of judgment revision in the

**TABLE 3**  
**Experiment 3 (Employee Selection): Effects of Amount of Target Information and Format of Challenge**

Dependent measure	Noncomparative challenge		Comparative challenge		Control	
	Low info	High info	Low info	High info	Low info	High info
Initial judgment	7.34	7.50	7.38	7.18	6.99	7.23
Confidence at Time 1	6.22	6.70	6.20	6.56	**	**
Postchallenge	4.23	5.67	4.93	4.72	6.78	7.11
Judgment revision	3.11	1.83	2.45	2.44	0.21	0.12
Proportion whose judgment revision is 1 unit or more	95%	65%	85%	95%	20%	7%
	(21/22)	(13/20)	(17/20)	(22/23)	(3/15)	(1/15)

\*\* Not measured.

noncomparative challenge condition, the simple effect of amount of information on judgment revision was reduced to nonsignificance ( $F < 1$ ), whereas the effect of recall was significant [ $F(1, 80) = 16.7, p < .01$ ].

#### *Discussion*

These results replicate those of Experiment 1 and suggest that the effects of comparative versus noncomparative challenges on judgment revision are robust across decision domains. Taken together, the results of the first three experiments indicate that comparative challenges, which explicitly invite comparisons of the target with a competitor, (1) decrease the weight attached to prior information and (2) increase the weight attached to the comparisons conveyed by the challenge. These effects occur even when the challenging information pertains to attributes that are less important than those contained in the prior information. Our results convey that because opportunity for comparison plays an important role in judgment revision, amount of prior information does not always reduce judgment revision. Experiment 4 examines the role of opportunity for comparison in judgment revision when comparisons *are only implicitly* invited.

### EXPERIMENT 4

Recall that the comparative revision hypothesis postulates two necessary conditions—joint access of the target and competitive information and commensurability—for comparison opportunity. In Experiments 1–3, at the time of revised judgments, information about the target as well as the competitor was available externally and in a commensurable format. Thus, the two conditions were met. In the real world, there are many instances in which competitive information is presented in a noncomparative manner. Further, opportunity for a side-by-side comparison may not be so readily available. In Experiment 4, we considered an instance of memory-based comparison and directly varied the two antecedents of comparison opportunity. The first condition, joint access of the target and competitor information was varied via an elaboration likelihood manipulation at the time the participants received initial information about the target. Conditions that enhance elaboration of the target information would also enhance subsequent memory for the target's specific attribute values, thus allowing a joint access to target and competitor information during judgment revision.

The second condition is that the target's and the competitor's attributes are commensurable. We achieved the commensurability manipulation via the format of the competitor information contained in the challenge. Thus, comparison opportunity would be higher in the condition that facilitates enhanced memory for the target information and also presents the competitor information in exactly the same format as that of the target information. Therefore, based on our comparative revision hypothesis, we predict that judgment revision

(downward) will be greater in the condition that combines high commensurability with greater elaboration of the initial information than in any other condition. Thus, under high commensurability, greater elaboration leads to a *lesser* rather than greater degree of resistance (cf. Haugtvedt & Wegener, 1994; Petty, Haugtvedt, & Smith, 1995).

### *Method*

*Participants and design.* Two hundred thirty-one participants were randomly assigned to one of four conditions of a 2 (commensurability)  $\times$  2 (elaboration) between-subjects design. Data from 15 participants who did not complete all the experimental tasks were excluded. In addition, 106 participants were assigned to two control conditions, which varied in terms of levels of initial elaboration, but did not involve a challenge. These control conditions allowed us to assess sheer evaluative persistence across levels of elaboration.

*Procedure.* The experiment was conducted in two parts separated by 90 min of a regular class lecture. The experiment was introduced as a study on consumers' evaluation of cameras. This product category was selected for two reasons. First, the elaboration manipulation required a certain level of product complexity. Second, the commensurability manipulation required a product that could be described by numerical attributes. In the first part, participants saw an advertisement for the target, Camera X, under conditions of either high or low elaboration. Participants then reported their initial evaluation of the target on three 9-point scales anchored by *agree (that it is good)–disagree (that it is good)*, *dislike–like*, and *unfavorable–favorable*. They also reported their confidence in their initial evaluation on the same scale as in the previous experiments.

