Different Scales for Different Frames: The Role of Subjective Scales and Experience in Explaining Attribute-Framing Effects

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Consumers respond more favorably to positively framed attribute information than to negatively framed attribute information, a finding that has been attributed to the affective associations evoked by each frame. We contend that framing effects also depend on the range and level of reference values used to evaluate attribute information. When the range of reference values is narrower for a positive frame than a negative frame, attribute values above expected performance levels favor the positively framed information and attribute values below expected performance levels favor the negatively framed information. When the range of reference values is wider for a positive frame than a negative frame, the opposite pattern emerges. Experience with a frame is one factor that reduces the range of reference values recruited to judge attribute information.

A fundamental characteristic of any selling proposition is the communication of product attribute information. Sellers inform buyers about attributes that differentiate their product from competitors’ products. For some attributes, the seller has the option of describing the performance of the product using a positive or negative frame (Levin and Gaeth 1988; Levin, Schneider, and Gaeth 1998). A medical procedure can have “95% success rate” or a “5% failure rate,” a product warranty can guarantee that the product will “have perfect performance” or “be free from defects,” and a product description can claim “0% fat” or “100% fat free” (see fig. 1). In each case, the seller is faced with the task of selecting from allegedly equivalent descriptions of the attribute.

The literature on attribute-framing effects shows that consumers respond more favorably to positive attribute frames than to negative attribute frames (Levin et al. 1998). Levin et al. (1998) review 36 attribute-framing studies and find overwhelming support for the superiority of positive frames. They argue that the attribute-framing effect occurs because information is encoded relative to its descriptive valence, causing valence-consistent evaluation shifts. Positive attribute frames evoke favorable associations in memory and encourage the recruitment of positive information, whereas negative attribute frames evoke unfavorable associations in memory and encourage the recruitment of negative information. If one assumes that all recruited information is integrated into an evaluation, judgments become more positive or negative depending on the framing of the attribute information.

Despite the apparent universal support for the advantage of positive attribute frames, there are some reported anomalies. Marteau (1989) found no framing effects across a variety of abortion decisions made by women and no framing effects for health-related predicaments judged by medical students. Levin, Schnittjer, and Thee (1988) found no framing effect for self-evaluations of cheating. In addition, there is typically no framing effect when subjects estimate their own performance (Schneider 1995; Sniezek, Paese, and Switzer 1990). Although these null effects are usually attributed to subjects’ abilities to ignore valenced associations, they raise the possibility that processes other than affective recruitment may contribute to attribute-framing effects.

Although attribute frames may encourage people to recruit affectively consistent information, they also require a person to make a subjective judgment about the attribute values. Subjective judgments are typically made relative to reference values, the set of stimuli that one expects to experience based on prior exposure, cueing, or some other factor. It is possible that attribute frames also encourage changes in people’s reference sets. Consistent with norm theory, positive and negative attribute frames may generate unique sets of reference values because each frame evokes...
different stimuli from memory (Kahneman and Miller 1986). The distribution of values in a reference set will influence the construction of the subjective scales used to evaluate attribute values. For example, if a positively framed attribute value falls in the upper end of the distribution of reference values evoked by its frame, it should receive a favorable evaluation. Similarly, if a negatively framed attribute value falls in the lower end of the distribution of reference values evoked by its frame, it should receive a less favorable evaluation.

In this study, we investigate two questions. First, do people use different subjective scales, a consequence of different reference sets, to evaluate positively and negatively framed attribute values? Second, does experience with a frame influence the width of the subjective scales by making a more restricted set of reference values available for the judgment? In experiment 1, we identify stimuli that are typically described using a positive frame and find that attribute values above expected performance levels are evaluated more favorably in the positive frame, whereas attribute values below expected performance levels are evaluated more favorably in the negative frame. In experiment 2, we show that the framing reversal observed in experiment 1 can be attributed to the positive frame having a narrower range of reference values than the negative frame. In experiment 3, we identify stimuli that are typically described using a negative frame and reverse the pattern of results shown in experiment 1. Finally, experiment 4 manipulates the amount of experience subjects have with a negative attribute frame and shows that experience with the negative frame affects a subsequent judgment made in a negative frame but does not affect a subsequent judgment made in a positive frame. These findings imply that attribute-framing effects may not depend solely on associations evoked by the frame.

FRAMING EFFECTS

Levin et al. (1998) discuss three types of framing. Risky choice framing offers people a choice between a risk-free outcome and a risky outcome that have been positively or negatively framed. For example, outcomes in the Asian disease problem are framed as definitely saving (losing) one-third (two-thirds) of the lives or a one-third chance (two-thirds chance) of saving (losing) all of the lives (Tversky and Kahneman 1981). Goal framing presents the consequences of engaging in an activity as an opportunity to gain a benefit or avoid a loss. For example, the benefit of engaging in a breast self-examination is an increased chance of finding a tumor at an early stage of the disease, whereas the loss of not engaging in a breast self-examination is the decreased chance of finding a tumor at an early stage of the disease (Meyerowitz and Chaiken 1987). Attribute framing “represents perhaps the simplest case of framing, making it especially useful for gaining a basic understanding of how descriptive valence influences information processing” (Levin et al. 1998, p. 158). In attribute framing, a product or option is described using a positive or negative attribute label. For example, ground beef can be described as being 75% lean or 25% fat (Levin and Gaeth 1988). The current research will focus solely on attribute framing.

Attribute-Framing Effects

Attribute-framing effects have been shown to influence evaluations in three types of judgments: (a) item evaluations, which describe performance using a positively or negatively valenced attribute label, (b) performance evaluations, which describe performance in terms of success versus failure rates, and (c) gambles, which describe outcomes of a single
Framing Effects

Failures of Attribute Framing

Despite the robust influence of attribute framing, there are three domains in which attribute frames have failed to influence evaluations: (a) topics involving strongly held attitudes, (b) topics having high personal relevance, and (c) studies involving self-evaluations. In the domain of strongly held attitudes, Marteau (1989) found no framing effects across a variety of abortion decisions made by women. In the domain of high-personal-relevance topics, Marteau (1989) found no framing effects for health-related predicaments judged by medical students. In the domain of self-evaluations, Levin et al. (1988) found that the general incidence of cheating was estimated to be higher when cheating frequency was framed as “percent of students that cheat” versus “percent of students that never cheat” but found no framing effect for self-evaluations of whether students themselves would engage in cheating. Similarly, attribute-framing effects are routinely found when the performance of others is described in terms of percentage correct versus percentage wrong (Levin et al. 1985), but there is typically no framing effect when subjects estimate their own performance (Schneider 1995; Snizek et al. 1990).

