Stages of Change in Dietary Fat Reduction: Social Psychological Correlates

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ABSTRACT This paper describes the application of the stages-of-change construct to fat intake by examining the association of social psychological variables with stages of change based on dietary fat reduction. The association of stages of change with motivational beliefs, social influence, and self-efficacy variables derived from social psychological theories and with fat intake was assessed in 615 adults. Results indicated that stage assignment of individuals by a short self-report staging instrument was corroborated by their fat intake data and that dietary stage groups differed significantly on most variables in ways predicted by theory. ANOVA and discriminant analyses showed that variables reflecting a state of psychological readiness to change and cues to action were more strongly associated with contemplation of change. Reduction of perceived barriers, mostly in terms of taste and perceived difficulty of performing needed behaviors, and increased overall health concern, social modeling, and self-efficacy were associated with taking action and maintaining the behavior change.


INTRODUCTION

Wide attention has been given to the relationship between diet and health, for example, between fat intake and chronic diseases such as coronary heart disease and certain cancers. There is increasing scientific consensus that lowering fat intake from the current (approximately) 34% of caloric intake to 30% could reduce the risk of developing these diseases. To bring about such changes in dietary intake, a variety of actions are needed involving changes in both the environment and individual food choice motivations and behaviors. The identification and measurement of social psychological and behavioral factors related to selection of low-fat diets and an understanding of the behavior change process are thus crucial for the design of appropriate dietary change interventions. The study reported here focuses on social psychological factors associated with dietary fat reduction.

Researchers have increasingly used various social psychological theories to study the domain of food selection, including selection of diets low in fat. A review of these studies suggests that personal attitudes from the theory of reasoned action (TRA), in particular the behavioral beliefs or outcome expectancy component, were most highly correlated with behavioral intention or behavior. Among outcome expectations or anticipated outcomes, taste, or hedonic preference, seemed to be consistently predictive of intake, followed by beliefs about health consequences, with less consistent results for other beliefs such as convenience or price. The importance of the social norm component of TRA, however, appeared to depend on both the specific behavior and the population studied. The importance of perceived control over being able to perform the behavior (a variable from the theory of planned behavior) also depended on the food practice under study.

Using a different approach, Contento and Murphy examined dietary change by examining whether social psychological factors from the health belief model (HBM), augmented with subjective norms, self-efficacy, and health locus of control variables, could differentiate between people who reported having reduced their fat intake from those who had not. Self-changers were differentiated from non-changers primarily on the basis of perceived susceptibility to diet-related diseases, perceived benefits of changing their diets, normative beliefs, overall health concern, cues to action, chance locus of control, and self-efficacy in terms of food preparation skills.

However, from a variety of retrospective, cross-sectional, and longitudinal studies of health behavior change, Horn, Prochaska and DiClemente, and others have proposed that change occurs through a series of stages. The stages proposed by the different researchers are somewhat similar. In the formulation of Prochaska and colleagues, based primarily on extensive study of psychotherapy and smoking cessation, change is proposed to occur through five stages: precontemplation (unaware or not thinking about making a change); contemplation (seriously thinking about changing); decision or preparation (making definite plans to change); action (actively modifying an unhealthy behavior); and maintenance (maintaining the new, favorable behavior for some time).
The stages-of-change construct has proved useful in studying several problem behaviors, thus indicating its usefulness as an integrative concept for understanding, and potentially accelerating, health-related behavior change. When applied to dietary change in the context of health promotion and disease prevention, however, the stage construct must take into account the unique features of the domain of everyday eating. For example, changing eating patterns to make them lower in fat or higher in fiber requires modification for improved health, not cessation of the behavior, as in the case of smoking, nor is the behavior emotionally laden, as in the case of dieting for weight control. There is little social stigma associated with eating high-fat foods, nor do reductions in fat intake lead to immediately discernible physiologic changes. At the same time, however, the behavior changes are more complex since they require reduction in the quantity of some foods and modifications or substitutions of others. These changes require knowledge about food composition, cognitive skills to analyze and evaluate food and nutrition information, and food selection and preparation skills.

