Understanding the Effects of Printed Health Education Materials: Which Features Lead to Which Outcomes?

F. C. BULL
Department of Public Health
University of Western Australia
Nedlands, Western Australia

C. L. HOLT
M. W. KREUTER
E. M. CLARK
D. SCHARFF
Health Communication Research Laboratory
Saint Louis University
Saint Louis, Missouri, USA

Printed health education materials (HEMs) are widely used to increase awareness and knowledge, change attitudes and beliefs, and help individuals adopt and maintain healthy lifestyle behaviors. While much of the contemporary research and development of persuasive communication is based on McGuire’s input/output model, to date few studies have compared the impact of a large set of inputs across a comprehensive set of the 12 outputs. We examined the effects of printed HEMs on weight loss on the cognitive, affective, and behavioral responses of 198 overweight adults. Participants were recruited via a newspaper advertisement and were randomly assigned to review one of three HEMs. Participants were interviewed and asked to complete a series of questionnaires both before and after viewing the HEMs. Regression analyses were conducted to identify the input characteristics associated with success at each of the output steps. The results revealed attractiveness, encouragement, level of information, and application to one’s life were significantly associated with early steps (attention, liking, and understanding) as well as some of the mediating steps (recalling, keeping, and rereading HEMs). Later steps, such as intention to change behavior and show others, were associated with readiness to change, self-efficacy, and perceived application to one’s life. Behavior change was more likely for those who received tailored materials and those who had higher self-efficacy. These results provide useful direction for the use of computers in tailoring the content of HEMs and the development of effective communication of health information on weight loss.

Printed health education materials (HEMs) have been used to increase awareness and knowledge, change attitudes and beliefs, and help individuals adopt and maintain healthy lifestyle behaviors (United States Department of Health and Human Services, 1992).
Although much research has been conducted to identify the source, message, channel, and receiver factors that are associated with effective communication (Chaiken, 1980; Fazio, Chen, McDonel, & Sherman, 1982; Rhodes & Wood, 1992), most of the previous studies have compared one or two of these factors with a single outcome such as increasing knowledge or a change in attitude. Consequently, less is known about the relative effectiveness of the individual factors in addressing different health-related outcomes. For example, HEMs that are highly attractive might catch an individual's attention and thereby increase awareness, but attractiveness alone will not stimulate lasting changes in complex lifestyle behaviors. To maximize the effectiveness of print-based communication, educational materials should include whatever combination of features is most likely to achieve the desired outcome in an efficient manner. By better understanding the capabilities and limitations of specific communication strategies, health educators can design more effective educational programs and materials. In this study we explored the effectiveness of different features of persuasive communication in written materials on weight loss. We used McGuire's (1968) model as a conceptual and analytical framework.

**McGuire's Communication/Persuasion Model**

Much of the contemporary research on persuasive communication is based on the early work of McGuire (1968) and the persuasive communication or input/output model. The model consists of five types of input variables (source, message, channel, receiver, and destination) that affect communication effectiveness, and 12 possible effects, or outcomes, of communication. The output variables or communication effects include message exposure, attention, liking, comprehension, skill acquisition, yielding, memory storage and agreement, information search and retrieval, deciding, behaving, reinforcement, and postbehavioral consolidation.

In the model, the outcomes are organized sequentially from affective and cognitive effects to behavioral outcomes, and it is proposed that progression through the steps is dependent on successful completion of the previous step and that progression can stop anywhere in the sequence (McGuire, 1976). McGuire states that to maximize persuasiveness and lead to a behavior change, a communication should be designed to maximize effectiveness at each step. He contends that many communications tend to focus on just one or two steps and ignore the others, and thus they fail to be persuasive or to result in behavior change. However, these ideas have not been empirically tested. It is, however, sometimes difficult to distinguish between the output steps in terms of how they are to be operationally defined, and McGuire himself has suggested that the division points between steps are arbitrary (McGuire, 1976, p. 303) and some “simplifications” (McGuire, 1968, p. 180) of the model can be made for use in empirical studies. For example, the researcher may combine the attention and liking steps, or the persuasion process may be analyzed only up to the yielding step. Indeed, in many instances message exposure, the first step, is under the control of the researcher, not the participants.

