

**Nutrition Education Research Brief:
Message Framing, Use of Interactive
Technology to Tailor Messages,
and Intervention Intensity**

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Nutrition Education Research Brief: Message Framing, Use of Interactive Technology to Tailor Messages, and Intervention Intensity

The Food and Nutrition Service (FNS) supports nutrition education in its nutrition assistance programs to help participants choose healthy foods and active lifestyles, within the constraints of a limited budget. Achieving and sustaining positive changes in eating and nutrition-related behaviors is, however, a complex challenge. To maximize the impact of nutrition education, FNS encourages providers to incorporate available scientific evidence into their plans and implementation.

This research brief and the more comprehensive research it summarizes here are intended to assist nutrition educators in maximizing the impact of nutrition research. The brief highlights key findings from research reviews on three topics that are pertinent to the design and implementation of nutrition education programs:

- Message framing
- Use of interactive technology to tailor messages
- Intervention intensity

These topics reflect an interest in understanding whether specific characteristics of nutrition education messages and interventions influence their effectiveness in promoting desired behavior change.

Identifying Relevant Research

To identify pertinent research, Mathematica Policy Research, Inc. (MPR) conducted a computerized literature search that targeted papers published in peer-reviewed journals from 1995 through 2004. The search, which was limited to the English language and to research conducted with U.S. populations, extended to several databases that cover the health, social science, and nutrition literature. Key words used in the search were “nutrition message” and “nutrition intervention”; the search identified a total 183 citations. We reviewed abstracts with respect to general topic, message characteristics, outcomes, study population, and research design and sorted them into three categories based on potential relevance for the research reviews. Two nutritionists reviewed and ranked each citation, and a senior research nutritionist adjudicated discrepant rankings.

The reviewers considered a total of 27 citations to be of “high relevance.” The citations reported on studies that included message framing, tailored messages, or intervention intensity as independent variables in randomized experiments or quasi-experiments. Ninety-five citations were considered of “medium relevance” and included studies that assessed outcomes of nutrition education interventions but did not focus specifically on characteristics of the nutrition education messages or the intensity of the intervention. Included, too, were citations that were more broadly relevant and could provide potentially useful background information on, for example, the development of nutrition education

messages. Finally, 61 citations were judged to be of “low relevance” because they were clearly “off topic” or the abstract provided limited information.

An effort also was made by FNS and MPR staff to identify relevant unpublished papers and reports. Selected government agencies were contacted, queries were posted on several list-serves available to nutrition educators, and Web sites of government agencies, professional associations, and healthcare organizations were searched. The last included the Food and Drug Administration, the U.S. Department of Agriculture’s Agricultural Research Service, the National Institutes of Health (National Heart, Lung and Blood Institute; National Institute of Diabetes and Digestive and Kidney Diseases; and National Cancer Institute), the Centers for Disease Control and Prevention, the American Dietetic Association, and the American Public Health Association.

FNS staff reviewed the papers and reports identified through the above process. Additional relevant research—identified by crosschecking references—was also reviewed. Three comprehensive reports were prepared, summarizing research findings in each topic area (message framing, use of interactive technology to tailor messages, and intervention intensity). This brief highlights findings from each of these reports. The last page provides complete citations and Web addresses for the full reports.

Message Framing

The goal of nutrition education is to persuade individuals to make meaningful changes in their dietary behaviors. Nutrition educators use messages to communicate desired behaviors to consumers. Several factors influence the ultimate persuasive power and effectiveness of the messages. A person’s willingness to adopt a specific behavior can be affected by (1) his or her perception about the likelihood of a particular outcome and (2) the relative importance or expected value of that outcome. For example, a person’s willingness to switch from whole to low-fat milk as a means to lower saturated fat intake may be influenced by perceptions about (1) the likelihood that the saturated fat obtained from whole milk increases the risk of heart disease and (2) the question of whether the benefit (decreased risk of heart disease) is worth the cost (loss of flavor).