Application of the stages-of-change construct to dietary change poses unique methodologic challenges for classifying people into these stages as well. Dietary change, even for the more limited purpose of reducing fat in the diet, involves not just a single behavioral outcome, as in the case of smoking cessation, but a complex set of behavioral outcomes. Classifying people on the basis of each of the behavioral outcomes would be very unwieldy. At the same time, asking people if they are eating diets 30% or lower in fat is too abstract. There is no clear criterion that lets people know whether in any given day or week they are eating 30% or less of their calories as fat. One study has attempted to use a subset of five dietary behaviors to predict fat intake at or below 30% of energy. Whether these five dietary behaviors are sufficiently predictive of overall intake in diverse populations is not known. The behavioral criterion chosen for this study was self-reports of having “deliberately changed the way you eat to reduce the amount of fat and fatty foods” eaten, with examples given of high-fat foods. A similar approach has been taken in several recent studies, for example, in a validation study of a stage-of-change formula or algorithm with respect to fat intake, in a study comparing four different algorithms, and in a study examining the association of dietary stages to demographic and selected psychosocial factors in a large, geographically diverse population of workers.

This study investigated the social psychological variables that have been used in other theory-driven studies of everyday food selection in relation to stages of dietary change. Several researchers have recently attempted to extend social psychological theories beyond previous approaches by adding a time perspective and taking into account the emergence of self-efficacy as an important variable. Schwarzer proposed a two-stage model involving a “motivation or decision-making phase,” in which perceived threat, outcome expectancies, and self-efficacy are major determinants of behavioral intention, and an “action phase,” in which perceived barriers, self-efficacy, social support, and resources are most important. Baranowski reviewed in detail five social psychological theories (diffusion of innovations, HBM, TRA, social learning, and locus of control), along with the empirical evidence, to identify overlapping and complementary beliefs that play a motivational role in stages of health behavior change, particularly dietary change, and to synthesize these beliefs into a unifying theoretical framework, which he described as a “syntheoretical model.” The study described here builds on the dietary change study of Contento and Murphy by examining differences by stage of change in social psychological variables from several relevant theories organized into three categories. Motivational beliefs leading to the psychological state of readiness to take action were derived from the health belief model. Variables included perceived threat and perceived benefits and barriers. Social influence was assessed by examining the subjective norms or perceived social pressure variable from the theory of reasoned action and a social modeling variable from the social cognitive theory of Bandura. Self-efficacy, or the confidence people have in their own abilities to successfully execute the behaviors needed to eat a low-fat diet, was derived from SCT.

Baranowski proposed that motivational factors that lead to a psychological state of readiness to take action would be more important in the early stages of the dietary change process. Social influences may be important at all stages but become more important in later stages as people decide to take action, as well as when the behavior becomes manifest. Self-efficacy may be important in all stages of change.

The purpose of the present study, therefore, was to compare systematically people who were at different stages of dietary fat reduction based on variables derived from relevant social psychological theories. The study was not designed to provide a description of distributions of people by stage or their characterization in the population at large. Study participants were first placed in stages of change using a staging algorithm based on self-reported behaviors and judgments having to do with reducing fat in their diets, and their stage assignment was corroborated using a short dietary assessment instrument. The subjects were then assessed on motivational beliefs (perceived threat and outcome expectancies), social influence, and self-efficacy variables, thus permitting comparisons of these variables between groups at different stages of dietary fat reduction.

METHODS

Participants. Study participants were 615 government employees in a primarily upper middle class suburban town...
in the northeast who responded to questionnaires accompanying individual paychecks. An incentive to respond was a $500 drawing. A reminder was sent at the end of the first week. This convenience sample was used since the purpose of the study was not to provide a characterization of the population at large by stage of change but only to compare subgroups within a sample. The respondents were similar to the government employees as a whole as well as to the local community in ethnicity (about 80% white, 16% African American, and 4% Latino and Asian), age (a mean age of 43 years), and level of education (a mean of 2 years of college). The respondents were slightly more likely to be female (66% vs. 54% in the total sample vs. the local community).