Ninety minutes later, as a challenge to the target, participants saw an advertisement for a competitor brand, Camera Y. The Camera Y ad provided noncomparative information that was either commensurable or noncommensurable with the Target X's information. After seeing the competitor's ad, participants reported their postchallenge evaluation of the target (using the same scales as for the initial evaluation), their confidence in the postchallenge evaluation, the perceived difficulty of comparing the two brands (1 = easy to compare and 7 = difficult to compare), the amount of attention paid to the target information during initial evaluation (1 = lot of attention and 7 = little attention), and their perceived knowledge of cameras (1 = not at all knowledgeable and 9 = highly knowledgeable). Participants in the control groups rated Camera X at Time 2 without seeing the Camera Y advertisement.

*Elaboration.* Degree of elaboration was manipulated by varying both the personal relevance of the target information and the opportunity to process this information (see Petty & Cacioppo, 1986). In the high-elaboration condition, participants were led to believe that the camera would soon be available at an on-campus trade show and were given 4 min to process the instructions and the ad content. In the low-elaboration condition, participants were told that



the product would be available next year in a distant city and were given only 1 min to process the instructions and the ad content.

The effectiveness of this manipulation was assessed across three measures: (1) self-reported attention, (2) number of thoughts listed, and (3) memory. Self-reported attention was assessed in the main study and is discussed later. One pretest ( $n = 28$ ) assessed the number of thoughts generated across levels of the elaboration manipulation. Participants first watched the ad for Camera X under either the high- or the low-elaboration condition. One hour later, participants were given 2 min to list all the thoughts that came to their minds. As expected, the number of camera-relevant thoughts was higher in the high-elaboration condition ( $M = 3.07$ ) than in the low-elaboration condition ( $M = 2.29$ ;  $F = 9.53$ ,  $p < .01$ ).

Another pretest ( $n = 49$ ) tested the assumption that the elaboration manipulation would influence memory for the specific values of the target brand's attributes. The procedure closely paralleled that of the main experiment. In the first part of the pretest, participants were exposed to the target ad under either high or low elaboration. In the second part, participants were exposed to an ad for the competitor brand described in a commensurable format. Instead of reporting their postchallenge evaluation of the target, participants were asked to recall the values of the numerical attributes of the target brand. The attribute dimensions (e.g., "weight" and "focus length") were provided as retrieval cues. The recall for each attribute was classified as accurate or inaccurate by a judge who was blind to the experimental conditions. As expected, an ANOVA revealed that the total number of attribute values accurately recalled was significantly higher in the high-elaboration condition ( $M = 2.17$ ) than in the low-elaboration condition [ $M = 1.12$ ;  $F(1, 47) = 12.62$ ,  $p < .01$ ].

*Commensurability.* The target ad shown in the first part of the main study stated Camera X's country of origin as well as numerical information about the camera's weight (320 g), focus length range (35–60 m), shutter speed (1/3000), and exposure accuracy (experts' rating of 3 of 5). Commensurability was manipulated by varying the format in which the competitor ad information was provided. In the high-commensurability condition, Camera Y's attributes were described in the same format as Camera X's. The two brands shared the same country of origin. However, Camera Y's numerical attributes (e.g., "weight: 280 grams") were clearly superior to those of Camera X. In the low-commensurability condition, Camera Y's attributes were described using verbal labels (e.g., "weight: somewhat light"). The verbal labels used in the noncommensurable condition were calibrated via a pretest ( $n = 40$ ) so that they would correspond to the numerical values used in the commensurable condition (see Appendix C). Another between-subjects pretest ( $n = 60$ ) showed that participants exposed to the verbal (noncommensurable) description of the competitor camera reported similar evaluation of this camera ( $M = 6.2$ ) as did participants exposed to the numerical (commensurable) description of the competitor camera ( $M = 6.5$ ),  $F < 1$ . Therefore, the competitor information had equal scale value

across levels of commensurability when this information was evaluated without a reference to the target.

*Results: Manipulation and Confounding Checks*

*Commensurability.* As expected, in the main study, participants in the low-commensurability condition perceived the comparison between the two brands to be more difficult than did participants in the high-commensurability condition [ $M_{\text{low}} = 4.62$ ,  $M_{\text{high}} = 3.44$ ,  $F(1, 214) = 8.3$ ,  $p < .01$ ].

