

## Assessing People's Knowledge And Beliefs About Dietary Supplements

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Many Americans have turned to dietary supplements for help in losing weight despite the significant health risks associated with their use. This study examines what people know and believe about dietary supplements. Results showed that participants were generally knowledgeable about dietary supplements, including their purpose, where they are sold, and the possibility that some dietary supplements can have unhealthy side effects. However, participants' knowledge and beliefs differed significantly as a function of gender, educational status, and whether they had ever taken dietary supplements. Users tended to perceive dietary supplements as less risky than participants who had never used them. Both male and student participants held more optimistic perceptions about the expected benefits and risks of dietary supplements, but were less likely to read the labels on these products. These results indicate that individual differences need to be taken into account when developing risk communications to accompany dietary supplements. Future research should address how knowledge gaps about dietary supplements can be addressed by educational and warning materials to influence knowledge and beliefs with the goal of providing needed information to make informed healthful decisions.

### INTRODUCTION

One of the most significant health epidemics facing Americans today is their weight. According to data from the 1999-2000 National Health and Nutrition Examination Survey (NHANES), nearly two-thirds of adults in the U.S. are overweight, and a significant number are obese. The prevalence of persons overweight and obese has increased by 12 percent and 70 percent, respectively, over the past decade (Mokdad et al., 2001; 2004). This trend is alarming given the fact that being overweight or obese are known risk factors for diabetes, cardiovascular disease, sleep apnea and other respiratory problems, musculoskeletal disorders, and several forms of cancer (Field et al., 2001; Must et al., 1999; Visscher & Seidell, 2001).

Approximately 300,000 adult deaths in the U.S. each year are attributable to unhealthy dietary habits and a lack of physical activity (U.S. DHHS, 2001). Many of these deaths, as well as the health problems associated with being overweight or obese, could be avoided through better dietary habits and regular exercise. Unfortunately, many overweight Americans have instead pursued other avenues to lose excess weight. A growing number of people have turned to dietary supplements for help in losing weight. Dietary supplements are typically sold in pill form, the active ingredients in many of them (up until April 12, 2004) contain ephedrine and caffeine or related compounds, and they can be purchased over-the-counter (no

prescription is required). Dietary supplements used for weight loss typically act to suppress a person's appetite and increase metabolic rate, which in turn, result in a feeling of increased energy level. Although some research has documented the effectiveness of dietary supplements in helping people to achieve weight loss, there can be significant health risks associated with their use (FDA, 2003).

Both the Food and Drug Administration (FDA) and the Federal Trade Commission (FTC) have expressed concerns regarding the use of certain dietary supplements, including those containing ephedra. These two agencies are not alone, as prior to the April 12<sup>th</sup> ruling, ephedra-containing products had already been banned in several states due to its safety profile. The concern centers around the significant contraindications and side effects associated with the use of dietary supplements. Examples of contraindications associated with many dietary supplements include pregnancy, a family history of cardiovascular disease, high blood pressure, or use of an MAO inhibitor. Examples of side effects include nausea and rapid heart beat. Contraindications or side effects associated with a dietary supplement can be severe (e.g., a stroke or heart attack).

In order to address the health concerns associated with the use of dietary supplements, manufacturers are now required to include a warning on labels that tells consumers that any claims made have not been evaluated by the FDA. Specifically, the warning must include the statement: *"These statements have not*

been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease." This practice was established in 1994 as part of the Dietary Supplement Health and Education Act, or DSHEA.

One problem with this warning, however, is that because of restrictions imposed by DSHEA it does not address the specific risks associated with a particular dietary supplement. In addition, the nature of the risks consumers face depend on a number of factors, including pre-existing health conditions and whether they are taking other medications or dietary supplements that could interact in unfavorable or otherwise unpredictable ways. Finally, it is not yet clear what information should be included with these products because research has been inadequate regarding their effects and because no research has systematically investigated what people already know (or do not know) about them. A related problem is that many people may not view dietary supplements as harmful, perhaps in part because they can be purchased without a doctor's prescription. Because of this, consumers may not be as likely to look for warning information on the label (Laughery & Paige, 2003).

The main purpose of this study was to explore what consumers know and believe about dietary supplements. A related aim was to investigate how people's knowledge and attitudes about these products relate to relevant personal characteristics, such as health status (e.g., weight, existing medical conditions) and prior use of dietary supplements, prescription drugs, and other over-the-counter products. Understanding the individual differences that underlie knowledge about dietary supplements is an important first step in designing product labeling that is maximally effective in communicating both the benefits and risks of these products to the consumers who use them.