Prospect theory suggests that the way in which a message is framed can influence its persuasiveness and effectiveness. Messages may be either gain-framed or loss-framed. A gain-framed message emphasizes the benefits associated with adopting the recommended behavior while a loss-framed message focuses on the negative consequences of not adopting the desired behavior. Using increased fruit and vegetable consumption as the recommended behavior, a gain-framed message would state, “Eating more fruits and vegetables can help you maintain a healthy weight and avoid certain types of cancer.” A loss-framed version of the same message would state, “Eating too few fruits and vegetables can make it harder to maintain a healthy weight and can increase your risk of colon cancer.”

Research on changing general health behaviors shows that gain-framed messages are more effective when the advocated behavior is prevention-oriented. Prevention behaviors are viewed as low-risk behaviors (they impose a relatively low perceived “cost” on the individual) with relatively certain outcomes. For example, people are willing to apply sunscreen because engaging in this behavior is relatively simple, and they can be certain of a beneficial outcome. Loss-framed messages, on the other hand, appear to be more effective when the advocated behavior is detection-oriented. Detection behaviors, such as undergoing mammography or colonoscopy screening, are perceived as high-risk

(they impose a considerably higher perceived “cost” on the individual) and are associated with uncertain outcomes. For example, people may be hesitant to undergo a colonoscopy screening because of perceptions about the negative short-term risks, such as discomfort and embarrassment, and uncertain long-term benefits. To overcome such resistance, individuals must be convinced that the long-term, positive outcomes outweigh the short-term negatives.

To date, most of the research on message framing has focused on general health behaviors. The literature search identified only three papers that examined the framing of nutrition education messages. One of these papers summarized findings from three experiments that hypothesized that, since nutrition education promotes preventive behaviors, gain-framed messages would be more effective than loss-framed messages. Only one of the experiments examined behavior change (self-reported intakes of fat and fruits and vegetables). The other two experiments focused on attitudes and reported intentions. All three experiments failed to demonstrate that message framing had a significant effect on nutrition-related outcomes. One possible explanation is that dietary behaviors are more complex than general health behaviors (for example, the use of sunscreen and seatbelts and undergoing health screenings, such as mammograms and colonoscopies) that have been the subject of most research on message framing.

Two other relevant papers identified in the literature search assessed whether personal psychological traits might influence how people respond to message frames. Results suggest that *ambivalence* about an advocated behavior and/or *self-discrepancy* (when peoples’ self-perceptions conflict with their ideals for themselves or what they believe others want them to be) may affect responsiveness to message frames. In general, highly ambivalent individuals tend to respond better to loss-framed messages, whereas individuals with different forms of self-discrepancy respond differently to gain- and loss-framed messages.

Summary

Research on general health behaviors suggests that:

- Gain-framed messages are more effective in promoting prevention behaviors
- Loss-framed messages are more effective in promoting detection behaviors

Dietary behaviors clearly fall under the heading of “prevention behavior.” However, the limited research available on framing and nutrition education messages has failed to demonstrate that gain-framed nutrition education messages are more effective than loss-framed messages. Given the complexity of dietary behaviors, it is possible that the relationship between message framing and behavior change is not as simple as that observed for general health behaviors.

While further research in this area is needed, existing research has identified two psychological characteristics that are sensitive to gain- and loss-framed messages: *ambivalence* and *self-discrepancy*. In most settings, it is unrealistic for nutrition educators to assess individuals’ self-discrepancy. It may be possible, however, to assess the level of individuals’ ambivalence about adopting a recommended behavior. When feasible, nutrition educators can use information about the level of ambivalence in their target audience to guide decisions about how to frame their messages. Initial efforts in this area

could be aimed at the development of a brief assessment tool that would allow nutrition educators to assess an individual's or group's level of ambivalence about adopted recommended dietary behaviors. Results of this assessment could be used to make decisions about message framing. For example, a group that expresses a roughly equivalent amount of positive and negative feelings about the recommended behavior can be considered ambivalent. Such groups may respond better to loss-framed messages.