Levin et al. (1998) argue that framing effects are absent in the aforementioned cases because associates of the frame apparently receive little or no weight in the judgment process, rendering the framing effects negligible. Although this may be the case, this explanation seems inconsistent with the priming explanation discussed earlier. Because a priming mechanism presumably operates automatically, positive and negative associations evoked by attribute frame primes should be integrated into a judgment regardless of context. If frames encourage affective associations, judgments should become more positive or negative depending on the frame that is used. No explanation has been given as to why framing effects are reliably observed in some decision domains and are reliably absent when topics involve strongly held attitudes, issues of high personal relevance, and self-evaluations.

Different Reference Sets

A plausible explanation for the differential effects of attribute framing across domains is that each attribute frame generates a unique reference set. A reference set is the collection of values that comprise the subjective scale used to evaluate an attribute value. In some cases, the reference sets for the positive and the negative attribute frames will differ and, as a consequence, a framing effect will be observed. In other cases, the reference set for the positive and negative attribute frame will be quite similar and, as a consequence, there will be no framing effect.

The potential role of reference sets in attribute framing can be illustrated using range theory, a simplification of range-frequency theory (Niedrich, Sharma, and Wedell 2001; Parducci 1965). Range theory proposes that any attribute value is evaluated using an internal, subjective scale anchored by two endpoints (Janiszewski and Lichtenstein 1999; Mellers and Cooke 1994; Parducci 1965; Volkmann 1951). When a stimulus is judged along with other stimuli, the contextual stimuli anchor the endpoints of the subjective scale. When a stimulus is judged in isolation, the stimulus generates its own reference set because it encourages the recruitment of items from memory (Kahneman and Miller 1986). To the extent that positive and negative attribute frames encourage a person to generate different reference sets, this change in the range of the objective attribute values corresponding to the endpoints of the subjective scale could contribute to changes in the evaluation of the attribute value.

Figure 2 illustrates the potential influence of competing attribute frames on the generation of subjective evaluation scales. First, assume that attribute values can be expressed using a positive frame or a negative frame, as illustrated in figure 2.1 and 2.2. In a positive frame, increases in objective attribute values correspond to increases in subjective scale values, whereas in a negative frame, decreases in objective attributes values correspond to increases in subjective scale values. Second, assume that the subjective scale associated with the positive frame (fig. 2.1) can correspond to a narrower range of objective attribute values (see shaded bar) than in the negative frame (fig. 2.2), the same range of objective attribute values as in the negative frame (not shown), or wider range of objective attribute values in the negative frame (fig. 2.3 vs. 2.4). Third, assume that the

1 Figures 2.1 and 2.2 will be used to illustrate experimental manipulations used in experiments 1 and 2. Figures 2.3 and 2.4 will be used to illustrate experimental manipulations used in experiment 3. Thus, objective scale values vary between figs. 2.1 and 2.3 and between figs. 2.2 and 2.4.
range of objective values comprising the reference sets have midpoints corresponding to approximately equivalent values (e.g., value $C$ in figs. 2.1 and 2.2).

Figure 2 illustrates two situations in which a positive frame will result in a more positive evaluation than a negative frame. First, when the upper endpoint of the range of referent values in the positive frame (e.g., objective value of 30% in fig. 2.1) is less extreme than the upper endpoint of the range of referent values in the negative frame (e.g., objective value of 65% in fig. 2.2), positively framed attribute values that are above the midpoint of the scale (e.g., values above $C$) should be valued more positively than corresponding negatively framed attribute values. For example, consider a meat pasta sauce that has meat (positive frame) and tomato sauce (negative frame) as the two ingredients. When a consumer is asked to judge the quality of a meat pasta sauce that is “25% meat,” he evaluates the pasta sauce using a set of referent values ranging from 10% to 30% meat (see fig. 2.1) and assigns a subjective value of approximately 50.

Second, when the lower endpoint of the range of referent values in the positive frame (e.g., objective value of 65% in fig. 2.3) is more extreme than the lower endpoint of the range of referent values in the negative frame (e.g., objective value of 30% in fig. 2.4), positively framed attribute values that are below the midpoint of the scale (e.g., values below $C$) should be valued more positively than corresponding negatively framed attribute values. For example, consider ground beef that has meat (positive frame) and fat (negative frame) as the two ingredients. When a consumer is asked to judge the quality of ground beef that is “75% lean,” he evaluates the ground beef using a set of referent values ranging from 65% to 95% lean (see fig. 2.3) and assigns a subjective value of approximately 35.

Hypotheses

If attribute framing does influence the reference sets used to evaluate an attribute value, then it should be possible to reverse a framing effect wherein positive frames are evaluated more favorably than negative frames in some situa-
tions, but negative frames are evaluated more favorably than positive frames in other situations. To illustrate, reconsider the scales in figures 2.1 and 2.2. In this case, positively framed attribute values that are above the midpoint of the range of values (e.g., point D in fig. 2.1) should be valued more positively than negatively framed attribute values (e.g., point D in fig. 2.2), but positively framed attribute values that are below the midpoint of the range of values (e.g., point B in fig. 2.1) should be valued less positively than negatively framed attribute values (e.g., point B in fig. 2.2). Thus, shifting the attribute quantity level from one end of the expected range of values to the other end of the expected range of values should reverse the relative evaluations of the framed attributes. We investigate this issue in experiment 1.

If positive and negative frames do encourage people to recruit different ranges of referent values, we should also be able to observe differential sensitivity to changes in objective values. For example, if the range of referent values in the positive frame is narrower than the range of referent values in the negative frame, then a 5% change in an objective value in the positive frame should result in more change in the subjective value than an equivalent 5% change in the negative frame. We investigate this issue in experiment 2.

Finally, we have argued that differential experience with a frame may be responsible for different sets of referent values. At the most general level, this must be true. If the experience with positive frame objective values does not correspond to the experience with negative frame objective values, then the reference sets will be different. In experiment 3, we investigate situations where prior experience is likely to have led to a narrower reference set for the negative frame as opposed to the positive frame. We expect that positively framed attribute values that are below the midpoint of the range of referent values (e.g., point B in fig. 2.3) will be valued more positively than negatively framed attribute values (e.g., point B fig. 2.4), but positively framed attribute values that are above the midpoint of the range of referent values (e.g., point D in fig. 2.3) will be valued less positively than negatively framed attribute values (e.g., point D in fig. 2.4). At a more specific level, experience itself may also reduce the range of a set of recruited reference values. That is, even though additional experience with a frame should not result in exposure to a reduced range of objective attribute values, experience may encourage the person to recruit a narrower reference set when making a judgment using that attribute frame, owing to confidence, more situationally appropriate values, or an ability to ignore outliers. This issue is investigated in experiment 4.