Assessment instruments. Stages of dietary change. The first part of the questionnaire contained seven questions, modified from Prochaska and DiClemente's staging questions for smoking cessation, and designed to place each subject into one of four stages: precontemplation (PC), contemplation (C), action (A), or maintenance (M). A four-stage algorithm was developed because, at the time this study was initiated, a four-stage model was being used in stages-of-change research. The stage left out was the decision or preparation stage between C and A, which does not usually contain many people.35,37

Subjects who reported neither eating a reduced-fat diet nor considering doing so were placed in the PC stage; subjects who reported not eating a reduced-fat diet, but thinking about doing so, were placed in the C stage; subjects who reported eating a reduced-fat diet for less than 2 years were placed in the A stage; and subjects who reported eating a reduced-fat diet for more than 2 years were placed in the M stage. Two years was chosen to define maintenance rather than the 6 months customarily used in smoking cessation studies and in the stages of fat reduction studies of Curry et al.35 and Glanz et al.37 There is no a priori reason for a particular time span and, in both a previous study35 and in pilot work for this one, people eating low-fat diets fell largely into those who had just initiated change and those who had been eating such diets for more than 2 years. The staging questions were piloted several times to ensure classification of subjects into nonoverlapping categories. The questions and staging algorithm are very similar to those of Curry et al.,35 Rossi et al.,36 and Glanz et al.,37 which were developed concurrently.

Social psychological variables. Part two of the questionnaire consisted of statements that were adapted from the study of Contenko and Murphy25 to assess 10 social psychological variables related specifically to selecting everyday diets that are low in fat. The variables were based on the three categories of constructs of our conceptual framework, as described earlier.

Motivational beliefs were determined with scales tapping six variables derived from the HBM, which proposes that the likelihood or readiness of people to eat a low-fat diet is determined by people's belief that they are personally susceptible to dietary fat-related chronic diseases, that the diseases are of at least moderate severity if contracted, that eating less fat will be beneficial in reducing the risk of getting these diseases, and that the psychological and practical barriers to eating less fat can be overcome with reasonable effort. Overall concern for health, or degree of valuation of healthfulness, and cues to action are also part of the model.

Social influence was estimated by measuring the subjective norm components of the TRA and social modeling from SLT. The subjective norm component included one scale for normative beliefs, which represents a person's belief that significant others think he should or should not reduce dietary fat intake, and a second scale for the person's motivation to comply with the wishes of these significant others. Social modeling involved a single scale representing the actions of friends and family with regard to fat intake.

Self-efficacy was assessed with a single scale designed to determine the confidence people have in their own competence to successfully perform specific behaviors needed to reduce fat intake, such as choosing low-fat items on menus and in the market and preparing low-fat meals that were also interesting and tasted good.

Respondents indicated the degree to which they agreed or disagreed with 65 of the 75 statements on a 5-point Likert-type scale with response options ranging from "strongly disagree" (1) to "strongly agree" (5). Responses to the 10 self-efficacy questions, however, were worded "not at all confident" (1) to "extremely confident" (5).

Since all social psychological statements and questions in this study were worded to relate directly to the issue of dietary fat reduction, reliability data derived from the Contenko and Murphy study,25 in which the statements were worded differently, are not directly applicable. Therefore, reliability coefficients were calculated for each of the constructs, based on the sample data. Sample questions and reliability coefficients are shown in Table 1.

Dietary fat intake. Part three of the questionnaire consisted of a validated short dietary assessment instrument designed by Kristal et al.44 This instrument was used to quantify daily fat intake as a percentage of total calories and hence confirm the stage classifications of study participants. Calculated via regression models, these dietary components were assessed from yes/no responses to a short list of "core" foods (eaten five or more times per week) and "secondary" foods (eaten one or more times per week). Although dietary fiber intake was not a primary focus of this study, this dietary assessment instrument also provided a means for assessing it. Since it is well recognized that a high-fat diet is typically associated with low fiber intake, the quantification of fiber intake was included in this study as an additional check on the stage classification of participants. This short dietary assessment instrument was chosen in order to reduce re-
Table 1. Sample questions representing social psychological variables related to selecting reduced-fat diets.

