KAREN RUSSO FRANCE AND PAULA FITZGERALD BONE

Policy Makers' Paradigms and Evidence from Consumer Interpretations of Dietary Supplement Labels

The regulation of marketplace information regarding health and nutrition is in flux. Nowhere, perhaps, is this more evident than in the dietary supplement industry. Herein, we present an experiment that examines the two major types of claims used for dietary supplements, testing the underlying assumptions made by policy makers. Our study suggests that a direct-effects consumer decision-making model does not apply in this context; instead, consumers process label claims through various biasing filters.

> A well-informed public is one of the best weapons against some of the biggest public health threats facing the country. Simply put, better information means that consumers can make better health choices (FDA 2004, 1).

During 2003, the Food and Drug Administration (FDA) undertook a number of initiatives with the goal of improving consumer information that should, in turn, lead to "smarter decisions about the foods they eat" (FDA 2004, 11). Among these initiatives were interim regulations and industry guidance allowing qualified statements that describe the relationship between a particular food or supplement (e.g., walnuts or antioxidant vitamins) and a particular disease or health condition (e.g., heart disease or cancer). The FDA noted that "Recent court decisions have clarified the need to provide for health claims based on somewhat settled science rather than just on the standards of significant scientific agreement, as long as the claims do not mislead the consumers" (FDA 2003c, 1). Thus, the FDA provided interim industry guidance regarding unqualified and qualified health claims, proposing four levels of scientific certainty ranging from "significant scientific certainty" to "extremely low level of comfort" appropriate for both dietary supplements and conventional foods (FDA 2003b).

Given the above, it appears that the FDA's treatment of food claims is being influenced by changes in the regulation of dietary supplements. Indeed, the regulation of marketplace information within the supplement

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industry has undergone significant changes over the past few years—a situation resulting from a confluence of changes in consumer attitudes, legislative action, industry activity, and court rulings. A major catalyst for these changes occurred with the 1994 passing of the Dietary Supplement Health and Education Act (DSHEA). This legislation allows dietary supplement manufactures to use "structure function" claims, such as, "Helps promote a healthy emotional balance," on supplement package labels without premarket FDA approval, provided the legislated disclaimer is included.

While DSHEA allowed much greater freedom to dietary supplement marketers in making package claims, the FDA continued to restrict specific health claims that linked consumption of a supplement to a specific disease or health condition. This restriction, however, was successfully challenged in Pearson v. Shalala (1999). Judges concluded that the FDA's reluctance to allow health claims on dietary supplements (e.g., "Consumption of fiber may reduce the risk of colorectal cancer") when accompanied by appropriate disclaimers was "draconian" and an unnecessary restriction of free speech. This ruling sparked further changes in the manner in which health information is provided to consumers on food and supplement packages.

Thus, our purpose is to empirically examine the current information environment in the dietary supplement industry. We are guided by two paradigms regarding consumer information processing—one arising from a "direct-effects" approach to consumer decision making and the other placing product labeling in a context that considers consumer biases. We look at consumer beliefs derived from structure function claims as well as disease claims and examine how such claims are interpreted when accompanied by disclaimers. We examine product-specific beliefs in light of consumers' more abstract beliefs regarding their approach to health, the supplement industry, and the government. We begin by providing background information regarding the regulation of dietary supplements. We then address the relevant literature while presenting our hypotheses. Finally, we provide data that test the two paradigms of consumer information processing.

BACKGROUND

The 1994 Dietary Supplement Health Education Act created a new class of product that is neither food nor drug—but is instead labeled "dietary supplement." This industry is large, estimated at $12.7 billion in 1997 (Nutrition Business International 1998). In April of 1998, the FDA proposed a rule for use of claims by dietary supplement manufacturers. The FDA proposal discussed three types of claims: (1) structure function

claims—claims that declare the effect of the supplement on a body system (e.g., helps maintain cardiovascular function), (2) implied disease claims—claims that do not explicitly mention a disease but would lead a consumer to infer a disease (e.g., prevents development of malignant tumors), and (3) express disease claims—claims that explicitly name the disease (e.g., for prevention of osteoporosis; FDA 1998). This controversial proposal sparked over 22,000 individually prepared responses. Many consumer groups were aligned with the industry and felt that the FDA proposal unnecessarily restricted a company's ability to communicate valuable information. Yet, much of the medical community felt that the proposal was not restrictive enough—allowing too many claims that lacked the needed supporting evidence.

The FDA's final rule regarding structure function claims, effective February 7, 2000, attempted to clarify when a particular claim would be deemed a structure function claim, thus not requiring premarket FDA approval (FDA 2000a). Structure function claims cannot be misleading and must be accompanied by the legislated disclosure, "This statement had not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease." The FDA considers any claim that is not a structure function claim (including implied disease claims) to be a disease claim, thus requiring review and approval under the Federal Food, Drug and Cosmetic Act.[1] However, circuit court judges reprimanded the FDA's reluctance to allow disease claims on dietary supplements, suggesting that the FDA's procedures and decisions infringe upon First Amendment Rights (Pearson v. Shalala 1999). The court recommended that disease claims be allowed, as long as appropriate disclaimers accompany such claims. The critical issue with respect to disease claims appears to be the amount of scientific evidence supporting the claim. Prior to Pearson v. Shalala, disease claims were allowed only when there was "significant scientific agreement" regarding the relationship. Now, however, "emerging science" must also be considered, allowing for the possibility of a qualified disease claim. As an example, on October 31, 2000, the FDA approved the disease claim, "Consumption of omega-3 fatty acids may reduce the risk of coronary heart disease," on omega-3 supplements but only when a disclaimer regarding the preliminary nature of the evidence was provided (FDA 2000b). The FDA suggested the following disclaimer:

> The scientific evidence about whether omega-3 fatty acids may reduce the risk of coronary heart disease (CHD) is suggestive, but not conclusive. Studies in the general population have looked at diets containing fish and it is not known whether diets or omega-3 fatty acids in fish may have a possible effect on a reduced risk of CHD. It is

not known what effect omega-3 fatty acids may or may not have on risk of CHD in the general population.