**EXPERIMENT 1**

The goal of experiment 1 was to provide evidence that positive and negative attribute frames evoke different subjective scales and that differences between these scales contribute to framing effects. Consistent with figures 2.1 and 2.2, we selected products in which the positive attribute frame was likely to evoke a narrower reference set than the negative attribute frame. Prior research has shown that experience with a stimulus set makes people more sensitive to differences between stimuli (Gibson 1953), so we selected products where a feature ingredient (i.e., a positively framed attribute) is used to promote the product. For example, consumers purchase meat pasta sauce primarily for the meat, fruit yogurt primarily for the fruit, and blueberry muffins primarily for the blueberries. These products are ones for which lower amounts of the feature ingredient are typically associated with lower quality and perceptions of “skimping.” Thus, we expected consumers to have a narrower range of reference values for the positively framed feature ingredient than for the negatively framed filler ingredient and that attribute values above the midpoint of the range would be more preferred in the positive frame, but that attribute values below the midpoint of the range would be preferred in the negative frame. Our assumption about differences in the ranges of reference sets will be directly tested in experiment 2.

**Stimuli**

We began our stimulus identification task by generating a list of products that consisted of two ingredients, a feature ingredient and a filler ingredient. We then screened the products using three additional criteria. First, subjects had to infer that the product consisted of only these two ingredients and that increasing the amount of one ingredient (e.g., meat) resulted in a decrease in the complementary ingredient (e.g., tomato sauce), given a constant volume. Second, the feature ingredient had to be perceived positively (e.g., increasing the percentage of meat in meat pasta sauce is valuable) and the filler ingredient had to be perceived negatively (e.g., increasing the percentage of tomato sauce in meat pasta sauce is negative). Third, the product had to be commonly promoted in terms of the feature ingredient (i.e., great meat pasta sauce has “more meat” as opposed to “less tomato sauce”). Eight products were chosen, and their respective feature and filler attributes were as follows: fruit yogurt (fruit, plain yogurt), jelly donut (jelly, donut batter), aloe moisturizing soap (aloe, soap), meat pasta sauce (meat, tomato sauce), cookies and cream ice cream (cookies, ice cream), ginseng tea (ginseng, tea), red wine vinegar (red wine, vinegar), blueberry muffin (blueberries, muffin batter).

Thirty-seven pretest subjects were asked to identify the preferred ingredient for each two-ingredient product, ensuring that one ingredient was more positively perceived than the other. An average of 88% of the subjects selected the featured ingredient as the more valued ingredient in each product ($z = 7.11, p < .001$). The $z$-test was significant for each product (all $p’s < .01$). As desired, the positive frame for each product was the featured ingredient. Additional pretests were conducted to select objective attribute values that were near the high and low end of the expected range of values.

**Design and Procedure**

One hundred six students from an undergraduate subject pool participated in the experiment for extra credit. The experiment used a 2 (frame) by 2 (attribute quantity level) by
framed attributes were significantly higher when the attribute levels were favorable (e.g., positive frame). The presentation order of the positive and negative frames was counterbalanced between subjects. Ratings were recorded on a bipolar scale ranging from -100 (poor) to +100 (good).

Results

The higher-order interactions between the framing counterbalance factor and the treatment variables were all statistically nonsignificant. There was no frame by attribute level by replicate three-way interaction (F(7, 714) = 0.65, p > .10), so we collapsed the replicate means. There was a significant frame by attribute level interaction (F(1,102) = 21.56, p < .001), as would be expected if the reference set differed for the positively and negatively framed attributes. Subjects’ evaluations of the positively framed attributes (M = 28.31) were significantly higher than the evaluations of the negatively framed attributes (M = 19.95) when the attribute levels were favorable (e.g., 25% meat/75% tomato sauce; F(1,53) = 8.74, p < .001). Subjects’ evaluations of the positively framed attributes (M = -24.31) were significantly lower than the evaluations of the negatively framed attributes (M = -15.00) when the attribute levels were unfavorable (e.g., 5% meat/95% tomato sauce; F(1,49) = 13.80, p < .001).

Discussion

The results of experiment 1 show that, counter to existing demonstrations of attribute framing in the literature, it is possible for negatively framed attribute information to be evaluated more favorably than positively framed attribute information. When attribute values were in the upper end of the reference set, products were evaluated more favorably when they were positively framed (e.g., 25% meat) than when they were negatively framed (e.g., 75% tomato sauce). However, when attribute values were in the lower end of the reference set, products were evaluated less favorably when they were positively framed (e.g., 5% meat) than when they were negatively framed (e.g., 95% tomato sauce). This demonstration is important given Levin et al.’s (1998, p. 160) claim that “we know of no case in which a negative attribute frame produced more favorable evaluations than a positive attribute frame.”

There are alternative explanations for the results of experiment 1. First, it could be argued that the results of experiment 1 demonstrate a response language effect (Lynch, Chakravarti, and Mitra 1991). Ordinal data are commonly used to provide evidence against response language effects. Therefore, 93 subjects were randomly assigned to one of the four frame by value conditions and asked if they were willing to purchase the product at a given price (e.g., meat pasta sauce that is 25% meat at $4.19). Using the same prices for each of the four conditions of a given replicate, we found a significant frame by value interaction (χ²(1) = 10.03, p < .01). Collapsing across replicates, a greater proportion of people were willing to purchase the positively framed product (60.0%) than the negatively framed product (43.5%) when the attribute values were favorable (t(382) = 3.27, p < .01), but a smaller proportion were willing to purchase the positively framed product (38.0%) than the negatively framed product (56.6%) when the attribute values were unfavorable (t(358) = -3.57, p < .001). Note that Levin et al. (1998) argue that attribute frame choice data are evaluation data measured as a discrete variable.

Second, it could be argued that respondents in experiment 1 had a different referent for a given attribute frame (i.e., an adaptation level) and that judgments were made relative to this referent. For example, if we assumed that the referent was lower in the positive frame (e.g., objective value of 15% in fig. 2.1) than the negative frame (e.g., objective value of 80% in fig. 2.2), a favorable positive frame value could deviate from the referent by a greater amount (e.g., 25% meat vs. 15% meat) than the corresponding negative frame value (e.g., 75% sauce vs. 80% sauce). Yet, this would also mean that the unfavorable positive frame value would deviate from the referent by a smaller amount (e.g., 5% meat vs. 15% meat) than the corresponding negative frame value (e.g., 95% sauce vs. 80% sauce) and, as a consequence, should be more preferred. This was clearly not the case in experiment 1.