<table>
<thead>
<tr>
<th>Number</th>
<th>Alphaa</th>
</tr>
</thead>
<tbody>
<tr>
<td>of Items</td>
<td></td>
</tr>
</tbody>
</table>

Perceived Susceptibility
I know I'll have a high cholesterol level some time in my life. 8 .70

Perceived Severity
If I found out I had cancer, I'd feel my life was over. 7 .54

Perceived Benefits
Eating fewer fatty foods is an excellent way to avoid getting a heart attack or cancer. 8 .63

Perceived Barriers
It's really hard to prepare low-fat meals that taste good. 9 .80

Cues to Action
Every time I read something about fat and heart disease, I think about cutting down on the amount of fatty foods I eat. 7 .77

Overall Health Concern
Staying healthy is worth everything to me. 6 .70

Normative Beliefs
My family thinks I should eat foods with less cholesterol and fat in them. 7 .70

Motivation to Comply
If my spouse, or someone else in my family, wanted me to eat foods lower in fat and cholesterol to prevent a heart attack, I would do it. 5 .73

Social Modeling
Most of my friends are very health conscious. 8 .65

Self-Efficacy
If you were given a restaurant menu, how confident are you that you could choose a meal that was low in fat? 10 .89

=cronbach's alpha reliability coefficients for scales measuring social psychological variables.

Respondent burden since the overall questionnaire was very lengthy.

Data analysis. Respondents in the PC, C, A, and M stages of dietary change were compared on dietary fat and fiber intake and on the 10 social psychological variables. One-way analyses of variance (ANOVA)s were used to determine the significance of group differences on these measures, and post-hoc Scheffe contrasts were employed to
determine significant mean differences between specific groups.

In order to determine the social psychological factors that more specifically differentiated individuals in the four stages of dietary change, three two-group discriminant analyses were conducted. These compared (1) individuals in the PC stage to those in the C stage; (2) individuals in the C stage to those in the A stage; and (3) individuals in the A stage to those in the M stage. The 10 social psychological variables were employed as predictors in each analysis.

RESULTS

Dietary fat and fiber intake. Table 2 presents the results of the ANOVA of the dietary fat and fiber intake measures for the entire sample and for men and women separately. It can be seen that stage assignment of individuals by the self-report instrument was corroborated by their fat and fiber intake data, with those in PC and C eating the most fat and the least fiber and those in the M stage eating the least fat and the most fiber. When the data were analyzed by gender, men and women within the PC and C stages consumed nearly identical percentages of fat. However, women in both the A and M stages seemed to be more successful in reducing fat intake. These differences did not apply to dietary fiber.

Social psychological variables by stage of dietary change. Table 3 presents the results of the ANOVA of the 10 social psychological constructs. Significant F-ratios were obtained for all variables. Although the F-ratios on the perceived severity and normative belief scales were significant at p < .05, post-hoc Scheffe contrasts indicated no significant pairwise differences. The remaining ANOVA were all significant at p < .001, and significant pairwise contrasts were identified in each case.

Those in the C stage had significantly higher scores than those in the PC stage on the variables of perceived susceptibility, perceived benefits, cues to action, and motivation to comply and significantly lower scores on self-efficacy. Those in the C stage seemed distinctive in that they had the highest perceived susceptibility to disease and perceived barriers to taking action and the lowest self-efficacy of any group. Those in the A stage had significantly higher scores than those in the C stage on perceived benefits, overall health concern, social modeling, and self-efficacy and lower scores on perceived barriers. Those in the M stage had the highest perception of the benefits of eating a low-fat diet, lowest perceived barriers to eating such a diet, highest overall health concern and motivation to comply with the opinions of significant others, and the highest self-efficacy.

Table 3 also presents the results of t-tests carried out to determine the significance of a linear trend in the group means of four stages. As indicated in the table, the linear
Table 2. Dietary fat and fiber intake of respondents at various stages of dietary change.