Previous research on the input variables in the McGuire model has investigated the effects of liking (Chaiken, 1980), credibility (Ward & McGinnies, 1974), and trustworthiness (McGinnies & Ward, 1980) of the source; self-esteem, intelligence, and age of the recipient (Rhodes & Wood, 1992); knowledge about the message topic (Wood, 1982); and age of the recipient (Harris et al., 1983). Research on the output variables of the model has also tended to focus on only one or two variables in each study. Comprehension (Chaiken & Eagly, 1976; Eagly, 1974; Greenwald, 1968), yielding (Hewitt, 1972), attention (Kleinhesseling & Edwards, 1975), skill acquisition (Meyer, Nash, McAllister, Maccoby, & Farquhar, 1980), and information search and retrieval (Fazio et al., 1982) are some of the output variables that have been empirically investigated.

However, to date, few studies have compared the impact of a large set of input variables across a comprehensive set of the 12 cognitive, affective, and behavioral outputs. Yet greater understanding of the effects of specific inputs on the specific outputs would provide valuable information on how to develop more effective health communications.

The purpose of this study was to examine the relationship between the communication inputs and the cognitive and behavioral outputs using an adapted version of McGuire’s communication persuasion model. This study used McGuire’s model as a framework to examine the effects of printed materials on weight loss on the cognitive, affective, and behavioral responses of 198 overweight individuals. We did not set out to test the model per se and the novel data reported were collected as part of a larger study testing the effectiveness of computer-generated tailored HEMs that has been previously reported (Kreuter, Bull, Clark, & Oswald, 1999). The input characteristics and output measures were operationalized and measured through items on a series of questionnaires that were completed before and after exposure to written materials on losing weight (HEM). The responses were analyzed to identify any associations between the input and output variables. This study took an exploratory approach to examine the relatively large number of inputs and outputs and thus set no a priori hypotheses.

**Method**

**Participants**

Potential participants from the St. Louis area responded to a newspaper advertisement that invited individuals to participate in a study examining reactions to printed weight loss materials. The research staff screened interested callers with a initial phone interview (Q1) to determine whether they met the criteria for participation in the study. Eligible individuals had a body mass index (BMI) of 27kg/m² or greater, were at least 18 years of age, expressed interest in losing weight, and had not used prescription weight loss medication at any time during the previous 6 months. A total of 233 participants met these criteria and enrolled in the study. Of these, 164 (31.7%) did not keep their appointment and 3 had a BMI <27kg/m² when verified clinically, resulting in a final sample of 198. All participants who came to the laboratory and completed the experimental session received $25 for their participation. The average age of the participants was 46.5 years, and the average BMI (kg/m²) was 37. The majority were women (83.2%) while 1.5% were of other ethnicities. The average years of completed education for the sample was 14 years. More than half of the participants reported they were in the action stage of behavior change for weight loss (“currently trying to lose weight”) while 35% were in preparation (“thinking about trying in the next 30 days”) and 8% were in contemplation (“thinking about losing weight in the next 6 months”).

**Baseline Measures**

Interested callers completed a brief (5 minute) telephone screening interview (Q1) to determine their eligibility to participate using the aforementioned criteria. Eligible participants then completed a telephone interview (Q2) that consisted of items required to generate the tailored HEM. In Q1, the participants' self-reported height, weight, age, use of prescription weight loss medications, and stage of readiness to lose weight were recorded. Researchers collected the following data for Q2: beliefs about weight loss;
motives for losing weight; perceived usefulness of different weight loss approaches; barriers to physical activity; triggers for eating and overeating (Brownell & Kramer, 1989; Brownell & Wadden, 1992); actual dietary habits and preferences; food shopping and preparation routines; preference for individual versus social learning activities (Brownell, 1994); preference for sources of weight loss information; and self-efficacy (Bandura, 1977) for eating healthier foods, eating less fat, increasing physical activity, and making progress toward weight loss goal. Responses to the latter two items were on a 3-point Likert scale (very likely, somewhat likely, and not at all likely) while all other items used a yes/no response scale.

On arrival at the research laboratory for their scheduled appointment, participants completed a brief interview to confirm their eligibility and collect demographic data and making progress toward weight loss goal. Responses to the latter two items were on a 3-point Likert scale (very likely, somewhat likely, and not at all likely) while all other items used a yes/no response scale.