Third, it could be argued that people had different latitudes of acceptable values in each framing condition, an argument based in social judgment theory (Sherif and Hovland 1961). In social judgment theory, attribute values that fall within the latitude of acceptable values encourage a person to shift his or her internal value toward the external value (i.e., assimilate), whereas attribute values that fall outside the latitude of acceptable values encourage a person to shift his or her internal value away from the external value (i.e., contrast). For example, if we assumed that the latitude of acceptable values was higher in the positive frame (e.g., objective values of 10%–25% in fig. 2.1) than the negative frame (e.g., objective values of 95%–80% in fig. 2.2), then favorable positive frame values (e.g., 25%) could be within the latitude of acceptable values and encourage the person to view the products more positively (i.e., preexisting judgment about product assimilates toward favorable framed value). Similarly, negative frame values (e.g., 75%) could be outside the latitude of acceptable values and encourage the person to view the products less positively (i.e., preexisting judgment about product contrasts from favorable framed value). Yet, this would also mean that unfavorable positive frame values (e.g., 5%) would fall outside the latitude of acceptable values and encourage the person to view the product more positively (i.e., preexisting judgment about
product contrasts from unfavorable framed value) and unfavorable negative frame values (e.g., 95%) would fall within the latitude of acceptable values and encourage the person to view the product less positively (i.e., preexisting judgment about product assimilates toward unfavorable framed value). These unfavorable value predictions are inconsistent with the results of experiment 1.

Finally, it is possible that the different attribute performance levels may have been differentially salient in each frame. When confronted with a product that performed poorly on the key ingredient (e.g., 5% meat in meat pasta sauce), the product’s deficiency may have become quite salient and the consumer may have inferred that the product was poor. Listing the product as performing poorly on the filler ingredient (e.g., 95% tomato sauce) did not highlight the product’s deficiencies and was not as damaging to product evaluations. One way to discredit this alternative explanation and provide support for the assumption that the positive frame in experiment 1 evoked a reference set with a narrower range of values is to demonstrate an interaction that directly relies on the hypothesized narrowness of the range of reference values in the positive frame.

EXPERIMENT 2

The goals of experiment 2 were to provide evidence that the range of reference values for the positive frame were narrower than the range of reference values for the negative frame and to determine if the differential salience of attribute information could have been responsible for the effects observed in experiment 1. In experiment 2, subjects rated three attribute quantities at the favorable (e.g., 24%, 25%, 26% meat and 76%, 75%, 74% tomato sauce) and unfavorable (e.g., 4%, 5%, 6% meat and 96%, 95%, 94% tomato sauce) levels. If consumers use a narrower reference set of values to evaluate the positively framed attribute information, then they should be more sensitive to changes in the objective value of the positively framed attribute than the negatively framed attribute. In other words, the slope of the evaluations of a series of positively framed attribute values should be steeper than the slope of the evaluations of a series of negatively framed attribute values (see fig. 3). Alternatively, if the results of experiment 1 occurred because attribute performance levels are differentially salient in each frame, then people should be equally sensitive to changes in the value of the positively framed attribute and the value of the negatively framed attribute. In other words, the slope of the evaluations of the positively framed attribute values should be equivalent to the slope of the evaluations of the negatively framed attribute values (not shown in fig. 3).

Design and Procedure

Seventy-four subjects from an undergraduate subject pool were asked to rate the same eight products investigated in experiment 1. The repeated-measures design consisted of a within-subjects manipulation of the frame (positive and negative) and frame value (value 1, 2, and 3), and a between-subjects manipulation of the attribute quantity level (favorable and unfavorable). The three frame values were 1% increases in the quantity of the framed ingredient. For example, subjects rated meat pasta sauce described as having “24% meat,” “25% meat,” and “26% meat” and “76% tomato sauce,” “75% tomato sauce,” and “74% tomato sauce.” The presentation order of the positive and negative frame values was counterbalanced between subjects so that half

FIGURE 3
PREDICTIONS AND RESULTS IN EXPERIMENT 2
of the subjects rated the positively framed products first and half of the subjects rated the negatively framed products first. A 3-min filler task separated the rating of the positive and negative frames. The sequence of the frame values was also counterbalanced between subjects so that half of the subjects received the frame values in ascending order (e.g., 24%, 25%, 26% for the positive frame and 76%, 75%, 74% for the corresponding negative frame) and half received the frame values in descending order (e.g., 26%, 25%, 24% for the positive frame and 74%, 75%, 76% for the corresponding negative frame). Product ratings were recorded on a bipolar scale ranging from −100 (poor) to +100 (good). The stimuli are presented in the appendix.

Results

The higher-order interactions between the counterbalance factors and the treatment variables were all statistically non-significant. The framing by attribute quantity level by replicate three-way interaction was also not significant ($F(7, 462) = 1.38, p > .10$), so we collapsed the replicate means and report the average means in figure 3. First, we confirmed that there was a framing by attribute quantity level interaction ($F(1, 66) = 11.79, p < .001$). Replicating experiment 1, evaluations of the positively framed attribute values ($M = 29.3$) were more favorable than the evaluations of the negatively framed attribute values ($M = 19.8$) when the attribute values were favorable and evaluations of the negatively framed attribute values ($M = 2.5$) were more favorable than evaluations of the positively framed attribute values ($M = −10.6$) when the attributes values were unfavorable. The results also show that the slope of the evaluation curve for the positively framed attribute values was significantly steeper than the slope of the evaluation curve for the negatively framed attribute values, as indicated by the framing by attribute value interaction ($F(1, 66) = 16.43, p < .001$). Subjects were more sensitive to incremental changes in attribute values in the positive frame than in the negative frame, an indication that the range of reference values for the positive frame was narrower.

Discussion

The results support the hypothesis that consumers use different subjective scales to evaluate values in opposing attribute frames. Our data suggest that people have a narrower set of reference values for frames that are frequently used to present product information (i.e., positive frames) and wider range of referent values for frames that are infrequently used to present product information (i.e., negative frames). As a consequence, people prefer positively framed attribute values to negatively framed attribute values when the value of the positively framed attribute is relatively high, but they prefer negatively framed attribute values to positively framed attribute values when the value of the positively framed attribute is relatively low. In addition, consumers are more sensitive to attribute value changes expressed in a positive frame than in a negative frame. This finding suggests that the attribute level by attribute frame interaction originally observed in experiment 1 was not due to a mechanism that relied on the relative salience of the framed ingredient percentages.

Two remaining issues need to be addressed before we can confidently claim that attribute-framing manipulations encourage people to adopt different subjective scales. First, the results of experiment 2 are also consistent with a two-part process that posits an initial judgment of an attribute value (e.g., “4% meat” is bad) and then incremental adjustments for judgments of each additional attribute value (e.g., “5% meat,” “6% meat”). Note that the set of values evaluated in the positive frame conditions were of a much smaller magnitude than the values evaluated in the negative frame conditions; hence relative changes in attribute values were proportionately larger. For example, a 2% change from 4% to 6% in the positive frame is proportionately larger than a 2% change from 96% to 94% in the negative frame. Thus, people may have made an initial judgment about whether an attribute level was good or bad and then made incremental adjustments to this estimate based on the relative magnitude of the percentage change in the quantity of the attribute.