From the above, it appears that the legislature, the courts, and the FDA policy makers assume that consumers directly incorporate labeling information into their belief system in an unbiased manner that allows for fine categorization of information. Yet, as is detailed below, much consumer behavior literature suggests that consumers are often subject to systematic and pervasive biases.

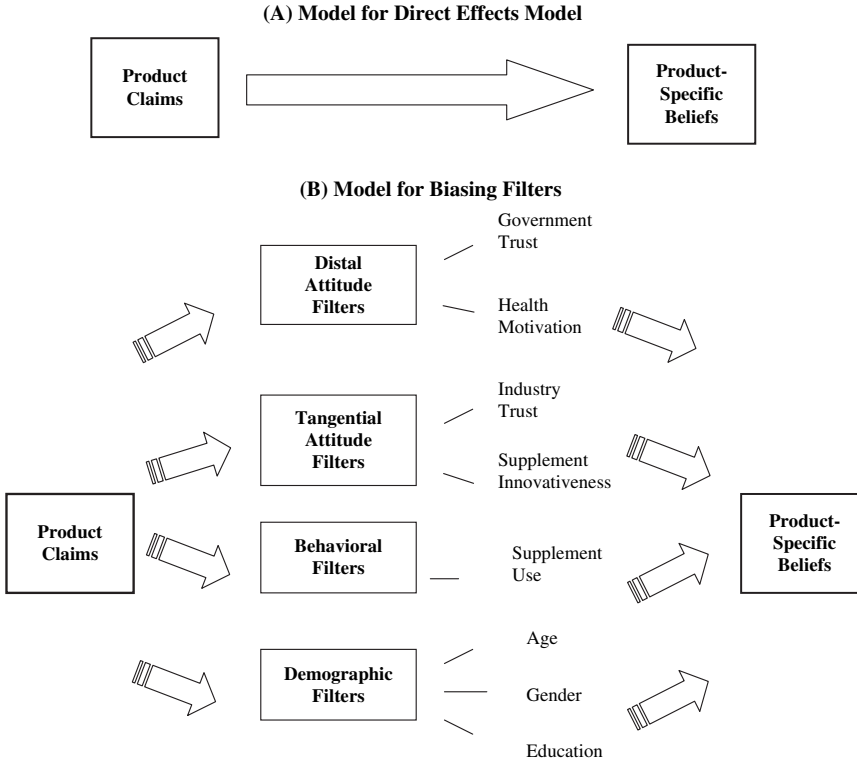
EXISTING LITERATURE

We draw upon two streams of consumer behavior and public policy research in this investigation: (1) disclaimers and product warnings and (2) consumer information processing, particularly the tendency to interpret information in light of prior beliefs. We suggest that while the extant literature on expectancy effects deals with product-specific expectations, these biases are more pervasive and that product perceptions are impacted by both distal and tangential beliefs (see Figure 1).

Disclaimers and Warnings

The research regarding disclaimers suggests that disclaimers may not have the intended impact on consumer beliefs and that disclaimers need to be carefully and strongly worded to be effective. For instance, Andrews, Netemeyer, and Burton (1998) and Andrews, Burton, and Netemeyer (2000) studied the interaction of food advertising claims, nutrition knowledge, and disclosures on consumer beliefs. They found that evaluative disclosures with risk identification, which included a statement regarding whether the product was "high" or "low" in a nutrient as well as the health consequences of consuming the nutrient, were more effective than absolute disclosures ("Contains 500 mg of sodium per serving"). Additionally, disclosures were most effective when the advertising claim was general (i.e., the product is described as being "healthier"). Murphy, Hoppock, and Rusk's (1998) multiphase advertising investigation began with a study of "halo" effects (effects in which a health claim about a beneficial nutrient found in a food reflects positively on beliefs regarding the products' overall nutrition) and found the "strong" disclosure confused consumers. Only a revised strong disclosure, which specifically used the name brand, improved the subjects' ability to understand how much fat or sodium was in the experimental product. In the second phase of their investigation, Murphy, Hoppock, and Rusk examined "substitution" claims—i.e., that

FIGURE 1
Theoretical Model



one product is "better" than another and thus could be substituted—and the effect of relevant disclosures. None of the disclosures, regardless of their strength, influenced consumers, and the authors characterized these results as the "unimpressive showing of the remedy disclosures" (44). Finally, in the third phase of their research, Murphy, Hoppock, and Rusk tested two product/disease combinations—vitamins' effect on cancer and margarine's effect on blood cholesterol within the advertising context. They examined four types of disclosures ranging from a proof claim ("Medical research has proven that supplements containing these same antioxidant vitamins also reduce the risk of cancer") to a qualified claim ("Some medical studies are now finding…," and "Scientists won't be sure until longer term research is completed"). They report that the very highly qualified and the highly qualified cells resulted in lower scientific certainty ratings than did the "proof" cell. However, the scientific certainty means between the qualified claim, which is most like the current disclaimers used in the market, and the

proof claim did not differ significantly from each other. In sum, the evidence suggests, "The history of print ad disclosures in 'curing' misleading adverting impression is not good" (Andrews, Netemeyer, and Burton 1998).

Stewart and Martin's (1994) work in the area of product warning labels can also be used to frame consumer understanding of claims and disclaimers. They suggest that warnings have different effects on consumers, depending on the consumer's ability to comprehend the message, the message's believability, the relevance of the message to the consumer, and the consumer's predisposition to believe or reject the message. Empirical evidence supports their views. For instance, the consumer's ability to comprehend a message may be facilitated by message structure. Ford et al. (1996) found that clear nutritional information, in which the nutrient content was labeled in absolute terms and with verbal qualifiers such as high or low, was more effective in influencing consumer beliefs. Wansink (2003) found that when a short disease claim on the front of a package label was accompanied by a longer claim on the back label, the consumer's ability to process the claim was increased. The personal relevance of the message to the consumer may correspond to the "strength" of the message discussed by Murphy, Hoppock, and Rusk (1998) and to the risk identification disclosure that tied the nutritional information to a specific risk used by Andrews, Netemeyer, and Burton (1998). Specifically, in both these papers, the "stronger" disclosure tied nutritional information (e.g., saturated fat per serving: 7 g—used by Murphy, Hoppock, and Rusk 1998) to specific diseases (e.g., "saturated fat may increase the risk of heart disease"), thereby increasing the personal relevance of the information to the subject. Finally, Andrews, Netemeyer, and Burton (1998) and Andrews, Burton, and Netemeyer (2000) found that understanding of nutritional disclaimers was dependent on the consumer's level of nutritional knowledge. Thus, one must consider relevant background beliefs when attempting to provide information to the consumer.