Through random assignment the participants received one of three HEMs on weight loss. Participants read the HEMs in a quiet room. A trained observer who also administered the follow-up questionnaires unobtrusively recorded the length of time spent reading the materials. Seventy-two participants received individually tailored HEMs, 73 received the American Heart Association (AHA) weight loss booklet, and 53 received materials that were in the same format and appearance as the tailored HEM, but contained the same content of the AHA materials (AHA formatted).

Health Education Materials (HEMs) on Weight Loss
Tailored HEMs are created through a process that involves combining selected health information to produce a unique communication intended to reach one specific individual and that based on characteristics of that person derived from an individual assessment. For example, a generic pamphlet on smoking cessation would have to include information relevant for all ages and ethnicity, males and females, and attempt to address all the motives for and barriers to smoking. In contrast a computer-generated tailored pamphlet can select and print only the text related to the relevant motives and barriers and that based on characteristics of that person derived from an individual assessment. Empirical studies have demonstrated the effectiveness of tailored HEMs compared with nontailored HEMs in health-related behaviors such as eating less fat, eating fruits and vegetables, quitting smoking, and changing individuals' inaccurate perceptions of health risks (Brug, Glanz, Van Assema, Kok, & Van Breukelen, 1998; Brug, Steenhuis, Van Assema, & De Vries, 1996; Campbell, De Vellis, Strecher, Ammerman, De Vellis, & Sandler, 1994; Curry, McBride, Grothaus, & Louis, 1995; Kreuter & Strecher, 1996; Prochaska, DiClemente, Velicer, & Rossi, 1993; Strecher, Kreuter, DenBoer, Koblin, Hospers, & Skinner, 1994). The tailored HEMs in this study were generated using the Adobe Pagemaker® (1996) program, and the text blocks were selected through computer algorithms using the responses to items from the telephone survey (Q2) and demographic data from Q1.

The AHA "Managing Your Weight" booklet is a commonly distributed weight loss book and contains a variety of general weight loss information, covering topics such as choosing and preparing low-fat foods, reducing calorie intake, increasing physical activity, and making progress toward weight loss goal, was measured in Q3B using the sum of four 3-point Likert items (very likely, somewhat likely, and not at all likely) while all other items used a yes/no response scale.

Follow-Up Measures and Attrition
After reading the assigned HEMs, the participants recorded their thoughts (cognitive responses, Q4A) and completed a series of 7-point Likert items (Q4B) assessing the input and output measures of McGuire's model (i.e., how attractive, informative, encouraging the materials were, their intention to reread). Open-ended ratings of the HEM were collected in questionnaire 4C (namely, what did you like best/least; what information was new, helpful; what ideas do you intend to try). Finally, participants completed a questionnaire (Q5) that assessed any immediate changes as a result of reading the HEM. Data from Q5 would detect changes in intention to change behavior, stage of change, and confidence to undertake various weight loss behaviors. Completion of the entire testing protocol took between 40–60 minutes. One month later, a follow-up telephone interview (Q6) reassessed recall of the information in the HEMs and the affective (usefulness, application to one's life, motivation to lose weight, confidence in undertaking weight loss behaviors) and behavioral outputs of McGuire's model (rereading the HEMs, showing the HEMs to someone, undertaking weight loss behaviors). A total of 189 participants completed the follow-up interview: 68 individuals in the tailored group, 50 in the AHA formatted group, and 71 from the AHA group.

Operationalization of McGuire's Model
Input Variables
The five categories of input variables included in our matrix are based on an adaptation of McGuire's (1989) model.

1. Receiver Factors: Psychosocial Characteristics. The receiver psychosocial characteristics included the participants' weight locus of control (WLOC) score (Salzter, 1982), readiness to lose weight, level of self-efficacy, and previous familiarity with the information in the HEMs. Familiarity with the information was measured using one 7-point Likert item (very familiar to not at all familiar) in Q4B. The WLOC score was assessed prior to the intervention (Q3B) and consists of four six-point Likert items (strongly agree to strongly disagree) developed to measure an individual's belief about their level of control over weight loss and has demonstrated internal reliability (alpha = .58). The lowest possible score of 4 indicates extreme externality and the highest score of 24 indicates extreme internality. Readiness to lose weight or stage of change for weight loss (O'Connell & Velicer, 1988; Rossi et al., 1994) was assessed through a single item on Q3B with four response options, namely "I am already trying to lose weight" (action stage, coded 1); "I am planning to start trying in the next 30 days" (preparation stage, coded 2); "I am thinking about starting to try in the next 6 months" (contemplation stage, coded 3); or "I am not thinking about trying to lose weight" (precontemplation stage, coded 4). Level of confidence (self-efficacy) in choosing healthier foods, eating less fat, increasing physical activity, and making progress toward their weight loss goal, was measured in Q3B using the sum of four 3-point Likert items (very, somewhat, not at all).
2. Receiver Factors: Demographic and Physical Characteristics. Age, gender, level of education, and BMI were entered as demographic characteristics. BMI was computed using height and weight measurements obtained at the laboratory visit. Age, gender, and education were collected in Q3.