<table>
<thead>
<tr>
<th>Stage of Dietary Change</th>
<th>Precontemplation</th>
<th>Contemplation</th>
<th>Action</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
</tr>
<tr>
<td>% of total daily calories as fat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total sample</td>
<td>47</td>
<td>39.4</td>
<td>5.6</td>
<td>57</td>
</tr>
<tr>
<td>Women</td>
<td>18</td>
<td>39.5</td>
<td>6.0</td>
<td>28</td>
</tr>
<tr>
<td>Men</td>
<td>29</td>
<td>39.4</td>
<td>5.5</td>
<td>29</td>
</tr>
<tr>
<td>Daily dietary fiber intake in grams</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total sample</td>
<td>48</td>
<td>11.8</td>
<td>2.6</td>
<td>57</td>
</tr>
<tr>
<td>Women</td>
<td>19</td>
<td>10.9</td>
<td>2.3</td>
<td>28</td>
</tr>
</tbody>
</table>
| Men                     | 29   | 12.4 | 2.7 | 29   | 12.8 | 2.5 | 64   | 13.4 | 3.1 | 85   | 14.4 | 3.0 | 4.40**  

a,b,c Means not sharing the same superscript are significantly different at p < .05 or beyond, using post-hoc Scheffe contrasts.

**p < .01; ***p < .001.

trend components were significant in 8 of the 10 analyses: perceived severity, perceived benefits, perceived barriers, cues to action, overall health concern, motivation to comply, social modeling, and self-efficacy.

Table 4 presents the results of the three discriminant function analyses conducted to differentiate individuals in the four stages of change. All three analyses were significant (p < .001), indicating that individuals in each pair of adjacent stages can be discriminated significantly by a linear combination of the 10 social psychological variables. Structural correlations and univariate F-tests were calculated to determine which social psychological variables contributed most to the discrimination. The structural correlations indicate how strongly each variable is correlated with the

Table 3. One-way analyses of variance of 10 social psychological variables with stage of dietary change.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Perceived susceptibility</td>
<td>2.71a</td>
<td>.75</td>
<td>3.08b</td>
<td>.58</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>3.40a</td>
<td>.64</td>
<td>3.67a</td>
<td>.56</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>3.61a</td>
<td>.68</td>
<td>3.96b</td>
<td>.46</td>
</tr>
<tr>
<td>Perceived barriers</td>
<td>2.85ab</td>
<td>.81</td>
<td>3.17a</td>
<td>.59</td>
</tr>
<tr>
<td>Cues to action</td>
<td>2.46a</td>
<td>.83</td>
<td>3.30b</td>
<td>.64</td>
</tr>
<tr>
<td>Overall health concern</td>
<td>3.47a</td>
<td>.69</td>
<td>3.67a</td>
<td>.52</td>
</tr>
<tr>
<td>Normative beliefs</td>
<td>2.76a</td>
<td>.69</td>
<td>2.93a</td>
<td>.69</td>
</tr>
<tr>
<td>Motivation to comply</td>
<td>3.15a</td>
<td>.82</td>
<td>3.60b</td>
<td>.58</td>
</tr>
<tr>
<td>Social modeling</td>
<td>2.85a</td>
<td>.56</td>
<td>2.88a</td>
<td>.46</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>3.49a</td>
<td>.89</td>
<td>2.99b</td>
<td>.86</td>
</tr>
</tbody>
</table>

1 Mean scores on scales ranging from 1 = strongly disagree to 5 = strongly agree.
2 t-test for significance of linear trend.

a,b,c Means not sharing the same superscript are significantly different at p < .05 or beyond, using post-hoc Scheffe contrasts.

*p < .05; ***p < .001.
Table 4. Discriminant analyses comparing successive stages of dietary change on 10 social psychological variables.

<table>
<thead>
<tr>
<th>Social Psychological Variables</th>
<th>Precontemplation to Contemplation</th>
<th>Contemplation to Action</th>
<th>Action to Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r(^a)</td>
<td>F(^b)</td>
<td>r</td>
</tr>
<tr>
<td>Perceived susceptibility</td>
<td>.35</td>
<td>6.43(^*)</td>
<td>-.13</td>
</tr>
<tr>
<td>Perceived severity</td>
<td>.28</td>
<td>4.16(^*)</td>
<td>-.04</td>
</tr>
<tr>
<td>Perceived benefits</td>
<td>.37</td>
<td>7.13(^**)</td>
<td>.53</td>
</tr>
<tr>
<td>Perceived barriers</td>
<td>.27</td>
<td>3.95</td>
<td>-.77</td>
</tr>
<tr>
<td>Cues to action</td>
<td>.68</td>
<td>24.47(^***)</td>
<td>.14</td>
</tr>
<tr>
<td>Overall health concern</td>
<td>.21</td>
<td>2.27</td>
<td>.41</td>
</tr>
<tr>
<td>Normative beliefs</td>
<td>.15</td>
<td>1.20</td>
<td>.12</td>
</tr>
<tr>
<td>Motivation to comply</td>
<td>.40</td>
<td>8.02(^**)</td>
<td>.29</td>
</tr>
<tr>
<td>Social modeling</td>
<td>.04</td>
<td>0.08</td>
<td>.38</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>-35</td>
<td>6.60(^*)</td>
<td>.64</td>
</tr>
</tbody>
</table>