Consumers' product perceptions and use of disclaimers may differ depending on whether one is discussing a structure function claim with the accompanying legislated disclaimer or whether the issue is a disease claim with accompanying scientific certainty disclaimer resulting from the Pearson v. Shalala case. Thus, we now turn our attention to these specific issues.

Structure Function Claims and DSHEA Disclaimer

Current regulations that make a distinction between structure function and disease claims are based on the legislatures', courts', and regulators' assumption that product labeling directly influences consumer beliefs (see Figure 1A). Structure function claims are designed to inform consumers

that the product supports a particular body function; however, it would be incorrect for such a claim to lead a consumer to believe that the product is effective in preventing a disease or that it effectively treats or cures a particular disease. Thus, based on the direct-effects model, we hypothesize

H1: Consumer beliefs regarding the effectiveness of a supplement in preventing, treating, or curing a disease are lower when exposed to a structure function claim than when exposed to a disease claim.

The purpose of the DSHEA disclaimer (e.g., "These statements have not been evaluated by the FDA. This product is not intended to diagnose, treat, cure or prevent any disease") is to ensure that consumers understand that the FDA has not evaluated the package claims and to reduce consumer beliefs that the product has the ability to prevent, treat, or cure a disease. Thus, we hypothesize that the DSHEA disclaimer is working as intended if

H2: Consumer beliefs regarding whether the FDA evaluated the statements made on the package label are lower when the DSHEA disclaimer is used on the package label than when it is not used on the package label.

H3: Consumer beliefs regarding the effectiveness of the supplement in preventing, treating, or curing a disease are lower when the DSHEA disclaimer is used on the package label than when it is not used on the package label.

Disease Claims and Scientific Evidence Disclaimer

Pearson v. Shalala allows for health claims even when the scientific evidence is inconclusive. The scientific certainty disclaimer differs substantially from disclaimers currently used. For instance, some disclaimers focus on providing consumers with risk information (e.g., "You should not take this drug if you have high blood pressure"). Another general type of disclaimer is one that provides clarifying information (e.g., "one-year contract required"). However, the disclaimers required by the Court with respect to dietary supplements deal with emerging science or "preliminary evidence" of a relationship. They provide information that essentially contradicts the primary disease claim being made.

Yet, as pointed out by the Federal Trade Commission (Murphy, Hoppock, and Rusk 1998), one of the problems in determining the effectiveness of scientific certainty disclaimers is that even a panel of scientists

who are experts in the field may disagree on the "actual" level of scientific agreement; therefore, an "accurate" belief point is difficult to identify. Like Murphy, Hoppock, and Rusk, we do not propose to identify the correct level of scientific certainty but will instead examine systematic differences in consumers' certainty ratings as a function of the claim/disclaimer to which they are exposed. Thus, based on Figure 1A, we suggest that support for the following hypotheses would provide evidence that the post-Pearson scientific certainty disclaimers are effective:

H4: Consumer beliefs regarding the scientific certainty about the relationship between a particular disease and a particular supplement are lower when the scientific certainty disclaimer is used on the package label than when it is not used on the package label.

H5: Consumer beliefs regarding the effectiveness of a dietary supplement in preventing, treating, or curing a particular disease are lower when the scientific certainty disclaimer is used on the package label than when it is not used on the package label.

Consumer Information Processing and Decision Making

It appears that much of the regulation in the marketplace takes a direct approach to consumer decision making (Figure 1A). This approach is based on the normative assumption that consumer beliefs should be significantly affected by information on the label and that such beliefs reflect differences between structure function claims and disease claims. Yet, evidence suggests that such an assumption may not hold. Indeed, prior research shows that the meaning consumers derive from structure function claims and qualified disease claims depends on several information processing factors including biases that are derived from consumers' preexisting beliefs and demographics (c.f., Andrews, Burton, and Netemeyer 2000; Andrews, Netemeyer, and Burton 1998; Stewart and Martin 1994).

We theorize that consumers process information (e.g., package label claims) through different "filters" that may bias consumer beliefs (Figure 1B). The first three filters, distal attitudes, tangential attitudes, and behavioral factors, are expected to create a confirmatory bias with respect to the interpretation of structure function and disease claims, as well as their disclaimers. In a nutshell, confirmatory bias theories state that once a consumer has developed a belief, incoming information is interpreted in a manner that confirms that belief (c.f., Chernev 2001; Deighton 1984; Hoch and Ha 1986; Russo, Meloy, and Medvec 1998). Confirmatory biases typically arise because consumers are motivated to maintain consistency in their

beliefs. Recent research shows that confirmatory biases operate prior to a consumer making any type of judgment or purchase decision regarding the brand (Russo, Meloy, and Medvec 1998). Chernev (2001) suggests that the confirmatory biases depend on the feature's attractiveness and the strength of a consumer's preexisting beliefs—indeed greater distortion is found among consumers with more strongly held beliefs.

Consumers can choose from a wide array of information channels regarding dietary supplements. They obtain health and nutrition information from television, consumer magazines, and the newspaper, since "health reporting has become mainstream news" (McMahon and Cameron 1998, 21). They also rely on friends and family for information and of course, search the Internet (McMahon and Cameron 1998). We suggest that, when a product has been available on the market for an extended period of time, product-specific beliefs will systematically bias the consumer's interpretation of label claims. The flip side of this line of thought is that claims and disclaimers should be most effective when the product is unknown since by definition the consumer will have no prior product-specific information that could bias interpretation of the label. Thus, we expect to find that

H6: There is a significant interaction between the claims/disclaimers and the supplement name such that claims/disclaimers have less impact on consumer beliefs regarding the supplement's effectiveness, the scientific certainty, and the FDA evaluation of the claims on a well-known dietary supplement than on an unknown supplement.