3. Channel Factors. This category contained one item (Q2) that assessed the individuals' preparedness to read printed materials. A 3-point Likert response scale was used (very likely, somewhat likely, not at all likely).

4. Source Factors. Perceived attractiveness of the HEM and the degree to which the participants found them to be trustworthy were used as source factors. Both were measured in Q4B using single 7-point Likert items (very much to not at all).

5. Message Factors. Input variables related to characteristics of the message (HEM) included the degree to which the participants found the HEM to be informative, encouraging, useful, how strongly the information was perceived to apply to the participants' lives, and message content (tailored or untailed). The first four of these variables were measured in Q4B via 7-point Likert items (very to not at all). Participants who received tailored HEM were compared with those in a combined untailed group (AHA and AHA formatted).

Output Variables

Our communication matrix incorporated 10 output variables that were adapted from McGuire's (1989) model and that are outlined below.

1. Exposure. Exposure to the message (HEM) was assumed to be the same for all participants because each participant was given the materials, instructed to read the materials, and observed by research staff.

2. Attention. The degree to which the HEM caught their attention was measured (Q4B) immediately after the participant had finished reading the HEM, using a 7-point Likert item (very much to not at all).

3. Liking. How much the participants liked the message was assessed in Q4B using a 7-point Likert item (very much to not at all).

4. Understanding. Ease of understanding the material was assessed in Q4B using a 7-point Likert item (very easy to not at all easy).

5. Skill Acquisition—Learning How. Learning was operationalized as the number of items participants stated they had learned from the HEM. This was measured during the telephone interview undertaken at the one-month follow-up (Q6).

6. Yielding. Attitude change as a result of the message was operationalized by constructing a compound measure consisting of the level of previous familiarity and agreement with the message content (both measured on 7-point Likert scales). Attitude change was said to occur only if a participant was not previously familiar with the content and reported a high level of agreement with the information. The variable was created by taking only those who responded 5, 6, or 7 on the agreement item (high agreement) and those who responded 1, 2, or 3 on the familiarity item (low previous familiarity), and coding them as positive for yielding. All other participants were coded as negative for yielding.

7. Memory Storage/Agreement. Memory storage was assessed in three ways. First, memory storage was assessed in terms of the amount of time participants estimated they spent thinking about the message content while reading the HEMs. This was measured in Q4B using a 7-point Likert item (little or no time to a lot of time). Second, memory was assessed in terms of the number of items participants stated they remembered from the HEM. A third indicator of memory/storage was whether the participants kept the HEM (Yes/No). The latter two outputs were measured in the follow-up telephone interview (Q6). The rationale for the third variable was that if the participants did not keep the HEM they would not be able to reread the material and would therefore not be able to review it for further memory storage.

8. Information Search and Retrieval. This output variable was measured in terms of how much of the HEM the participants had reread by the one-month follow-up, and was assessed in Q6 using a 7-point Likert scale (none to all).

9. Deciding. Whether participants made any decisions on the basis of the HEM was operationalized using two measures of behavioral intent: intention to make changes in weight loss behaviors, and intention to show the HEM to other people. Both of these were measured in Q4B using 7-point Likert items (very likely to not at all likely).

10. Behaving. Behaving in accord with their decision was assessed using two items at follow-up (Q6), namely, whether the participant had tried any of the weight loss suggestions given in the HEM; and whether they showed the HEM to other people they knew. The response to both these items was in a yes/no format.