## METHOD

### Participants

Participants were 119 student (55.8%) and 94 non-student volunteers (44.1%) for a total of 213. Of these, 112 were male (52.6%) and 101 (47.4%) were female. The student participants were recruited from classes at North Carolina State University, whereas the non-student volunteers were recruited at public places in the surrounding community. The mean age of the study sample was 29.4 years ( $SD = 13.9$ ). The mean age of the student and non-student volunteers was 20.8

years ( $SD = 2.3$ ) and 40.3 years ( $SD = 18.8$ ) years, respectively. In terms of their stated ethnicity, 75% of participants indicated they were Caucasian, 11% African or African-American, 5% Hispanic/Latino, 5% Asian, and 4% Other. Nearly 90% of the sample indicated that English was their first language.

### Materials and Procedure

Participants were asked to complete a two-part survey. The first part of the survey asked them for basic demographic information (e.g., age, gender, ethnicity, highest level of education completed) and for information pertaining to their average consumption of coffee and use of over-the-counter drug products, the amount of time they spend watching television, and their perception of the term "family history." The second part of the survey was designed to assess their knowledge and awareness of dietary supplements through a set of statements about dietary supplements. A complete list of the statements used is included as Table 1. To control for potential order effects, the items were given in two random orders and then reassembled into one. For each statement, participants were asked to report their level of agreement on a 9-point Likert-type scale with the following numerical and text anchors: 0 = *Do Not Agree At All*; 2 = *Agree Somewhat*; 4 = *Agree*; 6 = *Very Much Agree*; and 8 = *Completely Agree*. Participants were also asked: (1) whether they had ever taken dietary supplements themselves; (2) to define the term "dietary supplement"; and (3) to provide examples of products they viewed as constituting dietary supplements. Upon completing the survey, participants were debriefed and thanked for their participation.

## RESULTS

Overall, participants' responses suggested they were knowledgeable about certain aspects of dietary supplements. As illustrated in Table 1, participants' levels of agreement to the items suggested they know where dietary supplements are sold (e.g., in stores such as GNC and at the counters of convenience stores and drug stores), that dietary supplements are used to help people feel more energetic and to lose weight, that there are some contraindications to taking dietary supplements, and that some dietary supplements have unhealthy side effects. They appeared more likely to disagree somewhat with statements suggesting that dietary supplements are generally safe, can cure disease, or would increase people's health, again

suggesting some awareness that dietary supplements have limitations and can be dangerous.

More importantly, analyses examined differences in participants' ratings as a function of different grouping variables, including gender, student status (students vs. non-students), and whether they had ever taken dietary supplements and we will turn to these next. In each of the sections that follow, separate tables are provided containing only those items showing significant between-group differences.

Table 1. Mean Ratings of Agreement (and Standard Deviations) with Statements Assessing Knowledge and Beliefs about Dietary Supplements: *All Participants*.

Statement	Mean	S.D.
Dietary supplements are sold in stores such as GNC (General Nutrition Centers).	6.1	1.9
The FDA regulates dietary supplements under the same standards as drug and food products.	2.8	2.6
Dietary supplements are safe and generally do no harm.	2.2	1.9
Some dietary supplements make people more energetic.	4.1	2.1
There are some dietary supplements on the market that are effective in helping people lose weight.	3.9	2.2
Dietary supplements are sold at the counters of convenience stores and drug stores.	4.7	2.3
I would not expect dietary supplements to present a health problem to me.	2.5	2.3
There are some contraindications to taking dietary supplements; that is, conditions that if people have them they should not use the supplement.	5.2	2.1
Dietary supplements are good for people who are trying to keep fit.	2.3	2.0
I do not really know much about dietary supplements.	3.6	2.3
I would expect that dietary supplements increase people's health.	2.3	1.9
Some dietary supplements can cure disease.	1.1	1.5
Some dietary supplements have unhealthy side effects.	5.7	2.0
The government agency that approves and regulates the sale and distribution of dietary supplements is the FDA (U.S. Food and Drug Administration).	3.5	2.7
I usually do not read the labels on over-the-counter drug products (such as Advil, Tylenol, and cold medications).	2.5	2.7
Dietary supplements are generally safe.	2.4	1.8

### Experience with Dietary Supplements

About half (48.8%) of the participants reported having taken a dietary supplement at some point in their lives. Their reported experience with dietary supplements did not vary as a function of gender, age, ethnicity, or educational status ( $p > .05$ ). Significant differences did emerge, however, with respect to their level of agreement with several of the dietary supplement items described previously. As shown in Table 2, participants who had previously used dietary supplements expressed significantly higher agreement with statements that appeared to reflect their greater experience with and knowledge of these products. For example, they showed significantly stronger agreement with statements concerning where dietary supplements can be purchased and what they are used for (e.g., losing weight, keeping fit) than participants who had never used them. Their stronger agreement with statements concerning the relative safety of dietary supplements suggests that persons who have used them perceived dietary supplements as less risky than their counterparts who had never used them. As expected, non-users expressed stronger agreement with the statement "I do not really know much about dietary supplements."