While most consumer research regarding confirmatory bias has focused on brand- or product-specific information, we take a much broader view of confirmatory bias by examining beliefs that are not directly associated with the product or brand. We hypothesize that the consumer may interpret label claims and disclaimers in light of other, much more general beliefs. Thus, a consumer with positive beliefs about supplements brings those beliefs with him/her when examining the package label. Confirmatory bias theory suggests that if supplements are perceived positively, then, in order to maintain consistency, a specific dietary supplement would be perceived positively. This leads to a situation in which structure function claims, disease claims, and their accompanying disclaimers will be interpreted by the consumer to confirm his/her more abstract beliefs.

A distal attitude that may influence interpretation of claims and disclaimers is the consumers' trust in the government itself. A consumer may hold a general belief that the government is watching out for the consumer and that the government would not allow unsafe or ineffective products on store

shelves. Such trust in government may allow the consumer to discount the DSHEA disclaimer (i.e., "These statements have not been evaluated by the FDA …") to be more consistent with his/her overall belief structure. Nisbett and Ross (1980) label this type of bias as "theory maintenance" in that when a consumer holds a particular viewpoint, that viewpoint continues despite discordant evidence. Thus, we suggest that

H7: Consumers with high levels of trust in the government believe that the government is evaluating the dietary supplements, regardless of disclaimer statements.

A second distal attitude that may impact label processing is health motivation. Moorman and Matulich (1993, 210) define health motivation as "goal-directed arousal to engage in preventive health behaviors" and find that health motivation is positively related to the amount of information acquired from media sources and professional contacts. The consumer's health motivation is likely to be positively related to his/her evaluations of a particular supplement due to the publicity that supplements have received regarding their ability to prevent a particular disease (for example, see Weil's [1997] best-selling book, *8 Weeks to Optimum Health* and Schar's articles in *Prevention Magazine*; Schar 2002a, 2002b). Given the prevalence of information promoting the preventative nature of dietary supplements, we predict that

H8: Consumers concerned with preventing health problems believe that the supplement supports a particular body function and is more effective in preventing, treating, and curing a particular disease.

Consumers are exposed to information regarding the industry (for example, "Supplements are good for you" or "Beware of using supplements") and the product ("Flaxseed oil is good for you" or "St. John's Wart doesn't work") from which they may form opinions that are reflected in their assessment of a specific market offering. This can lead to a situation in which tangential attitudes, including trust in the supplement industry and supplement innovativeness, and behaviors will impact processing of the package label. Trust in the supplement industry would lead to enhanced beliefs regarding the supplements efficacy. Moreover, individuals who are self-described as more innovative with regard to the types of supplements they use would demonstrate more positive beliefs regarding the supplements' efficacy. Last, we expect that individuals currently using supplements would be positively biased toward a specific supplement and the claims being made.

H9: Consumers with preexisting positive (negative) beliefs and behaviors regarding the dietary supplement industry believe that a particular supplement is more (less) effective than those with preexisting negative (positive) beliefs and behaviors.

The last set of filters represents the broadest category and includes various demographic differences. Several studies have demonstrated that demographics play a role in our interpretation of information. For example, research has demonstrated that men and women tend to weight salient attributes (Holbrook 1986) and information sources (Meyers-Levy 1989) differently. Meyers-Levy (1989) proposes that gender differences in information processing occur because men tend to be "selective processors" who rely only on a subset of available and salient cues, whereas women are likely to be "comprehensive processors" who attempt to assimilate all information. Burton and Biswas (1993) found similar results in that women viewed the inclusion of all 17 elements of the nutrition label as more important than men. This suggests that gender may impact the processing of package labels.

Age may also affect how information is processed. There is general agreement that individuals process information less efficiently as they age. For example, consumer researchers report that as individuals age, they limit the amount of information obtained prior to choice (Beatty and Smith 1987; Cole and Balasubramanian 1993). Moreover, Cole and Balasubramanian (1993) find that older individuals consider fewer attributes and alternatives when making a product choice than younger individuals. Finally, Burton and Andrews (1996) find that older individuals perceived the labels in their study as less understandable than younger subjects. Thus, age is expected to act as a filter through which label information is processed.

Finally, education could act as a filter. Highly educated individuals may process the package information in more depth than individuals with lower levels of education. Consistent with this, Nayga, Lipinski, and Savur (1998) found that individuals with some college education were more likely to use nutrition labels to compare brands. This result confirms that of Wang, Fletcher, and Carley (1995). Thus, those with higher education may be more skeptical of the conflicting information on the label (e.g., the claim and the disclaimer) and more likely to bias their beliefs downward.

H10: Gender, age, and education serve as a filter through which information is processed.

In the following section, we discuss a study designed to address the above hypotheses.

METHOD

Sample Characteristics

The sample consisted of 359 individuals who were selected and interviewed by an external research firm at seven geographically disperse mall locations (Pittsburgh, $n = 29$; Chicago, $n = 55$; Philadelphia, $n = 55$; Los Angeles, $n = 55$; Atlanta, $n = 55$; Dallas, $n = 55$; and Minneapolis, $n = 55$). All respondents were at least 18 years of age. Quota sampling was used to match U.S. Bureau of the Census (2000) projections for age 18–29, 21.69%; 30–40, 22.71%; 41–56, 29.59%; and 57 and older, 26.01%.

Labels

Enlarged, full-color mock-up labels of dietary supplements patterned after existing labels in the marketplace were developed. Subjects viewed both a front and a side panel. The front panel included the name, "Brand X" dietary supplement, and the structure function claim or disease claim. On the label's side panel, placed on the right-hand section of the page, was a disclaimer (when appropriate for the experimental condition) and a set of usage instructions. Each subject read one of five labels for one of two products or a control label. Labels are available from the authors. This procedure resulted in a 2 (garlic vs. Herb X) by 5 (supplement claim and disclaimer) factorial design study plus a control.