*Elaboration.* Consistent with the pretest results, in the main study, the elaboration manipulation resulted in greater self-reported attention in the high-elaboration condition ( $M = 2.60$ ) than in the low-elaboration condition [ $M = 3.09$ ,  $F(1, 212) = 5.43$ ,  $p < .02$ ]. Self-reported knowledge of the product category did not vary across elaboration conditions ( $F < 1$ ), and therefore was not a potential confound.

*Likelihood of revision.* Table 4 reports the proportion of participants who revised their judgments in each condition. A commensurability  $\times$  elaboration logit analysis of this measure revealed a main effect of commensurability (Wald  $\chi^2(1) = 15.59$ ,  $p < .01$ ). As expected, the probability of revision was greater when the competitor challenge was highly commensurable (63%) than when it was not commensurable (35%). There was also a main effect of elaboration (Wald  $\chi^2(1) = 15.59$ ,  $p < .05$ ), showing that judgment revision was more likely under high elaboration (62%) than under low elaboration (35%). More important, these main effects were qualified by a commensurability  $\times$  elaboration interaction (Wald  $\chi^2(1) = 2.58$ ,  $p < .10$ ). The effect of high commensurability was much stronger under high initial elaboration (Wald  $\chi^2(1) = 14.96$ ,  $p < .01$ ) than under low initial elaboration (Wald  $\chi^2(1) = 2.88$ ,  $p < .10$ ). Contrasts with the control conditions (within each level of elaboration) show that, in the high elaboration–high commensurability condition, the probability of judgment revision increased significantly over that accountable by the effect of time (Wald  $\chi^2(1) = 25.03$ ,  $p < .01$ ). None of the other experimental conditions

**TABLE 4**  
**Experiment 4 (Camera): Effects of Initial Elaboration and Commensurability**

Dependent measure	Low-elaboration Commensurability			High-elaboration Commensurability		
	Low	High	Control	Low	High	Control
Initial judgment	5.37	5.24	5.53	5.2	5.23	5.67
Confidence at Time 1	4.03	4.79	4.85	4.95	5.05	5.28
Postchallenge judgment	5.35	4.64	5.18	5.52	4.06	5.56
Judgment revision	0.02	0.60	0.35	-0.24	1.17	0.11
Proportion whose judgment revision is more than 0	33%	49%	48%	36%	74%	22%
	(17/52)	(26/53)	(25/52)	(22/61)	(37/50)	(12/54)

exhibited significantly greater revision than in the corresponding control condition.<sup>3</sup>

*Judgment revisions.* The magnitudes of judgment revisions (see Table 4) were submitted to a similar commensurability  $\times$  elaboration ANOVA. The analysis revealed the expected main effect of commensurability [ $F(1, 212) = 29.52, p < .01$ ], showing that judgment revisions were more pronounced in the high-commensurability condition ( $M = 0.88$ ) than in the low commensurability condition ( $M = -0.12$ ). However, this effect was again qualified by a commensurability  $\times$  elaboration interaction [ $F(1, 212) = 5.07, p < .03$ ]. The simple effect of commensurability was much stronger in the high-elaboration condition [ $F(1, 212) = 30.3, p < .001$ ] than in the low-elaboration condition [ $F(1, 212) = 4.06, p < .05$ ]. Contrasts with the control conditions (within each elaboration condition) show that judgment revisions were greater than those accountable by the effect of time only in the high elaboration–high commensurability group [ $F(1, 316) = 20.83, p < .01$ ].

### Discussion

This experiment provides further evidence that the magnitude of judgment revision on encountering a challenge depends on whether the challenge facilitates comparisons between the target and its competitors. We found that judgment revisions were most likely and most pronounced in the condition where there was *both* high initial elaboration of the target information and high commensurability between the target's attributes and those of the competitors. This effect occurred because this condition combined the two necessary and jointly sufficient determinants of comparison opportunity—joint access to target the competing sets of information and high commensurability. Specifically, high initial elaboration of the target information increases the subsequent accessibility of the target's specific attribute values, whereas high commensurability facilitates attribute-by-attribute comparisons between the accessible target information and competitor information.