One method of investigating the alternative hypothesis that subjects were making judgments based on the relative magnitude of attribute value changes is to test for differences in the slopes for each condition of each frame. Slopes were computed as the mean difference between the high and low values for each condition. If people were using the relative magnitudes of attribute value changes to make judgments of attribute performance, the slope of the positive frame should be greater in the unfavorable condition (e.g., a 2% change from 4% to 6%) than in the favorable condition (e.g., a 2% change from 24% to 26%). This test was significant ($F(1, 72) = 23.81, p < .001$). Likewise, the slope of the negative frame should be greater in the favorable condition (e.g., a 2% change from 76% to 74%) than in the unfavorable condition (e.g., a 2% change from 96% to 94%). The data showed the opposite pattern of results. The slope of the negative frame was significantly smaller in the favorable condition than in the unfavorable condition ($F(1, 72) = 7.56, p < .01$). Thus, the evidence from experiment 2 is not consistent with a two-stage process involving an initial positive or negative judgment followed by adjustments that were sensitive to the magnitude of the change in the value of the attribute.

A second issue relates to the uniform, negative direction of the unfavorable attribute level manipulation in experiments 1 and 2. In the first two experiments, we decreased (increased) the value of the positively (negatively) framed attribute to show that the negative frame could be superior to the positive frame. Our manipulation was effective because we used stimuli that had a narrower set of reference values for the positive frame than the negative frame, as shown in figures 2.1 and 2.2. In effect, we showed that bad products appear “less bad” when presented in a negative frame. Alternatively, we could have used stimuli where an increase in the value of the positively framed attribute should...
benefit the negative frame (i.e., good products appear “less good” when presented in a positive frame). Stimuli that have a narrower reference set for the negative frame, as shown in figures 2.3 and 2.4, should exhibit this property. This demonstration would be damaging to any alternative hypothesis that relies on the fact that unfavorable attribute values led to a higher evaluation of the negative frame in experiments 1 and 2. We investigate this issue in experiment 3.

EXPERIMENT 3

In experiment 3, we investigate stimuli where the positive attribute frame is likely to evoke a wider range of reference values than the negative frame. When the positive attribute frame evokes a wider range of reference values than the negative attribute frame, increasing the appeal of the attribute value (e.g., moving from region B to region D in figs. 2.3 and 2.4) should provide less of a benefit to the positively framed attribute.

Design, Stimuli, and Procedure

The experiment was a 2 (frame) by 2 (attribute quantity level) by 4 (replicate) repeated-measures design consisting of a within-subjects manipulation of frame label (positive and negative) and a between-subjects manipulation of the attribute quantity level (unfavorable and favorable). Unfavorable attribute quantity levels were selected to represent point B in figures 2.3 and 2.4, whereas favorable attribute quantity levels were selected to represent point D in figures 2.3 and 2.4.

We selected four stimuli using criteria similar to those used in experiments 1 and 2. We wanted stimuli that consisted of only two ingredients, that had positively and negatively perceived ingredients, and that improved as the positive ingredient improved. In addition, we wanted products where the negative frame was likely to evoke a narrower range of reference values than the positive frame. Based on these criteria, four products were chosen: ground beef, turkey meat, skinless chicken breast, and tuna, with “fat” representing the negative frame and “lean” representing the positive frame. “Fat” was expected to evoke a narrower range of reference values than “lean” because (1) all nutritional information labels list the fat content of products and (2) food manufacturers often promote products by advertising their low “fat” content. Thus, we expected that consumers would have more experience with negative than with positive frames for these products. The frames and attribute quantity levels for each replicate are shown in the appendix.

The procedure was identical to experiment 1 and included a 3-min filler task between the presentation of the positive and negative frames.

Results

Manipulation Check. A manipulation check was used to confirm that the negative frame evoked a narrower range of reference values than the positive frame. Thirty-two subjects were exposed to the negative (e.g., fat) or positive (e.g., lean) frame and asked to estimate the percentage of fat/meat in the product. For example, the ground beef replicate instructions said, “Ground beef can be described as having X% fat. How fatty would you expect the highest quality ground beef to be? How fatty would you expect the lowest quality ground beef to be?” The positive frame replaced the words “fat”/“fatty” with the word “lean.”

The framing by replicate interaction was not statistically significant (F(3, 90) = 1.25, p > .10), so we collapsed the replicate means. As expected, the negative frame produced a narrower range of attribute values (M<sub>high-quality = 8.2% fat</sub>, M<sub>low-quality = 25.4% fat</sub>) than the positive frame (M<sub>high-quality = 78.8% lean (21.2% fat)</sub>, M<sub>low-quality = 45.2% lean (54.8% fat)</sub>; F(1,30) = 10.56, p < .05). We note that the lower boundary in the negative frame (e.g., 8.2% fat) is lower than the corresponding upper boundary in the positive frame (e.g., 78.8% lean [21.2% fat]). Thus, reducing the fat content should favor the negatively framed attribute, but should not necessarily create an evaluation reversal.

Attribute Ratings. Thirty-five students from an undergraduate subject pool received extra credit for participation in the study. The higher-order interactions between the counterbalance factors and the treatment variables were all statistically nonsignificant. There was no framing by attribute level by replicate three-way interaction (F(3, 93) = 1.18, p > .10), so we collapsed the replicate means. There was a significant framing by attribute level interaction (F(1,31) = 6.64, p < .05), as would be expected if the subjective scale differed for the positively and negatively framed attributes. Subjects’ evaluations of the positively framed attributes (M = 31.61) were significantly greater than those of the negatively framed attributes (M = 13.84) when the attribute values were unfavorable (F(1,13) = 5.31, p < .05). Subjects’ evaluations of the positively framed attributes (M = 61.88) were lower than those of the negatively framed attributes (M = 66.46) when the preferred ingredient values were favorable, although this difference was not statistically significant (F(1,18) = 0.83, p > .10).

Discussion

The data from experiment 3 show that the advantage of positive framing disappears when the attribute level is increased from unfavorable values (e.g., “85% lean”/“15% fat”) to favorable values (e.g., “99% lean”/“1% fat”). Unlike experiments 1 and 2, where making attribute values more unfavorable benefited the negative frame, experiment 3 showed that making attribute values more favorable benefited the negative frame. If positive associations are the only factor responsible for the framing effect, then the framing effect should have persisted as the positive frame attribute values became more attractive.

As with experiment 1, an alternative explanation for the results of experiment 3 is a response language effect (Lynch et al. 1991). Similar to experiment 1, choice data were used to provide evidence against a response language effect. Ninety-three subjects were randomly assigned to one of the
four frame by value conditions and asked if they were willing to purchase the product at a given price (e.g., meat that is 25% fat at $3.29/lb). Using the same prices for each of the four conditions of a given replicate, we found a significant frame by value interaction ($\chi^2 = 17.28, p < .001$). Collapsing across replicates, a greater proportion of people were willing to purchase the positively framed product (32.0%) than the negatively framed product (5.4%) when the attribute values were unfavorable ($t(190) = 4.93, p < .001$), but a smaller proportion were willing to purchase the positively framed product (33.3%) than the negatively framed product (46.4%) when the attribute values were favorable ($t(178) = -1.80, p < .05$, one-tail).