Two supplement "names" were used. Garlic was chosen as a well-known supplement. In 1998, garlic supplement sales were $76 million and showed a 137% increase over 1997 (Promo XI 1998). Garlic sales increased by 13% from 2002 to 2003 (Chemist and Druggist 2003), indicating relatively high levels of consumer awareness of garlic's use as a supplement. Most importantly for our manipulations, garlic is available both in the food supply and in supplement form. Thus, it is very similar to omega-3, a fatty acid commonly found as part of a typical diet as well as available in supplement form, and for which the FDA has provided specific guidance regarding a qualified disclaimer. For the unknown supplement, we used "Herb X."

Five label conditions were developed: (1) structure function claim with no disclaimer, (2) disease claim with no disclaimer, (3) structure function claim with the DSHEA disclaimer, (4) disease claim with a short version of the post-Pearson scientific evidence disclaimer, and (5) disease claim with the post-Pearson scientific evidence disclaimer that closely parallels the disclaimer recommended by the FDA for omega-3 (FDA 2000b; see Figure 2).

FIGURE 2
Label Statements Used in Study

Structure/Function Claim
- Garlic (Herb X) maintains a healthy circulatory system.

Disease Claim
- The consumption of Garlic (Herb X) may reduce the risk of coronary heart disease.

DSHEA Disclaimer
- These statements have not been evaluated by the FDA. This product is not intended to diagnose, treat, cure, or prevent any disease.

Shortened Post-Pearson disease claim disclaimer:
- The scientific evidence about whether garlic (Herb X) may reduce the risk of Coronary Heart Disease (CHD) is suggestive, but not conclusive.

Post-Pearson FDA suggested disease claim disclaimer:
- The scientific evidence about whether garlic (Herb X) may reduce the risk of Coronary Heart Disease (CHD) is suggestive, but not conclusive. Studies in the general population have looked at diets containing garlic (Herb X) and it is not known whether diets or garlic (Herb X) in food may have a possible effect on a reduced risk of CHD. It is not known what effect garlic (Herb X) may or may not have on the risk of CHD in the general population.

Additionally, a control label with no claims or disclaimers for the garlic supplement was developed.

Procedure

An external research firm conducted mall intercepts at seven geographically disperse locations. Respondents were qualified to meet the sample quota requirements and then randomly assigned to examine 1 of the 10 experimental labels or the control label. Interviewers followed a script. A mock-up practice label for margarine was provided so that respondents could become accustomed to a verbal protocol task. The respondents were then provided with the supplement label and asked to assume that they were shopping at a major retail store and saw the dietary supplement package. Respondents were asked to say everything that they were thinking while looking at the label. Next, respondents were asked several open-ended questions,[2] and then completed a self-administered questionnaire. Respondents were permitted to view the experimental label while completing the

interview and questionnaire. This procedure allowed maximum exposure to and understanding of the label and did not require memorization of information; therefore, we should observe a maximum effect from the label conditions. Empirical evidence from a posttest, conducted with 19 university employees and graduate students who examined one of the three garlic labels with a disclaimer, confirms that attention was given to the statements made on the mock-up labels. Of the 19 respondents, 18 read the structure function or disease claim and only 1 did not, while 15 read the disclaimer and 4 did not.

Measures

Each dependent measure and its reliability is presented in Figure 3. Subjects completed two sets of belief measures. One 3-item measure tapped the

FIGURE 3
*Measures and Reliabilities for Dependent Variables**

Structure Function Beliefs: average of two six-point items anchored "not at all likely" to "very likely" (α=0.84)

How likely is it that garlic (Herb X) supplements help keep a person's heart healthy?
How likely is it that garlic (Herb X) supplements help keep a person's heart functioning in a healthy way?

Disease Beliefs: average of three six-point items anchored "not at all likely" to "very likely"
(α=0.82)

How likely is it that garlic (Herb X) supplements help cure heart disease?
How likely is it that garlic (Herb X) supplements help prevent heart disease?
How likely is it that garlic (Herb X) supplements help reduce the symptoms of heart disease?

Scientific Certainty: two individual six-point items anchored with "very unsure" and "very sure"
How sure are scientists that taking garlic (Herb X) will help maintain a healthy heart?
How sure are scientists that taking garlic (Herb X) will reduce the risk of heart disease?

FDA Evaluation of Claim: average of two five-point Likert-type items anchored with "strongly disagree" and "strongly agree" (α=0.89)

People at the Food and Drug Administration (FDA) have checked that the statements about garlic (Herb X) supplements on the package are true.
The Food and Drug Administration agrees that "Garlic (Herb X) supplements maintain a healthy heart function."

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subject's beliefs regarding the supplement's ability to maintain a body system (referred to hereafter as *structure function beliefs*), and the second tapped the subject's beliefs about the supplement's ability to prevent, treat, or cure disease (referred to hereafter as *disease beliefs*). Subjects indicated the level of scientific certainty regarding both the structure function claim and the disease claim. These measures were patterned after those used by Murphy, Hoppock, and Rusk (1998). Even though these two items were highly correlated ($r = .89$), the FDA treats them as two separate issues; thus, each item was analyzed individually. Subjects' beliefs regarding the FDA's evaluation of the package claims were assessed using a 2-item scale.

As discussed above, we examined several "biasers" of labeling effects. Two measures tapped distal attitude filters. First, trust in the government (FDA) was measured with seven 5-point Likert-type items patterned after those used by Scholz and Lubell (1998). It includes statements such as "I generally trust that the U.S. government and the Food and Drug Administration will prevent harmful dietary supplements from being sold to consumers" and "I do not trust that the U.S. government and the Food and Drug Administration will make sure that the information on the label of dietary supplements tells the truth about what the product does" (reverse coded; $\alpha = .84$). The second variable, health motivation, was measured using items suggested by Moorman and Matulich (1993). This 8-item scale ($\alpha = .77$) contains statements such as "I try to protect myself against health hazards I hear about" and "I often worry about the health hazards I hear about, but I don't do anything about them" (reverse coded).