Analysis

Multiple stepwise regression analyses were conducted to identify the inputs that would best predict each of the 10 outputs. Linear regression was used for the following outputs: attention, liking, understanding, concepts learned, reread material, intention to show, and intention to make changes. Logistic regression was used for the remaining categorical data (yield, time spent thinking, concepts remembered, kept, did show, did make change) The criteria for entry and removal of variables in the models were probability of $p \leq 0.05$ and $p \geq 0.10$, respectively.

Input variables were treated as either continuous (namely, those collected using a 1–7 Likert response scale) or categorical. Because of a negative skew in the responses to the input variables, these Likert data were transformed (McGartland-Rubio, 1997) from 7-point to 4 point scales with 1–4 coded as 1, 5 coded as 2, 6 coded as 3, and 7 coded as 4. Furthermore, the two input characteristic variables (previous familiarity and how informative) were omitted from the logistic regression on yielding because they were used to construct this compound output measure. The following variables were collapsed into two categories: locus of control (external and internal); stage of change (contemplation/preparation/preparation and action); tailored (yes and no); likely to read print material (very likely and somewhat likely/not at all likely). Demographic data on education, age, and BMI were treated as continuous in the linear regression and collapsed into three equal groups (tertiary) for the logistic regression. Sex was entered as a categorical variable (male/female).

Results

Table 1 reports the results of the regression analyses and illustrates the relationships between the input and output variables.

Attending to and liking the communication were positively associated with perceiving the HEM to be more attractive, informative, and encouraging ($p < 0.001$, respectively). Tailored rather than nontailored HEM was positively associated with heightened attention ($p < 0.001$); however, age of recipient was negatively related to


TABLE 1 Results of Hierarchical Logistic Regressions and the Input/Output Matrix

<table>
<thead>
<tr>
<th>Input (predictors)</th>
<th>Source</th>
<th>Message</th>
<th>Psychosocial Demographics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Highly attractive</td>
<td>Highly trustworthy</td>
<td>Highly informative</td>
</tr>
<tr>
<td>Exposure (all)</td>
<td>***</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Attention</td>
<td>0.372</td>
<td>0.216</td>
<td>0.249</td>
</tr>
<tr>
<td>Liking</td>
<td>***</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Understanding</td>
<td>0.275</td>
<td>0.310</td>
<td>0.349</td>
</tr>
<tr>
<td>Skill acquisition—concepts learned</td>
<td>***</td>
<td>***</td>
<td>0.255</td>
</tr>
<tr>
<td>Yielding</td>
<td>0.248</td>
<td>-0.205</td>
<td>**</td>
</tr>
<tr>
<td>Memory storage—agreement—time spent thinking</td>
<td>**</td>
<td>0.604</td>
<td></td>
</tr>
<tr>
<td>Memory storage—agreement—concepts remembered</td>
<td>**</td>
<td></td>
<td>-1.66</td>
</tr>
<tr>
<td>Memory storage—agreement—kept materials</td>
<td>**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information search/retrieval—reread materials</td>
<td>**</td>
<td></td>
<td>***</td>
</tr>
<tr>
<td>Deciding—intention to show to others</td>
<td>***</td>
<td>0.346</td>
<td>0.175</td>
</tr>
<tr>
<td>Deciding—intention to make changes</td>
<td>0.259</td>
<td>0.346</td>
<td>**</td>
</tr>
<tr>
<td>Behavior—showed to others</td>
<td>**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavior—tried suggestions given</td>
<td>0.470</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: * = p < 0.10, ** = p < 0.05, *** = p < 0.01.
how much attention was given to the HEM (p < 0.005). Liking the materials was also predicted by how much the materials applied to the participants (p < 0.05) and how likely the individual was to read written materials on weight loss (p < 0.05). Finding the materials easy to understand was significantly associated with perceiving the HEM to be attractive (p < 0.001), trustworthy (p < 0.005), familiar (p < 0.01), and applicable to one's life (p < 0.001).

Mediating factors to behavior change such as learning new information (skill acquisition), attitudinal change (yielding), and remembering concepts were significantly associated with perceiving the message to apply to one's life (p < 0.05, respectively). Perceiving the HEM to contain new information (low level of previous familiarity) was also associated with learning and remembering. Participants who felt the materials were more useful were significantly more likely to have yielded or changed their attitude (p < 0.001). Those who found the materials to be more informative were more likely to report spending more time thinking about the message (p < 0.05) if the participants were more confident (high self-efficacy), or who were in the action stage of behavior change, were significantly more likely to remember more of the HEM content at follow-up (p < 0.05, respectively).