The findings on fat and fiber intake by stage corroborate the findings of Curry et al.\(^{35}\) for fat intake and Glanz et al.\(^{37}\) for fat and fiber intake. A stage classification algorithm using a simple seven-item questionnaire based on self-perceptions of change is indeed able to classify people into mutually exclusive groups who differ in their fat and fiber intake. Respondents classified on the basis of self-report into the PC through M stages ate progressively less fat and more fiber at each stage. The Curry et al.\(^{35}\) study used the same brief dietary measure that was used in this study while the Glanz et al.\(^{37}\) study used a full-length food-frequency questionnaire.

DISCUSSION

The study reported here examined whether people classified into stages of dietary change differed in their fat intakes and in variables derived from social psychological models.
beliefs from the HBM, social influence, and efficacy expectations that have been used in other theory-driven studies of everyday food selection. Findings from this study provide specific data on how these variables differ across stages and thus lend some general support to the model of Schwarzer\(^{38}\) and the predictions of Baranowski\(^{29}\) that the importance of these variables should differ for those at different stages of change.

Motivational beliefs, represented by HBM variables contributing to a psychological state of readiness to take action, were certainly important in distinguishing people at the early stages of change. While people in all stages judged fat intake-related diseases to be severe, those in contemplation compared to those not thinking about making changes had a significantly higher perception of personal susceptibility or vulnerability and were more sensitive to cues to action such as news stories or relatives and acquaintances being afflicted with chronic diseases, supporting Baranowski\(^{29}\) proposals and Schwarzer’s suggestion that any integration of social psychological theories should include the emotion-based motivational variables from the HBM because “a minimum level of threat or concern must exist before people start contemplating the benefits of possible actions and ruminate their competence to actually perform them.”\(^{38}\) The cues to action variable is somewhat similar to the process of “consciousness raising” examined in other stage-of-change research.\(^{29}\) A lower sense of vulnerability in the later stages was accompanied by a higher overall health concern, indicating that a state of concern remains important in the initiation and maintenance of behavior change as well, but is now directed at achieving health rather than avoiding disease.

Most social psychological theories propose that outcome expectancies are beliefs that have motivational power, as reviewed by Baranowski,\(^{39}\) and hence would be expected to be especially important in the early stages of dietary change. In this study, outcome expectancies, operationalized as perceived benefits, were indeed significant in distinguishing those contemplating and those already taking action from those not considering action, confirming the findings of most previous food-related studies, particularly in terms of fat intake, that the anticipated outcomes or the behavioral beliefs component of attitudes is important in predicting behavioral intention or behavior.\(^{4,10,16,17,20}\)

Social influence variables, particularly the subjective norm variable, in previous food-related studies have given inconsistent results, with some studies showing a positive relationship\(^{10,23,43}\) but many more showing no relationship.\(^{4,16,17,20}\) Schwarzer\(^{38}\) suggests that the inconsistent results may be due to the fact that the subjective norm variable has not been adequately conceptualized and measured. In this study, while normative beliefs was not significantly different by stage, with scores in the neutral range, significant differences in motivation to comply by stage were found. This finding may be due to the wording of the questions in this study. Instead of the standard bipolar scale in which people express whether they generally do or do not want to do what a significant other wants them to do, the items were expressed as statements to which people agreed or disagreed, and some items contained an element of social support, for example, “If my friends at work were worried about my health and wanted me to change my eating habits, I would do it.” The higher scores distinguishing C from PC and M from A suggest that the concern of friends and family may help people to contemplate change as well as maintain change.