Table 2. Mean Ratings of Agreement (and Standard Deviations) for Statements Assessing Knowledge and Beliefs about Supplements as a Function of *Prior Use*.

Statement	Mean		P
	Never Taken	Have Taken	
Dietary supplements are sold in stores such as GNC (General Nutrition Centers).	5.7 <i>1.9</i>	6.4 <i>1.8</i>	**
There are some dietary supplements on the market that are effective in helping people lose weight.	3.5 <i>2.1</i>	4.3 <i>2.2</i>	*
Dietary supplements are sold at the counters of convenience stores and drug stores.	4.2 <i>2.2</i>	5.2 <i>2.3</i>	**
I would not expect dietary supplements to present a health problem to me.	2.2 <i>2.0</i>	2.8 <i>2.4</i>	*
Dietary supplements are good for people who are trying to keep fit.	1.8 <i>1.7</i>	2.8 <i>2.2</i>	**
I do not really know much about Dietary supplements.	4.3 <i>2.3</i>	2.8 <i>2.1</i>	**
I would expect that dietary supplements increase people's health.	1.9 <i>1.6</i>	2.6 <i>2.0</i>	**
Dietary supplements are generally safe.	2.2 <i>1.6</i>	2.7 <i>1.9</i>	*

Note: \*  $p < .05$ ; \*\*  $p < .01$

**Gender Effects**

Significant gender differences also emerged with respect to their level of agreement with several of the dietary supplement items. As shown in Table 3, these differences revealed that males tend to hold more optimistic perceptions concerning both the expected benefits and risks associated with the use of dietary supplements. Specifically, male participants expressed stronger agreement with statements suggesting that dietary supplements are effective in helping people to lose weight, keep fit, feel more energetic, and increase their health as compared to their female counterparts. Males also showed significantly stronger agreement that these products are safe, both for themselves and in general. Finally, males were more likely to agree that they usually do not read the labels on over-the-counter drug products. Interestingly, both male and female participants tended to express strong disagreement with regard to the statement “Some dietary supplements can cure disease.”

Table 3. Mean Agreement Ratings (and Standard Deviations) for Statements Assessing Knowledge and Beliefs about Dietary Supplements as a Function of *Gender*.

Statement	Mean		P
	SD (in italics)		
	Males	Females	
Dietary supplements are safe and Generally do no harm.	2.6 2.2	1.8 <i>1.6</i>	**
Some dietary supplements make people more energetic.	4.5 2.3	3.8 <i>1.8</i>	*
There are some dietary supplements on the market that are effective in helping people lose weight.	4.3 2.3	3.4 <i>2.0</i>	**
I would not expect dietary supplements to present a health problem to me.	2.8 2.4	2.2 <i>2.1</i>	*
Dietary supplements are good for people who are trying to keep fit.	2.8 2.2	1.8 <i>1.7</i>	**
I would expect that dietary supplements increase people’s health.	2.7 <i>1.9</i>	1.8 <i>1.7</i>	**
Some dietary supplements can cure disease.	1.3 <i>1.6</i>	0.9 <i>1.4</i>	*
I usually do not read the labels on over-the-counter drug products.	2.8 2.8	2.1 <i>2.4</i>	
Dietary supplements are generally safe.	3.0 <i>1.8</i>	1.9 <i>1.6</i>	**

Note: \*  $p < .05$ ; \*\*  $p < .01$

**Students vs. Non-Students**

Significant differences concerning level of agreement with the dietary supplement items also emerged between student and non-student participants. As shown in Table 4, students tended to hold more optimistic perceptions toward the benefits and risks of dietary supplement use relative to non-student participants. Students expressed significantly stronger agreement with statements suggesting that dietary supplements are effective in helping people to lose weight, keep fit, and increase their health. Students also showed stronger agreement that dietary supplements are generally safe, both for themselves and in general. Students’ stronger agreement with statements concerning the FDA’s role in regulating dietary supplements indicates they may be less knowledgeable than the non-students with regard to this aspect of dietary supplements. They also showed significantly stronger agreement with the statement indicating they are unlikely to read labels on over-the-counter products.

Table 4. Mean Agreement Ratings (and Standard Deviations) for Statements Assessing Knowledge and Beliefs about Dietary Supplements as a Function of *Student Status*.