Two variables were used to examine the influence of tangential attitudes on supplement beliefs: trust in the herbal dietary supplement industry and dietary supplement innovativeness. Industry trust was measured with three 5-point Likert-type items patterned after Mohr, Eroglu, and Ellen (1998) including "I have confidence that the information on herbal dietary supplement labels is truthful" and "Most herbal dietary supplement companies provide accurate information about what the product does for a person" ($\alpha = .68$). Supplement innovativeness was measured with items similar to those proposed by Goldsmith and Hofacker (1991) including six 5-point Likert items such as "In general, I am among the first in my circle of friends to use a new dietary supplement when it appears" and "I do not like to use dietary supplements before other people do" (reverse coded; $\alpha = .74$).

Another class of variables contains the behavioral filter, supplement use. Subjects were asked to list any dietary supplements they had taken within the past three months. The total number of dietary supplements used was used as a behavioral measure.

The final, broadest category of filters includes the demographic characteristics of education, gender, and age. Education was measured using a 6-point scale anchored with "Less than high school" and "A graduate degree." Age was measured on a 7-point scale, generally in 10-year increments (exceptions are the "18–25" and "over 75"). Gender was dummy coded such that "1" represents female and "0" represents male.

RESULTS

Multivariate analysis of covariance (MANCOVA) was used to test the propositions. The independent variables included the herb name treatment (either garlic or Herb X), the five supplement claim and disclaimer conditions, and the interaction between these two treatments. The two distal attitudes (government trust and health motivation), the two tangential attitudes (industry trust and supplement innovativeness), the behavioral filter (supplement use), and the three demographic filters (age, gender, and education) were included in the model as covariates. The results of the MANCOVA model are presented in Table 1, and cell means are shown in Table 2.[3]

All five models were statistically significant, explaining from 23% to 35% variance in beliefs. However, the Wilks' Lambdas show that there is no overall effect for the herb name (Wilks'$\Lambda = 0.97$, $p = .12$), for the various label claims and disclaimers (Wilks'$\Lambda = 0.90$, $p = .07$), or for the interaction between these manipulations (Wilks'$\Lambda = 0.90$, $p = .08$).

We first test the direct consumer decision-making model shown in Figure 1A and leading to H1–H5. H1 states that consumer disease beliefs should be lower when exposed to a structure function claim than when exposed to a disease claim. The nonsignificant Wilks'Λ for the label claims and conditions is evidence that disease beliefs do not vary depending on whether a structure function claim or a disease claim is made. Moreover, means from cell 1 (the structure function claim only) and cell 2 (the disease claim only) show no differences in disease beliefs. The cell 1 mean for the garlic treatment equals 10.90, while the cell 2 mean equals 10.94 ($F = 0.45$; $p = .51$). When no supplement name is used (Herb X condition), cell 1's mean is 11.47 and cell 2's mean is 10.47 ($F = 0.35$, $p = .55$). Thus, we conclude that there is no support for H1.

H2 states that consumer beliefs regarding whether the FDA evaluated the statements made on the package label are lower when the DSHEA disclaimer is used on the package label than when it is not. To test this effect, we examine differences in the FDA evaluation beliefs between cells 1 (structure function claim) and 3 (structure function claim with DSHEA disclaimer). We find no difference between these two cells in the garlic

TABLE 1
MANCOVA Results

	Structure Function Beliefs	Disease Beliefs	Scientific Agreement regarding Structure Function	Scientific Agreement regarding Disease	FDA Evaluation
Manipulations					
Herb name	NS	NS	NS	$F = 4.08$, $p = .04$	NS
Label claims and disclaimers	NS	NS	NS	NS	NS
Herb name by label claim interaction	$F = 3.14$, $p = .02$	$F = 2.90$, $p = .02$	NS	NS	NS
Covariates					
Distal attitude filters					
Government trust	NS	NS	NS	NS	Positive, $F = 16.09$, $p < .01$
Health motivation	Positive, $F = 12.04$, $p < .01$	Positive, $F = 9.94$, $p < .01$	NS	NS	NS
Tangential attitude filters					
Industry trust	Positive, $F = 44.15$, $p < .01$	Positive, $F = 40.77$, $p < .01$	Positive, $F = 21.01$, $p < .01$	Positive, $F = 15.20$, $p < .01$	Positive, $F = 18.88$, $p < .01$
Supplement innovativeness	Positive, $F = 7.48$, $p < .01$	Positive, $F = 15.14$, $p < .01$	Positive, $F = 7.94$, $p < .01$	Positive, $F = 15.98$, $p < .01$	Positive, $F = 14.11$, $p < .01$
Behavioral filter					
Supplement use	NS	Positive, $F = 8.84$, $p < .01$	NS	NS	Positive, $F = 8.09$, $p < .01$
Demographic filters					
Education	NS	Negative, $F = 11.04$, $p < .01$	Negative, $F = 8.53$, $p < .01$	Negative, $F = 11.01$, $p < .01$	Negative, $F = 20.77$, $p < .01$
Gender	NS	NS	NS	NS	NS
Age	NS	NS	NS	NS	NS
F	7.20	8.80	5.08	5.58	8.59
p	<.01	<.01	<.01	<.01	<.01
R^2	0.30	0.35	0.23	0.25	0.34