The results also offer commensurability as a moderator of the relationship between elaboration of prior information and resistance. Previous research had suggested that high initial elaboration should strengthen the initial evaluation and therefore decrease subsequent revision (Haugtvedt & Wegener, 1994; Petty et al., 1995). Greater elaboration indeed enhanced the strength of prior evaluations in terms of confidence in and persistence of prior evaluation when there was no challenge. However, when there *was* a challenge from a superior and commensurable competitor, high elaboration *increased* the likelihood and magnitude of subsequent revision. The relationship between initial elaboration

<sup>3</sup> Contrasts with the corresponding control conditions (within each level of elaboration) were necessary in this experiment because, unlike in the other experiments, the two control conditions differed significantly in terms of probability of subsequent revision (Wald  $\chi^2(1) = 11.39, p < .001$ ). Consistent with prior theories on attitude strength, in the absence of a challenge, the likelihood of revision was lower under high elaboration (22%) than under low elaboration (44%).

and subsequent revision may thus depend on both the nature of the initial information and the type of challenge.

### GENERAL DISCUSSION

Because people encounter information that challenges their prior evaluations almost every day, the determinants of judgment revision need to be better understood. It is obvious that judgment revision will depend on the relative scale value of the challenging information. Various streams of research suggest that judgment revision may also be inversely related to the amount and elaboration of the information that supports the prior evaluation. The present research investigated the role of a hitherto unexamined factor—opportunity for comparison produced by the challenge—in judgment revisions. Consistent with the comparison–revision hypothesis, the results from four experiments indicate that whenever challenges facilitate comparisons between the target and its competitors, these comparisons generally carry a disproportionate weight in the revised judgments. Strong opportunities for comparison may attenuate and, at times, reverse the previously documented negative relationship between amount and elaboration of prior information and judgment revision.

The moderating role of comparison opportunity was observed with two distinct operationalizations of this construct. In Experiments 1, 2, and 3 opportunity for comparison was driven by the comparative vs noncomparative framing of the challenge. It was found that challenges framed in a comparative format were weighted more strongly in judgment revisions than were equally negative challenges framed in a noncomparative format.

These effects are consistent with the evaluability hypothesis (Hsee, 1996; Hsee, Loewenstein, Blount, & Bazerman, 1999), which was originally proposed as an explanation of preference reversals between joint evaluations of alternatives and separate evaluations of the same alternatives. The hypothesis holds that such reversals occur because a joint evaluation enhances the “evaluability” of otherwise ambiguous attributes. In our Experiments 1 to 3, the noncomparative challenging information, which focused on target attributes of *lesser importance*, may have been hard to assess by itself. However, when presented in a comparative format, the same information may have been disambiguated by the mention of a superior competitor reference, thereby inducing a greater degree of judgment revision.

Apart from suggesting that commensurability moderates the elaboration–judgment revision relationship, Experiment 4’s results also extend the research that shows that alignable differences between alternatives receive greater weight in judgment and choice (e.g., Markman & Medin, 1995). Previous studies of this phenomenon focused on situations in which the information about the alternatives was externally provided (e.g., Slovic & MacPhillamy, 1974). Experiment 4 suggests that this effect may also extend to situations in which information about one of the alternatives is available only from memory.

The moderating role of comparison opportunity appears to be a general one. Not only did we observe it with distinct operationalizations, we also observed

it across different judgment domains: evaluation of a pen, evaluation of an employee, and evaluation of a camera. However, our studies examined only instances where favorable initial evaluations were subsequently challenged by negative information. A worthwhile extension of this research would be to examine instances in which negative prior evaluations are subsequently challenged by favorable information.

Another interesting issue to investigate in future research is whether people update their prior attitudes or construct new attitudes when the challenge is framed in such a manner as to offer a high opportunity for comparison. Given the recent view that often evaluations are constructed rather than stable entities (Wilson & Hodges, 1992), it is worth studying whether comparison opportunity serves as an antecedent of such construction. In our future research that will investigate the constructional nature of revised judgments, we intend to obtain additional process measures such as response times and verbal protocols.