The evaluation and choice data are consistent with the hypothesis that people evoke reference sets with different ranges of values in the positive and negative frame. The positive frame evoked a wider set of reference values than the negative frame. Hence, unfavorable attribute values were perceived as more positive in the positive frame than in the negative frame, and favorable attribute values were perceived as more positive in the negative frame than in the positive frame. The weak preference for the negatively framed favorable attribute values can be attributed to the countervailing effects of scale ranges and scale endpoints. As illustrated by the manipulation check data, the negative frame had a narrow range of reference values, which favored the negative frame as fat content was lowered, and the negative frame also had a scale endpoint that was lower than the corresponding scale endpoint in the positive frame, which favored the positive frame as fat content was lowered.

Thus far, we have purposely selected stimuli where the endpoints of the reference set for the negative frame were (1) wider than the endpoints of the reference set for the positive frame (e.g., experiments 1 and 2) or (2) narrower than the endpoints of the reference set for the positive frame (e.g., experiment 3). However, not all positive/negative attribute frames fall into one of these two classifications. There are certainly frames where the endpoints of the reference set for the positive frame are uniformly lower than the corresponding endpoints of the reference set for the negative frame and, as a consequence, a wide range of positively framed attribute values are preferred to their negatively framed counterpart values (see fig. 4). These results should not be viewed as evidence that reference sets do not contribute to framing effects for some stimuli. Instead, these frames are simply insensitive to the value shift manipulations used in the previous studies. To provide direct evidence that attribute-framing effects depend on the distribution of reference stimuli, we must manipulate the range of reference values and provide evidence that reference sets can influence attribute evaluations in this third class of stimuli.

**EXPERIMENT 4**

In experiment 4, we wanted to actively influence the reference values people used to judge a framed attribute value. There were two options for achieving this objective. Option 1 was to give people experiences with different values in the positive and negative frame. Option 2 was to give people different levels of experience with an attribute frame. We preferred the second option to the first. With respect to the first option, giving people prior experience with different attribute values in each frame is an exercise in calibration—giving people experience with lower (higher) values in the negative (positive) frame would simply shift the reference set lower (higher). This type of demonstration is common in context studies (e.g., Parducci 1965; Volkmann 1951) and thus would contribute little new knowledge. With respect to the second option, there are few demonstrations that experience with a frame, or any attribute dimension, substantially influences the reference set used to make a judgment. Yet, experience with a frame should encourage a person to establish a set of accessible reference values in memory. In subsequent judgments involving the frame, the person can recruit reference values from within the context-specific domain as opposed to across a set of domains associated with the frame. Thus, just as within-category variability on a dimension is less than between-category variability on a dimension, within-context reference values should be less variable than between-context reference values.
Design and Procedure

The experiment used a two (experience/no experience) by two (positive/negative frame) by two (unfavorable/favorable attribute value) between-subjects design. In the experience condition, a two-stage procedure was used. In stage 1 of the experience condition, subjects were shown a list of 10 franchise opportunities in the local area: a nightclub, an upscale restaurant, a bookstore, a pizza shop, a CD store, a coffee shop, a fashion boutique, a toy store, a furniture store, and a sports bar. Half of the subjects were asked to estimate the failure rate (experience with a negative frame) for each franchise given the current business environment in the local area. Unbeknownst to participants, the 10 failure rate estimates were recorded and averaged to create a normative failure rate estimate for each subject. This estimate was subsequently used in stage 2 of the experiment.

In stage 2 of the experiment, subjects were asked to evaluate the attractiveness of a target franchise opportunity, a fast food fried chicken restaurant, based on an estimated performance level advertised by the franchiser. The performance level was framed as “X% success” or “X% failure” and the level was set to be 15% above (unfavorable) or 15% below (favorable) the subject’s average estimate of business failure elicited in stage 1. For example, assume a subject’s failure estimate averaged 40% in stage 1. The subject could receive either a 55% failure frame (40% failure + 15%) or a 45% success frame in the unfavorable attribute level condition. Similarly, the subject could receive either a 25% failure frame (40% failure – 15%) or a 75% success frame in the favorable attribute level condition.

The no experience condition was a control condition. In the no experience condition, subjects skipped stage 1 of the procedure (i.e., no experience with the negative frame) and participated only in stage 2. Because control group subjects did not estimate failure rates in stage 1, the framed performance rates were based on the mean estimated failure rate for the fried chicken franchise that were collected in an earlier pretest. Note that this rate (38% failure) fortuitously was equivalent to the mean average estimated failure rate in the four experience conditions ($M = 37.5; t(91) < 1.0$). As a result, the framed performance rates presented to the control groups essentially matched the mean rates presented to the experience groups.

Predictions

We predict that experience with a negative frame will result in a narrower set of reference values and these reference values will only exert their influence when the target franchise opportunity is presented using a negative frame. In the negative frame conditions, people who had prior experience with the 10 failure scenarios should be more sensitive to differences in a franchise’s potential failure rates than people who had no experience with the failure scenarios (i.e., control subjects). In the positive frame conditions, people who had prior experience with the 10 failure scenarios should behave no differently than people who had no experience with the failure scenarios.

Assumptions and Potential Confounds

The goals of experiment 4 required that we confirm assumptions about the target stimuli and that we collect data to rule out potential confounds. First, we tested the assumption that the “success” attribute frame was superior to the “failure” attribute frame for the four levels of attribute values we planned to use in the control group (see appendix). We tested this assumption using a four-cell between-subjects design. Eighty-three subjects estimated high and low probabilities of (1) expected success for a fast food fried chicken franchise having an advertised success level of either 78% or 48% or (2) expected failure for a fast food fried chicken franchise having a franchiser advertised failure level of either 22% or 52%. As expected, the range of estimated probabilities was superior in the success conditions than in the corresponding failure conditions. The low probability estimate in the 78% success condition ($M_{.78\% success} = .35$) was lower than in the 22% failure condition ($M_{.22\% failure} = .47 failure [.53 success]$). The low probability estimate in the 48% success condition ($M_{.48\% success} = .26$) was lower than in the 52% failure condition ($M_{.52\% failure} = .53 failure [.47 success]$). The main effect test for a difference in the lower bounds was significant ($F(1,79) = 17.86, p < .05$). The high probability estimate in the 78% success condition ($M_{.78\% success} = .70$) was lower than in the 22% failure condition ($M_{.22\% failure} = .12 failure [.88 success]$). The high probability estimate in the 48% success condition ($M_{.48\% success} = .56$) was lower than in the 52% failure condition ($M_{.52\% failure} = .28 failure [.72 success]$). The main effect test for a difference in the upper bounds was significant ($F(1,79) = 16.93, p < .05$). There was no frame by level interaction for lower or upper bounds (both $F’s < 1.0$). These data suggest that attribute values in the “failure” frame may be judged more negatively because the set of reference values evoked when judging values in this frame is relatively higher (see value $C$ in Fig. 4 for illustration).