TABLE 2
Cell Means and Standard Deviations

Condition	Structure Function Beliefs		Disease Beliefs		Scientific Agreement Re: Structure Function		Scientific Agreement Re: Disease		FDA Evaluation	
Scale range	2–12		3–18		1–6		1–6		2–10	
	Garlic	Herb X	Garlic	Herb X	Garlic	Herb X	Garlic	Herb X	Garlic	Herb X
Cell 1: structure function claim only	8.18 (2.31)	8.80 (2.35)	10.91 (3.32)	11.47 (3.83)	3.70 (1.31)	3.27 (1.46)	3.76 (1.12)	3.73 (1.36)	6.52 (1.52)	5.93 (2.24)
Cell 2: disease claim only	8.25 (2.46)	8.20 (1.90)	10.94 (3.72)	10.47 (3.32)	3.78 (1.18)	3.27 (1.14)	4.00 (1.19)	3.50 (1.07)	5.78 (2.45)	5.53 (2.46)
Cell 3: structure function claim, DSHEA disclaimer	8.35 (1.96)	8.06 (1.74)	11.55 (2.90)	10.66 (2.68)	3.90 (1.19)	3.38 (1.21)	3.90 (1.01)	3.44 (1.29)	6.61 (1.75)	6.03 (1.99)
Cell 4: disease claim, short FDA disclaimer	8.28 (1.99)	8.31 (2.65)	11.64 (2.77)	11.28 (3.80)	3.48 (1.16)	3.76 (1.30)	3.32 (1.06)	3.66 (1.40)	6.08 (2.13)	5.79 (2.26)
Cell 5: disease claim, long FDA disclaimer	8.67 (1.86)	7.19 (1.92)	12.00 (3.09)	9.93 (2.81)	3.73 (1.08)	3.37 (1.08)	3.67 (1.12)	3.41 (0.93)	6.20 (1.85)	5.96 (1.89)
Cell 6: garlic control	8.13	NA	10.71	NA	3.53	NA	3.59	NA	6.48	NA
F value	0.22	1.66	0.83	1.27	1.12	0.27	0.44	1.10	0.83	0.28
p value	.95	.16	.52	.28	.35	.90	.81	.36	.53	.89

treatment ($p = .11$) and the Herb X treatment ($p = .56$). Therefore, H2 is unsupported—consumers are not less likely to believe that the FDA has evaluated the product claims when the DSHEA disclaimer is present.

H3 states that consumer disease beliefs are lower when the DSHEA disclaimer is used on the package than when it is not. In order to examine this hypothesis, we test differences between cell 1 (structure function claim only) and cell 3 (structure function claim with DSHEA disclaimer) for the disease belief measure. Cell 1 and cell 3 do not differ with respect to disease beliefs for neither the garlic nor the Herb X conditions ($p = .99$ and $p = .39$, respectively). Thus, H3 is not supported.

H4 states that consumer beliefs regarding the scientific certainty about the relationship between a disease and a supplement are lower when the scientific certainty disclaimer is present than when the disclaimer is absent. This is tested by examining contrasts between cell 2 and cells 4 and 5 using the two scientific certainty scores as the dependent variables. None of the four relevant contrasts using the data from the garlic condition were significantly different (all ps $> .15$). Additionally, none of the four contrasts using the data from the Herb X treatment showed significant differences between the scientific certainty scores (all ps $> .30$); therefore, we must conclude there is no evidence suggesting that the post-Pearson type of disclaimer significantly affects consumer beliefs regarding the science behind the claim.

H5 states that consumer disease beliefs are lower when the scientific certainty disclaimer is on the label than when it is not. In order to examine this hypothesis, we test for disease belief differences between cell 2 (the disease claim–only condition) and cells 4 and 5—both of which use the disease claim with some form of scientific certainty disclaimer. Neither contrast is statistically significant in the garlic treatment (both $p > .50$) nor in the Herb X treatments (both $p > .25$). Thus, we find that the post-Pearson disclaimer does not weaken consumer beliefs regarding the efficacy of a supplement in preventing a disease and H5 is not supported.

Given the above, we find very little support for the direct-effects model shown in Figure 1A. We now turn our attention to the remaining hypotheses based upon the filters model presented in Figure 1B.

H6 states that there is a significant interaction between the claims/disclaimers and the supplement name. As noted earlier, the overall Wilks'Λ for this interaction is not statistically significant (Wilks'$\Lambda = 0.90$, $p = .08$). While the interaction is significant for the submodels, which use structure function beliefs and disease beliefs as the dependent variable, when we examine these beliefs within the Herb X condition, we find no statistical differences between cells in the structure function beliefs

($F = 1.66, p = .16$) and in the disease beliefs ($F = 1.27, p = .28$). Thus, we find no evidence supporting H6.

H7 and H8 deal with the biasing influence of distal attitudinal filters. H7 states that consumers with high levels of trust in the government are more likely to believe that the government is evaluating the dietary supplements, regardless of any disclaimer statements. This hypothesis is supported by the positive relationship between government trust and FDA evaluation found in the MANCOVA results. H8 states that consumers concerned with preventing health problems will have stronger structure function and disease beliefs. This hypothesis is supported by the positive and statistically significant relationship between health motivation and structure function beliefs and disease prevention beliefs shown in the MANCOVA model. Therefore, we have support that distal attitudes do influence consumer interpretation of structure function and disease claim as H7 and H8 are confirmed.

H9 predicts that consumers with preexisting positive (negative) beliefs and behaviors regarding the dietary supplement industry believe that a particular supplement is more (less) effective than those with preexisting negative (positive) beliefs and behaviors. Both industry trust and dietary supplement innovativeness are positively related to all efficacy beliefs (structure function and disease beliefs). This effect carries over to beliefs regarding scientific certainty and FDA evaluation. Therefore, we have strong support that tangential attitudes affect product-level cognitions.

With respect to consumer behavior regarding supplement use, we find that approximately 45% of the respondents indicated using one or more supplements. Supplement use is significantly related to disease beliefs in that the more supplements that an individual uses, the more likely she/he is to believe that the supplement is effective in curing, preventing, and reducing the symptoms of heart disease. Additionally, those using more supplements are more likely to agree that the FDA had evaluated the claims. Thus, we find evidence of a behavioral filter effect and ample support for H9.

H10 suggests that demographic characteristics such as gender, age, and education serve as filters through which information is processed. Only education is significantly related to consumer product beliefs. Respondents with higher education have lower disease belief scores, lower scientific certainty scores, and are less likely to believe that the FDA had evaluated the package claims. There is only partial support then for H10.

DISCUSSION AND CONCLUSION

Given our study context, we find that consumers make no distinction between structure function claims and disease claims on the supplement label;

however, distal and tangential beliefs systematically bias product-specific judgments regarding efficacy, scientific certainty, and FDA evaluation.