Use of Interactive Technology to Tailor Messages

When individuals are considering persuasive messages that are intended to prompt behavior change (such as nutrition education messages), they are likely to process personally relevant messages more thoughtfully than they process generic messages. Message tailoring is intended to make messages more personal, thus garnering deeper attention. Tailored messages are personalized based on assessments of individual characteristics and needs and/or specific targeted outcomes. Factors for consideration include demographic characteristics and relevant health, nutrition, and psychological characteristics. Research indicates that psychosocial factors such as intention, motivation, attitude, social influences, and perceived self-control have more influence on behavior than simple demographic characteristics.

Several behavior change theories provide frameworks for tailoring messages based on psychosocial characteristics. For example, tailoring based on the Stages of Change Model would consider an individual's level of readiness or motivation to change a specific behavior. Tailoring based on the Health Belief Model would include the individual's perception of the risks and benefits associated with adopting the recommended behavior. Many message-tailoring interventions combine elements of several behavior change theories. Several comprehensive reviews of research on message tailoring conclude that tailored nutrition education messages are more effective than generic messages. Tailored messages are more likely than generic messages to be read, remembered, and viewed as relevant. Most important, they are more likely to promote behavior change.

The most direct method of tailoring nutrition education messages is through individualized counseling. However, counseling is generally not feasible in settings where resources are limited and large, diverse populations must be reached. In these settings, interactive technology can make it possible to deliver tailored nutrition education messages. Three approaches have been used: computerized telephone counseling, or telephone-linked care (TLC); computer-based multimedia programs; and Web-based programs.

The literature search identified six research papers that summarize results of five studies (randomized control trials) of interactive nutrition education programs. One study used a TLC intervention, three used computer-based programs, and one used a Web-based program. Outcomes of interest included nutrition knowledge, self-efficacy, diet-related intentions, and self-reported dietary behaviors or intake. All of the studies reported positive effects on knowledge and attitudinal measures. Moreover, two of the four studies that examined self-reported dietary behaviors reported positive effects on intake of fat, fruits and vegetables, and fiber, or on specific behaviors related to intake of these nutrients.

Several important features limit the generalizability of findings from this research. First, the populations included in each study were self-selected. Second, exposure to the intervention was directly related to individual motivation. In some cases, subjects in the treatment group never accessed

the interactive program. Finally, most of the studies focused on populations that were highly educated, largely female, and personally motivated to change. The two studies that included lower-income populations found no effects of interactively tailored nutrition education messages on self-reported dietary behaviors. While this pattern suggests that interactive tailoring may be less effective in lower-income populations, the limited number of studies and major differences across studies in populations, interventions, and outcomes make it impossible to draw firm conclusions.

Summary

The use of interactive technology holds promise as a cost-effective means of delivering tailored nutrition education messages to large and diverse groups. Tailored messages are more likely than generic messages to be read, remembered, and viewed as personally relevant. Some evidence suggests that tailored messages may be more effective than generic messages in increasing dietary knowledge and promoting modest changes in dietary behaviors, particularly with respect to dietary fat. More research is needed, however, to answer critical questions about the types of interactive computer-tailored interventions that work best with different population subgroups. Information is also needed on how mode of intervention (telephone, computer/multimedia, Web) may influence program effects.

Intervention Intensity

The question underlying interest in intervention intensity asks, “How much nutrition education is needed to achieve desired changes in dietary behaviors?” Intensity, also sometimes referred to as “dosage,” measures individuals’ level of exposure to an educational intervention. Such exposure is usually defined in terms of the number of contacts between an individual and an educator--whether via individual counseling sessions, group meetings, or telephone contacts-- and the amount of time associated with the contacts. As principles of social learning theory have been incorporated into nutrition education initiatives, the concept of intensity has expanded to include the number of communication channels. For example, in a school-based setting, communication channels may include classroom lessons, activities to pursue at home with parents, posters in the cafeteria, and/or special events. Intensity may also incorporate a measure of duration or the overall length of the active intervention period.