We also made an effort to rule out potential confounds in the experiment. Experience with the negative frame involved asking subjects to judge the probability of failure for a set of 10 franchise opportunities. We hypothesized that the experience of making failure judgments would reduce the range of reference values used to judge the attractiveness of a franchise offer framed as having a specific failure rate. There were two concerns. First, it was also possible that the set of 10 franchise failure estimates provided by the subjects in the experience condition would have a lower range of failure rates than the expected range of failure rates provided by the control subjects who simply thought about a fried chicken restaurant. If this were the case, the experience condition would be the equivalent of providing subjects with a restricted set of reference values in the negative frame (i.e., our discarded option for influencing reference values). To investigate this potential confound, 32 subjects were asked to judge the expected failure rate of the 10 franchise op-
portunities and the expected failure rate, lowest expected failure rate, and the highest expected failure rate of a fast food fried chicken restaurant. The average range of expected failure rates across the 10 franchise opportunities was 55%, whereas the average range of the lowest and highest expected failure rates for the fried chicken restaurant was 26%. Thus, it did not seem to be the case that we selected a set of 10 franchise opportunities that represented a smaller range of reference values than the range of values that were naturally recruited to judge the fast food fried chicken franchise opportunity. The second concern was that the average expected failure rate for the 10 franchise opportunities was higher than the expected failure rate for the fast food fried chicken restaurant. Both estimates were 37% (t(32) < 1.0), so this did not seem to be a problem.

Results

One hundred eighty-five students from an undergraduate subject pool participated in the experiment for extra credit and were randomly assigned to one of the eight conditions. The means of the eight conditions are shown in figure 5. Owing to the a priori hypotheses, two-way interactions were investigated within the positive and negative frame conditions. When subjects were asked to evaluate a fried chicken franchise advertised as having a “X% probability of failure,” there was a significant experience by attribute level interaction (F(1,177) = 8.65, p < .01). Changing the level of failure from an unfavorable (M = −36.0) to a favorable (M = 57.0) level in the experience condition had a much larger impact on judgments than changing the level of failure from an unfavorable (M = −42.1) to a favorable (M = 5.9) level in the control condition. When positive frame subjects were asked to evaluate a fried chicken franchise advertised as having a “X% probability of success,” there was a nonsignificant exposure by attribute level interaction (F(1,177) = 1.22, p > .10). This means that experience with the failure scenarios did not change the subjects’ sensitivities to changes in attribute values expressed in the positive frame. We also note that positive frame subjects who had experienced the failure scenarios (M = 24.0) did not judge the franchise opportunity differently than positive frame subjects in the control condition (M = 26.9; F(1,177) = 0.22, p > .10).

We conducted a final test to confirm that the positive frame resulted in more positive evaluations than the negative frame in the absence of experience with the negative frame. Using only the control condition data, the main effect of frame was significant (F(1,180) = 31.16, p < .01). Subjects’ evaluations of the positive frame (M = 26.9) were significantly more favorable than those of the negative frame (M = −18.13).

Discussion

The data from experiment 4 show that experience with a negative frame affects a subsequent judgment made in a negative frame but does not affect a subsequent judgment made in a positive frame. People who made prior judgments about the likelihood of business failures were more sensitive to changes in the advertised rate of failure of a target business than those who did not make prior judgments. People who made prior judgments about the likelihood of business failures were no more sensitive to changes in the advertised rate of success of a target business than those who did not make prior judgments. The results are consistent with the hypothesis that experience with a frame reduces the range of reference values used to judge attribute values in that frame, even if the experience itself does not expose people to a restricted set of objective values.

GENERAL DISCUSSION

There is little doubt that attribute framing influences judgments of product attractiveness. The issue is how this effect occurs and what factors affect the direction and magnitude of attribute-framing effects. The prevailing view is that attribute-framing effects occur due to the affective recruitment associated with the frame. Levin et al. (1998) argue that attribute-framing effects occur because information is encoded relative to its descriptive valence. The encoding encourages people to recruit valance-consistent associations that are subsequently integrated into judgments about the attribute value. We offer an additional explanation of framing effects. We argue that framed attribute values are evaluated relative to evoked sets of reference values and that different attribute frames can evoke different reference sets. Across four studies, we show that attribute framing depends on the location of attribute values within the expected range of values and on the amount of experience the consumer has with a particular frame, each of which is consistent with the reference-set hypothesis.

These results are important for a number of reasons. First, they demonstrate that attribute framing need not merely re-
sult in uniform shifts in preferences. Instead, as we demonstrate, attribute values at one end of the anticipated attribute range may become more (or less) attractive when positively framed, whereas attribute values at the opposite end become less (or more) attractive when similarly framed. Prior work on attribute framing implied that all products would benefit equally from describing desirable attributes in a positive frame. Contrary to this recommendation, our results suggest that a positive frame may particularly benefit products that have better-than-average values of this attribute but may harm products that have worse-than-average values of the attribute, at least in categories where positive framing is the norm.

Second, our results show that attribute framing is sensitive to the experience that the consumer has with the frame. We argue that people often have different histories of experience with each frame. This experience can create differences in the endpoints of the range of reference values, as was shown in the pretest data for experiments 3 and 4. Experience can also restrict the range of reference values and make people more sensitive to changes in attribute values, as was shown in experiment 4. This result suggests that attribute-framing effects may have relatively little impact for first-time buyers, the potential for significant impact when experience is limited to one frame or experienced values vary by frame, and limited impact when experience allows people to effortlessly convert perceptions from one frame to another.

Third, our results point to yet another manner in which reference stimuli influence product perception. It is accepted that product perceptions are typically based on comparisons between the products and different referents. In many theories, a single reference level is assumed (e.g., Kahneman and Tversky 1979; Thaler 1985). Our work demonstrates that framing does more than invoke a single reference level. Our results are consistent with the theory that the frame in which a stimulus is described evokes an entire reference set of stimuli that collectively define not just the central tendency of consumer expectations but also their range. Furthermore, unlike the existing research that shows the effects of attribute range by manipulating the stimulus distribution (Cooke and Mellers 1998; Mellers and Cooke 1994), the current work demonstrates that such reference contexts can be evoked through the description of a single stimulus.