Statement	Mean		P
	SD (in italics)		
	Students	Non-Students	
The FDA regulates dietary supplements under the same standards as drug and food products.	3.5 2.5	1.8 <i>2.3</i>	**
Dietary supplements are safe and generally do no harm.	2.5 <i>1.9</i>	1.8 <i>1.9</i>	**
There are some dietary supplements on the market that are effective in helping people lose weight.	4.2 2.2	3.5 <i>2.2</i>	*
I would not expect dietary supplements to present a health problem to me.	2.8 <i>2.4</i>	2.1 <i>2.1</i>	*
Dietary supplements are good for people who are trying to keep fit.	2.6 <i>2.1</i>	2.0 <i>1.8</i>	*
I would expect that dietary supplements increase people’s health.	2.5 <i>1.9</i>	2.0 <i>1.7</i>	*
The government agency that approves and regulates the sale and distribution of dietary supplements is the FDA.	4.2 2.5	2.7 <i>2.7</i>	**
I usually do not read the labels on over-the-counter drug products.	2.8 2.7	2.1 <i>2.5</i>	*
Dietary supplements are generally safe.	2.8 <i>1.9</i>	2.0 <i>1.6</i>	**

Note: \*  $p < .05$ ; \*\*  $p < .01$

## DISCUSSION

Overall, these results show that participants were generally knowledgeable about some aspects of dietary supplements, including their purpose, where they are sold, and the possibility that some dietary supplements can have unhealthy side effects. However, the results also show that participants' knowledge and beliefs differed significantly as a function of several grouping variables, including gender, student status, and whether they had ever taken dietary supplements

Participants who had used these products previously tended to perceive dietary supplements as less risky than participants who had never used them. This suggests that supplement users may gain a false sense of safety because most of them never personally experience any of the potential adverse affects of dietary supplements. This may place this group particularly at risk as they may be less likely to take appropriate precautions before using these products in the future, such as reading product labels (e.g., warnings).

Both male and student participants appeared to hold more optimistic perceptions concerning both the expected benefits and risks associated with the use of dietary supplements. Both groups tended to show high levels of agreements for items suggesting that these products are generally safe and both groups were more likely to agree that they usually do not read the labels on over-the-counter drug products. However, it is noteworthy that the student and non-student participants differed in age (20.8 years vs. 40.3 years, respectively), and therefore, these effects may be age-related.

Overall, the information this study suggests a need to provide better warnings to facilitate more informed choices on the part of people who use these products—particularly groups of people who may be at increased risk because of their pre-existing beliefs about the relative safety of dietary supplements. It may also serve as a platform from which to change current labeling requirements for dietary supplements.

The issues of overweight and obesity addressed at the outset of this article are also important. Such factors may well be the basis of intense motives to lose weight that in turn influence judgments about risk-benefit tradeoffs. In this context, it is even more important that good information be provided about the risks associated with the use of these products.

In our view, this work on labeling should begin with a clear understanding of what various target groups know and need to know about the dietary supplements they are most likely to use. Future research should relate knowledge gaps about dietary supplements to specific educational and warning material in order to influence knowledge and beliefs about such products. The ultimate goal, of course, is to provide the information needed to make informed, healthful decisions.

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## REFERENCES

- Field, A. E., Coakley, E. H., Must, A., Spadano, J. L., Laird, N., Dietz, W. H., Rimm, E., & Colditz, G. A. (2001). Impact of overweight on the risk of developing common chronic diseases during a ten-year period. *Archives of Internal Medicine*, *161*, 1581-1586.
- Laughery, K. R. & Paige, D. L. (2003). The effectiveness of warning information in dietary supplement product labels. *Proceedings of the Human Factors and Ergonomics Society*, *47*, 1740-1743.
- Mokdad, A. H., Bowman, B. A., Ford, E. S., Vinicor, F., Marks, J. S., & Koplan, J. P. (2001). The continuing epidemics of obesity and diabetes in the United States. *JAMA*, *286*, 1195-1200.
- Mokdad, A. H., Marks, J. S., Stroup, D. F., & Gerberding, J. L. (2004). Actual causes of death in the United States, 2000. *JAMA*, *291*, 1238-1245.
- Must, A., Spadano, J., Coakley, E. H., Field, A. E., Colditz, G., & Dietz, W. H. (1999). The disease burden associated with overweight and obesity. *JAMA*, *282*, 1523-1529.
- U.S. Department of Health and Human Services. (2001). *The Surgeon General's call to action to prevent and decrease overweight and obesity*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Office of the Surgeon General.
- U.S. FDA. (2003). Evidence on the safety and effectiveness of ephedra: Implications for regulation. <http://www.fda.gov/bbs/topics/NEWS/ephedra/whitepaper.html#six>.
- Visser, T., & Seidell, J. (2001). The public health impact of obesity. *Annual Review of Public Health*, *22*, 355-375.