Our study adds to the consumer literature by explicitly examining the biasing effects of beliefs held at a very abstract level. Heretofore, consumer researchers have focused on the biasing effects of prior brand-specific beliefs on product judgments but have not explored how higher-order beliefs such as those related to a particular industry or the government influence product-specific evaluations. To our knowledge, we are the first to examine confirmatory biases that arise from distal, more general beliefs, attitudes, and behaviors. Because these factors are holistic in nature, they are likely to create a bias in multiple circumstances and for many different supplement offerings. We find that general beliefs about the supplement industry affect product-specific efficacy judgments. We find that those persons for whom disease prevention is important are more likely to place more faith in both structure function claims and disease claims. Finally, perceiving oneself as innovative in supplement use predisposes one to believe that a supplement is more effective, has greater scientific support, and has been evaluated by the FDA.

These findings are important since they suggest that information regarding a particular product can be overridden by the consumer's existing and distantly related beliefs. This bias is problematic for two reasons. First, consumers with negative beliefs regarding supplements may eliminate a potentially helpful product from their evoked set—an error of omission. Alternatively, those with positive opinions regarding the industry, who are innovative and motivated to protect themselves, may use many supplements that are not useful. This latter situation is all the more important as little, if any, scientific evidence is needed for dietary supplement to make structure function claims. Also problematic is the fact that heavy supplement users are more likely to believe that the FDA has evaluated the supplement; yet, they are also the ones who have been most exposed to the DSHEA disclaimer.

Our study's conclusions are bounded by issues regarding both situational and enduring involvement, areas that have not received much attention within product labeling. Yet, preliminary research suggests that priming consumers to pay particular attention to certain aspects of a product label can significantly influence use and understanding of the label. For instance, Basil, Deshpande, and Basil (2004) have researched such issues by priming certain health conditions (heart disease or diabetes) and examining nutritional label effectiveness. In our investigation, situational involvement was not directly addressed. Indeed, the level of situational involvement and attentiveness to the task experienced by the consumers

participating in our study may have been attenuated by the simplified nature of the experimental stimuli and artificial brand and supplement names used. Specific measures of attention focused on the various aspects of the label (supplement name, supplement claim, and supplement disclaimer) were not taken but would have been helpful in examining this possibility. It could be that, in a more realistic setting, claims and disclaimers may be used and interpreted differently than what was observed herein. Current work by Eggers and Fischoff (2004), using a behavioral decision approach, is likely to shed light on these concerns in the future.

Enduringly involved consumers—i.e., those actively engaged in seeking a product that can maintain heart health or prevent heart disease—may also interpret the structure/function and disease claims and disclaimers differently. Within our subject pool, only 12 (3%) respondents used garlic within the past three months, and only 23 (6%) stated that they suffered from heart disease. This indicates limited enduring involvement with either garlic or heart disease. Yet, the issue of enduring involvement is one ripe for further investigation. Szykman, Bloom, and Levy's (1997) study provides a beginning to this line of investigation. They found that consumers either at the risk of a diet-related disease or who had a diet-related disease were not more likely to use nutritional labeling but were more likely to self-report using the claims on the label. Their work leads to questions regarding how such labels are interpreted by those at risk or suffering from a relevant disease. An investigation of enduring involvement due to chronic health issues would be particularly interesting in the supplement context since consumers with a certain medical condition should not, according to FDA guidelines, be using the supplement in order to treat that condition.

We suggest that policy makers take a more holistic approach to policy design, one that actively accounts for preexisting beliefs and dispositions that influence the consumers' actual decision making and behaviors. Unfortunately, it is likely that the more distal the belief, the more resistant it is to change. Additionally, we know that even individuals who are aware that they are making biased interpretations have difficulty eliminating this bias from judgments (Alba and Hutchinson 2000). As academic researchers, we believe this area seems to be one that would be both theoretically interesting and important to pursue. How does one identify the relevant distal beliefs and then, how in a public policy environment, does one combat the biasing effects of these beliefs?

Finally, it is clear that this area will continue to allow for theoretically interesting and important research. The FDA's interim proposal for disease claims (FDA 2003b) on foods and supplements suggests four levels of scientific certainty that will require different levels of qualification. For

instance, "significant scientific agreement among qualified experts" suggests that there is a "high level of comfort" among qualified scientists that the relationship between the consumption of a particular food or supplement and the disease is scientifically valid. This level of certainty does not require qualification. Three levels of qualified disease claims are proposed, ranging from a "moderate/good level of comfort among scientists" to "an extremely low level of comfort among qualified scientists." All such claims will be allowed, as long as they are qualified. The FDA is concerned whether or not consumers are able to make judgments regarding scientific certainty and whether qualifications will be effective in keeping the disease claim from misleading consumers. Our study suggests that the likelihood of success is low, particularly if current word-based approaches are used. The FDA is, however, also considering nonverbal methods of communicating this information. Such an approach would require consumer education programs similar to those currently being conducted by the FDA regarding trans fatty acids, which include both information on FDA Web sites and partnering with governmental, nonprofit, and industry organizations to improve consumer knowledge (FDA 2003a).

ENDNOTES

1. It should be noted that the Food and Drug Act, Section 101.93 (g), makes an exception for preapproval of disease claims for "diseases resulting from essential nutrient deficiencies (e.g., scurvy, pellagra)."

2. Thought listings revealed that the structure function claim resulted in more respondents stating that the supplement was intended to "maintain" circulation and more inferring that the product "improves" circulation than did the disease claim. The disease claim resulted in more subjects stating that the supplement prevents heart disease and inferring that the supplement "cures" heart disease. Many of the respondents (66), particularly those exposed to the structure function claim, stated that the supplement generally improves health. Further details regarding the thought listings are available from the authors.

3. The control group is not included in the MANCOVA reported in Table 1 since there is no structure function claim or disclaimer on this label. However, the control group is included in the overall analysis of variance submodels reported in Table 2. As shown in Table 2, the cell means do not differ from each other. Contrasts with the control group and the five treatment cells show no difference with respect to structure function claims (all $ps > .36$), with respect to disease beliefs (all $ps > .13$), with respect to scientific certainty regarding the structure function claim (all $ps > .08$), with respect to scientific certainty regarding the disease claim (all $ps > .28$), and with respect to beliefs regarding FDA evaluation (all $ps > .14$).

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