Although our results are consistent with the reference set hypothesis and cannot be fully explained by the affective recruitment hypothesis, it is important to note that both processes operate at different ends under different conditions. Because both processes rely on information retrieved from memory, it is difficult to define the boundary conditions of each process. Existing research techniques do not allow us to determine the relative contribution of each process to multiattribute judgment. Nonetheless, it is important to anticipate boundary conditions. First, we expect affective priming will be more influential than the reference set when attributes are not described using quantitative levels. For example, when a product is described as “fatty” or “lean,” there is no attribute value to be judged in the context of other values. Second, when frames are specific and judgments are general, people may be discouraged from judging the specific attribute value. For example, a car with a braking system that is “100% reliable” versus “never fails” may be judged a better “value” because of general associations to reliability as opposed to specific judgments about reliability. Third, when people have no experience with the positive or negative frame, the reference set for each frame is likely to be ill-defined and any differences in evaluation are likely to be a consequence of priming.

Areas for Future Research

Our research has clarified some of the processes underlying attribute-framing effects, but it has also brought other issues under scrutiny. We claim that the way an attribute is described affects the set of reference stimuli recruited. However, in all our studies, stimuli were judged in isolation. In such instances, it is natural for consumers to recruit other reference stimuli and use those stimuli to determine the value of the current stimulus. However, in many purchasing environments, the consumer has both these internal and external referents available. It is not clear how consumers will deal with such situations. One possibility is that the local stimulus context will override any reference set evoked from memory, producing effects of the available product context but little effect of framing (Niedrich et al. 2001). Another possibility is that the consumer will merge the local and evoked sets to form a more complete reference set. If so, consumers will be influenced both by local context and by the frame.

A related issue is the persistence of framing effects. Our research suggests that attribute-framing effects are sensitive to the experience that a consumer has with the frame. This implies that one method to debias some framing effects is to present products using both frames. If one is exposed to yogurts that are sometimes described in terms of percent fat content and other times are described in terms of absence of fat, consumers may converge on a single reference set that operates under either description. It would seem likely that explicit comparisons between products using different frames would hasten this convergence.

Another concern is how consumers encode product experience. Our work suggests that the range of the reference sets consumers recruit depends on their experience with the frame. In experiment 4, we showed that when people are presented with a set of stimuli described using one frame, they will use this frame to evaluate other stimuli presented in the same frame. But how similar must the categories be for the particular reference set to be evoked? In experiment 4, the stimuli consisted of different types of businesses in the same community. Although business success certainly depends on the type of business, it also certainly depends on the community. Thus, it is reasonable for subjects to view the two factors as causally related. But what if the context and the target stimulus are not causally connected? For example, if people are exposed to product failure rates for one product category, does this experience influence the framing of success/failure for other product categories?
Conclusions

This article examines the mechanisms producing attribute-framing effects. We find that attribute framing depends on both the level of the framed attribute and on the experience that the consumer has with similarly framed products. We propose that attribute frames naturally evoke a reference set relative to which individual stimuli are evaluated and that different frames can evoke different reference sets. When the reference sets evoked by alternative frames differ in range, they produce systematic differences in the effects of the framed attribute. Experience with a particular frame tends to reduce the range of the reference set for that frame but leaves the evoked reference set for the alternative frame relatively unchanged. We conclude that reference sets play an important role in the direction and magnitude of framing effects.

APPENDIX

TABLE A1

EXPERIMENT 1 AND 2 STIMULI

<table>
<thead>
<tr>
<th>Evaluation statement</th>
<th>Unfavorable</th>
<th>Favorable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive frame</td>
<td>Negative frame</td>
</tr>
<tr>
<td>Judge the value of fruit yogurt that is:</td>
<td>4%, 5%, 6%</td>
<td>96%, 95%, 94%</td>
</tr>
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<td>fruit yogurt</td>
<td>96%, 95%, 94%</td>
<td>24%, 25%, 26%</td>
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<tr>
<td>Judge the taste of a jelly donut that is:</td>
<td>2%, 3%, 4%</td>
<td>98%, 97%, 96%</td>
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<td>jelly donut</td>
<td>99%, 98%, 97%</td>
<td>14%, 15%, 16%</td>
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<tr>
<td>Judge the moisturizing ability of aloe soap that is:</td>
<td>1%, 2%, 3%</td>
<td>99%, 98%, 97%</td>
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<td>aloe soap</td>
<td>99%, 98%, 97%</td>
<td>14%, 15%, 16%</td>
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<td>Judge the healthiness of ginseng tea that is:</td>
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<td>98%, 95%, 94%</td>
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<td>99%, 98%, 97%</td>
<td>19%, 20%, 21%</td>
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<tr>
<td>Judge the taste of cookies and cream ice cream that is:</td>
<td>1%, 2%, 3%</td>
<td>99%, 98%, 97%</td>
</tr>
<tr>
<td>cookies and cream ice cream</td>
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<td>19%, 20%, 21%</td>
</tr>
<tr>
<td>Judge the healthiness of ground beef that is:</td>
<td>75% lean</td>
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<td>ground beef</td>
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<td>Judge the healthiness of turkey meat that is:</td>
<td>80% lean</td>
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<tr>
<td>turkey meat</td>
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<tr>
<td>Judge the healthiness of skinless chicken breast that is:</td>
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<td>skinless chicken breast</td>
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<td>Judge the healthiness of tuna that is:</td>
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</tr>
<tr>
<td>tuna</td>
<td>10% fat</td>
<td>99% lean</td>
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NOTE.—Bold values were used in experiment 1. All values were used in experiment 2.

TABLE A2

EXPERIMENT 3 STIMULI

<table>
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<tr>
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<td>Negative frame</td>
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<td>Judge the healthiness of ground beef that is:</td>
<td>75% lean</td>
<td>25% fat</td>
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<tr>
<td>ground beef</td>
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<td>100% lean</td>
</tr>
<tr>
<td>Judge the healthiness of turkey meat that is:</td>
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<tr>
<td>turkey meat</td>
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<tr>
<td>Judge the healthiness of skinless chicken breast that is:</td>
<td>85% lean</td>
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<tr>
<td>Judge the healthiness of tuna that is:</td>
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<td>tuna</td>
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TABLE A3

EXPERIMENT 4 TREATMENT GROUP STIMULI

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<tbody>
<tr>
<td></td>
<td>Positive frame</td>
<td>Negative frame</td>
</tr>
<tr>
<td>Average failure rate</td>
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<td>38.1%</td>
</tr>
<tr>
<td>Adjustment applied to subject’s average failure rate estimate:</td>
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<td>+15.0%</td>
</tr>
<tr>
<td>Example: Judge the attractiveness of a fast food fried chicken franchise that typically has a “___” rate.</td>
<td>47% success</td>
<td>53% failure</td>
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</table>
REFERENCES


[David Glen Mick served as editor and Joel Huber served as associate editor for this article.]