Intensity is influenced not only by program design but also by the behaviors of educators (who may not implement the program as designed) and participants (who may not participate in all activities even when activities are implemented). Many nutrition education programs are delivered in existing organizational settings, such as schools, job sites, community centers, and supermarkets, all of which impose competing priorities and constraints that can influence both program delivery and exposure.

To understand fully the role of intervention intensity in promoting desired dietary behavior changes, researchers must undertake rigorous studies that include experimental manipulation and clear and consistent documentation of all dimensions of intensity. To date, few such studies have been completed. Most studies that have examined the influence of intervention intensity have done so on a post hoc basis by using dose-response analyses. Nonetheless, existing research yields some useful lessons for nutrition educators.

The literature review identified three studies that used randomized experiments to assess the effects of intervention intensity on dietary behaviors. The three studies shared important design

features. Specifically, the more/most intense intervention in each study (1) provided increased interpersonal contact through small group meetings, (2) included some type of initial self-assessment and identification of strategies for changing behavior, and (3) involved more than one type of contact. In addition, control groups received less intense interventions than treatment groups rather than no intervention. All three studies found that the more or most intense intervention produced small but statistically significant effects on one or more measures of dietary behavior. The studies observed the most consistent effects for self-reported fruit consumption.

A handful of review articles that addressed quasi-experimental and non-experimental research generally also report a modest but positive relationship between intervention intensity and behavior change. In general, successful interventions tend to incorporate several delivery channels, involve more than two contacts, and require delivery over long periods of time. However, findings from some studies are clouded by the fact that the more intensive interventions were directed at more motivated or more at-risk individuals.

An important consideration in interpreting the intensity aspect of the research findings is that the intensity of the intervention received by any individual is often lower than what was intended. The literature is replete with papers reporting poor participation or engagement by study subjects and/or significant levels of attrition. Given this reality, it is important to note that the existing research suggests that less intensive interventions can produce small changes in dietary behaviors if they are (1) targeted to individuals or small groups and (2) involve several channels of communication.

Summary

Available evidence suggests a generally positive association between intervention intensity and dietary behavior change. However, we are still at the threshold of understanding the effect of intervention intensity in community-based interventions with general populations. Few studies have experimentally manipulated intensity, and none has examined more than one or two variations in intensity. Much of the available research is post hoc in nature, making it difficult to draw unequivocal conclusions about cause and effect. In addition, intensity is a multidimensional concept that includes number, length, and type of contacts; total duration (calendar time); and number and type of communication channels. At this point, we know little about the relative influence of these various dimensions or the interactions among them. To contribute to our understanding in this area, nutrition researchers should take care in routinely and precisely documenting the dimensions of intensity associated with interventions under study.

In recognition of the challenges inherent in delivering intensive interventions that rely on a substantial amount of face-to-face contact, much of the ongoing research in this area is focusing on alternative, less costly communication channels (for example, self-assessment materials and use of telephone-, mail-, and computer-based contacts). Some investigators have suggested that these delivery channels can be effective because they can be used at home or work, all settings where stimulus control and self-monitoring activity are highly important.

Concluding Remarks

Existing research on message framing, the use of information technology to tailor messages, and intervention intensity offers no firm conclusions about how these features can be used to enhance the

effectiveness of nutrition education programs. In addition to the limitations discussed above, many of the reviewed studies shared other important weaknesses, including (1) small sample sizes, (2) reliance on self-reported measures of dietary behavior, and (3) use of convenience samples, which were often predominantly female, well-educated, and higher-income. If efforts to promote meaningful changes in the dietary behaviors of nutrition assistance program participants are to be effective, future nutrition education research must involve representative low-income populations.

Information Sources

Aldridge, D. *Interactive Computer-Tailored Nutrition Education*. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service, 2006.

Aldridge, D. *Message Framing Effects in Nutrition Education*. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service, 2006.

Olander, C. *Nutrition Education and the Role of Dosage*. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service, 2007.

NOTE: These three papers include detailed references for all research reviewed.