Surprisingly, there was a (modest) negative association between keeping the HEM and perceived level of trustworthiness (p < 0.1). However, receiving tailored HEMs and being in the action stage and interested in reading printed materials (likely to read printed HEMs) were significantly related to rereading the HEMs (information search and retrieval). Furthermore, intention to show the materials to others was significantly associated with having high self-efficacy for weight loss behaviors (p < 0.001), believing the material to be more encouraging, being less familiar with the content, and being in the action stage of behavior change and lower BMI (p < 0.05). Intention to make behavior change was associated with finding the HEM to be more useful (p < 0.001), informative (p < 0.001), new (less familiar, p < 0.05), and also having higher self-efficacy (p < 0.005).

Actual behavior change, such as showing the HEM to others, was associated with receiving tailored rather than nontailored materials (p < 0.05) and being internal rather than external on the WLOC scale. Finally, trying the suggestions given in the HEM was significantly associated with having a high self-efficacy for weight loss behaviors (p < 0.05) and rating the materials as more informative (p < 0.01).

Discussion

Although there has been a great deal of persuasion research and assessment of outcomes, there still remains uncertainty about when and how to apply specific characteristics and features to achieve desirable objectives in the area of health (Leventhal & Cameron, 1994). This is a challenging task, however, as previous research has been described as lacking in detail and precision and has not included the range of factors that can impact upon the various health actions targeted by health messages (Leventhal & Cameron, 1994).

Like much of the persuasion research, we used McGuire's input/output model of communication but rather than examine just one or two of the inputs and outputs, the current study is unique in that we looked at 10 outputs using a full range of inputs. Weight loss was chosen as the focus of this investigation because of the increasing prevalence of overweight and obese adults in most developed countries. Obesity represents a major risk to public health and the World Health Organization has classified obesity as a disease and recommended that considerably more attention is given to the prevention of weight gain and obesity (World Health Organization, 1997). As previous research has highlighted that providing supporting written materials is more effective than verbal advice alone (Russell, Wilson, Taylor, & Baker, 1979), knowledge of the role and importance of the potential design and format features, as well as content characteristics, of HEM, is imperative.

The results of this study reveal that the important preliminary steps to behavior change, namely, attending to, liking, and understanding the health information, are predicted by how much an individual perceives the HEM to be attractive, informative, encouraging, new, and useful. Attractiveness is subjective and transitory, often changing alongside trends in colors and design. However, it may be possible to enhance perceived attractiveness by including features unique to the individual, or perhaps characteristics known to be attractive to an individual. This can be achieved through the use of computer-generated tailored HEM. For example, it is possible to add the person's name to the HEM, and personalize the material, as was done in this study. Moreover, it would be feasible to print HEM using a font tailored to an individual's favorite colour to increase attractiveness, although the effectiveness of this particular kind of tailoring has yet to be tested empirically. This study did find that receiving tailored (and personalized) material predicted attention to the HEM.

Perceiving the material to apply to one's life was important to liking and understanding the HEM and to recalling new concepts about weight loss and yielding to the message. This highlights the importance of the content chosen for HEM where inevitably space is limited. Application of the transtheoretical model of behavior change suggests that individuals in the early stages of precontemplation and contemplation may benefit from content aimed at the cognitive processes of change (e.g., self-revaluation, consciousness raising) while those in later stages require information on behavioral processes and strategies (e.g., counterconditioning, stimulus control, social support) (Marcus & Simkin, 1994). Again, manipulating the content of HEM for different individuals can be achieved through tailoring, although an alternative would be to produce a set of materials, each one targeting a group of people with similar characteristics. However, HEM can be made more applicable to individuals not only by providing the "right" strategy but also by using examples relevant to a person's lifestyle. For example, providing alternatives or modifications to their favorite type of food when they dine out, or giving suggestions that acknowledge whether they are responsible for the shopping and/or food preparation in their household. Computer tailoring makes this both practical and feasible.