#### APPENDIX A

##### **Attributes Used in Experiment 1 (Importance Ratings on an 11-Point Scale Anchored by “Not at All Important” and “Extremely Important”)**

###### Initial Information in the Nine-Claims Condition

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Special erasing features that eliminates smudges (8.66)  
 The benzine tip that facilitates smooth, no-skip writing (9.38)  
 The smearproof, quick-drying ink that improves writing performance (8.49)\*  
 A special feature that helps a comfortable grip (8.34)  
 Sloped design and optimal balancing (8.61)\*  
 The special pressurized cartridge that allows for writing at any angle (9.0)  
 Omega 3’s availability at most stores (8.72)  
 New ink polymer in the Omega 3 for long use (9.21)\*  
 Offering good writing performance on most surfaces (9.08)

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\* Claims that were also used in the low-information (three-claims) condition.

###### Challenge Claims

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Performance on nonporous surfaces such as glass and ceramics (7.92)  
 Availability of refills (7.47)  
 Ease (or difficulty) of opening the packages in which the pens were shipped (7.90)

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#### APPENDIX B

##### **Attributes Used in Experiment 3 and Their Importance Ratings on an 11-Point Scale**

###### Initial Information in the High-Information Condition

---

Has 8 years of prior experience in management consulting (7.8)\*

Has an MBA degree from one of the top 20 business schools in the United States (7.1)\*  
 Has worked in four different Asian countries in addition to the United States (6.6)\*  
 Has good presentation skills (7.4)  
 Keeps up to date with the business news by reading several business newspapers and magazines (6.9)  
 Has been promoted recently in his current place of work (6.3)

---

\* Subset used in the low-information condition.

#### Challenge Attributes

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Not very good with office software such as PowerPoint, Word, and Excel (5.9)  
 Is not well organized (6.4)  
 Was 10 min late for the job interview (5.7)

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## APPENDIX C

### Pretest for the Choice of Verbal Labels Corresponding to the Numerical Descriptions

The verbal labels for the specific numeric attributes of cameras were initially selected on the basis of product literature and consultations with a small group of experts ( $n = 5$ ) in the field. These labels were then validated in a pretest among 80 participants belonging to the same population as participants in the main study. In the pretest, participants were provided with the numerical values of either the target camera ( $n = 40$ ) or the competitor ( $n = 40$ ) and were asked to indicate which of the five categories will accurately describe the camera. For example, participants were asked which of the following labels would be most appropriate for a camera that weighs 320 g: Light, Somewhat Light, Medium Weight, Somewhat Heavy, and Heavy. Response frequencies (proportions) are given below.

#### Initial information ( $n = 40$ )

---

Weight (320 g): Light [7 (17.5%)]; Somewhat Light [25 (62.5%)]; Medium Weight [6 (15%)]; Somewhat Heavy [2 (3%)]; Heavy [0].  
 Focus length range (35–60 m): High [4 (10%)]; Somewhat High [31 (77.5%)]; Medium [3 (7.5%)]; Somewhat Low [1 (2.5%)]; Low [1 (2.5%)]  
 Shutter speed (1/3000 of a second): High [8 (20%)]; Somewhat High [24 (60%)]; Medium [4 (10%)]; Somewhat Low [3 (7.5%)]; Low [1 (2.5%)]  
 Exposure accuracy [3 on a 5-point scale (rated by experts)]: Accurate [0]; Somewhat Accurate [5 (12.5%)]; Medium [34 (85%)]; Somewhat Inaccurate [1 (2.5%)]; Inaccurate [0]

---

Challenge Information ( $n = 40$ )

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Weight (280 g): Light [28 (70%)]; Somewhat Light [6 (15%)]; Medium Weight [4 (10%)]; Somewhat Heavy [2 (3%)]; Heavy [0].

Focus length range (35–120 m): High [32 (80%)]; Somewhat High [7 (17.5%)]; Medium [1 (2.5%)]; Somewhat Low [0]; Low [0]

Shutter speed (1/8000 of a second): High [35 (87.5%)]; Somewhat High [4 (10%)]; Medium [1 (2.5%)]; Somewhat Low [3 (7.5%)]; Low [1 (2.5%)]

Exposure accuracy [4 on a 5-point scale (rated by experts)]: Accurate [2 (5%)]; Somewhat Accurate [33 (82.5%)]; Medium [5 (12.5%)]; Somewhat Inaccurate [0]; Inaccurate [0]

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