McGuire's model posits that individuals need to store, retrieve, and make decisions about the message as cognitive steps on their way to behavior change. Attractiveness was not found to predict these steps; they were in fact predicted by message characteristics, such as how informative, useful, and encouraging the HEM was perceived to be. Again, it is how relevant and applicable the content is perceived to be that remains important. Our results show that the message must also be seen as new, as those who were more familiar with the content were less likely to remember fewer concepts and were less likely to intend to show others or intend to make changes. Level of confidence in weight loss (self-efficacy) was predictive of intending to show others and intending to make changes. This is consistent with the findings from research investigating the effectiveness of interventions that have shown those with higher self-efficacy are more likely to adhere to programs (McAuley, 1993). Similarly, being in the action stage of change was associated with intending to show the HEM to others. Social support has consistently been found to be important in changing lifestyle-related risk factors such as smoking, level of exercise, and diet (Dishman & Sallis, 1994). Showing the materials to significant others, such as family or friends, may be an
important stimulus to creating a network of support for an individual adopting or maintaining lifestyle changes.

The results of the regression analyses did reveal a significant relationship between the receiver characteristics of age, BMI, and level of education, and the output steps of intention to show others and make behavior changes. Lower BMI was associated with being more likely to make changes. It is possible that the HEM used in this study did not persuade those with higher BMI to make changes. These people may be more resistant to change and/or require HEM with specific content. Finally, actual behavior change, such as showing others and trying strategies, was positively related to how informative the HEM were perceived to be and level of self-efficacy. Careful selection and preparation of content to increase the informative value of the HEM is therefore of great importance.

Like attractiveness, the determinants of how informative a HEM is perceived to be are likely to be individual and depend on previous knowledge and exposure to other messages. They are also very likely to be related to reading level and preferred learning style.

It is not surprising that this one-time presentation of HEM did not result in significant behavioral changes in the participants. The often low correlation between attitudes and behaviors has engaged social psychologists for many years (McGuire, 1976; Zanna, Higgins, & Herman, 1982). There was some evidence that attitude change did occur, at least for a portion of the participants. However, as is known in the field of persuasion, a communication that results in attitude change will not necessarily result in behavioral change. There are many complex factors involved between the sequence attitudes and behavior, such as situational variables, which can result in behaviors that do not match attitudes or even behavioral intentions (Zanna et al., 1982). In addition, any behavior change that is a result of a persuasive communication is subject to an attenuation that occurs over time (Evans, Rozelle, Lasater, Dembroski, & Allen, 1970). This may help to explain why there were only a moderate number of input variables associated with the two behaviors of showing the HEM to others and trying the suggestions given.

In general, the findings from this study are in agreement with previous research and consistent with McGuire’s predictions. Specifically, input variables such as attractiveness, tailored HEM, and encouragement were associated with earlier output steps such as attention, liking, and understanding. Perceived usefulness and application to one’s life were associated with the middle (cognitive) steps, and inputs such as self-efficacy and internal locus of control were associated with the later behavioral steps of the model. New content that is perceived as informative is an important predictor of the majority of the steps up to and including behavior change.

These results are useful to individuals who prepare and disseminate HEM as knowing what input characteristics relate to which outcomes provides a theoretical framework for generating and testing persuasive communications. For practitioners our results suggest that written health information on weight loss for obese adults must present information that is perceived as new to increase the chances of the material being attended to, liked, and read. Furthermore materials must be perceived as attractive and seen as trustworthy. Tailoring materials to individual characteristics can increase the likelihood of the HEM being read and shown to others, which is an important component of developing social support. Weight loss material must also be seen as relevant to the reader’s life. Again this can be attained through tailoring the examples and recommendations to aspects of an individual’s lifestyle.

A potential limitation of this study is the moderate ability to generalize these results. These data on weight loss materials were collected from a sample that contained few men and that had little ethnic diversity. Participants were more likely to be older (59% aged 35–54 years) compared with the general population (41% aged 35–54 years). In addition, the current sample consisted of overweight individuals who were interested in losing weight and who had either already started or who were planning to start to lose weight in the following 30 days. These results should not be generalized to individuals in the precontemplation stage. The subjects were also a highly motivated population, which may have influenced the pattern of responses. All these factors should be considered in the interpretation of the current findings to overweight populations.

Understanding persuasion in health communications may benefit from future studies investigating the association of additional input variables with a similar set of output variables. Studies of this type may yield a more comprehensive picture of how to construct effective health communications. This information could supplement what was learned from the current study and may be used by individuals who are interested in generating effective HEM. An adapted McGuire model could also be used with HEM or different health issues such as smoking or alcohol consumption.

References