Such an interpretation is strengthened by the finding that social modeling, or observing others in the social environment who eat low-fat diets, was important as a variable distinguishing those who had initiated and maintained behavior change from those in other stages. It appears that those in action and maintenance had friends, coworkers, and family who also ate low-fat diets. The cross-sectional nature of this study does not permit us to speculate whether survey respondents were influenced by friends and family to eat low-fat foods or were influencing others to eat low-fat diets. In either case, a supportive social environment seemed to exist for those in maintenance. These findings support the suggestion of Baranowski\(^{29}\) that social modeling factors may be most important in later stages of change when lower fat eating behaviors become manifest and hence subject to social inspection.

Self-efficacy has been shown to be a predictor of change in several health behavior domains such as smoking\(^{31,46}\) and exercise.\(^{47}\) In the present study, the perceived barriers and self-efficacy variables showed a pattern by stage of change that were mirror images of each other and in opposite directions. Self-efficacy was lowest for those in C, and then significant and linear increases occurred for those in the A and M stages, suggesting that an increasing confidence in the ability to select low-fat food in stores and restaurants and to prepare tasty, low-fat meals distinguished those who had initiated and maintained behavior change from those who had not. Perceived barriers were highest for those in C and increasingly lower for those in A and M. A careful examination of the perceived barriers scale indicates that a major barrier to eating lower fat diets is taste, a variable which is an important, if not the most important, correlate of intake in national polls and in studies where it has been measured,\(^{5,48,49}\) the scale also taps other aspects that are negative counterparts to self-efficacy and can be labeled “difficulty.” For example, items ask whether preparing low-fat dinners is “too time consuming,” or “it’s really hard to prepare low-fat meals that taste good,” or choosing low-fat foods is “very hard for me” because of lack of knowledge about the fat content of foods. Perceived difficulty of carrying out needed actions appears to be as salient to people in attempting to eat reduced-fat diets as confidence in the ability to carry out these actions. Indeed, another study found that perceived difficulty of adopting disease risk-reducing or
weight-reduction activities was a more powerful factor in the likelihood of adoption than the perceived effectiveness of the activities. Difficulty is also somewhat similar to the notion of complexity in the diffusion of innovations theory, which Baranowski proposed would be a negative motivator in the decision through early change stages, as found in this study.

Our finding that perceived barriers are most important in distinguishing those in the later stages of change, whereas perceived benefits are most important in distinguishing those in the earlier stages of change, provides some support for the suggestion of Schwarzer that some of the variables of the HBM are misspecified, in that perceived barriers should not be confounded with outcome expectancies (i.e., perceived benefits) as a single component. Perceived benefits are expected to be important in a motivational phase, enhancing people's readiness to take action, whereas perceived barriers should instead be thought of as in a separate causal pathway, important in an action phase. In this respect, the lower perceived barriers and higher self-efficacy scores of those in PC compared to those in C in our sample may be because the former are unrealistic in their perceptions of both the difficulty of making changes in fat intake as well as their ability to carry out needed actions, since they have not attempted to make such changes. The perceived benefits and barriers variables in this study are somewhat similar to the "pros" and "cons" of change used in stages-of-change research, where it has been shown that the "pros" of changing usually increase between PC and C (as in this study) and "cons" decrease between C and A (as in this study).

There are several limitations to this study. The study respondents represented a convenience sample and hence results should not be assumed to describe populations as a whole or to generalize to other samples. The study sought only to examine whether people placed into different stages based on self-report and corroborated by their fat intake data differed on social psychological variables derived largely from expectancy value and social learning theories. In addition, the disproportionate numbers of respondents in A and M may be due to a response bias as individuals who were interested in diet and health may have been more likely to complete the rather lengthy questionnaire. Large proportions of respondents in A and M were also found in the Curry et al. and Glanz et al. studies. This distribution may have also reduced the likelihood of finding positive results even if they were there. The fact that predictable results were found in this study would suggest that the models and variables being tested are quite robust. Nevertheless, these limitations must be taken into account when interpreting the results.

This study suggests that adding a time dimension to social psychological models can increase our understanding of food choice and dietary change. Such understanding can assist us in designing nutrition education interventions that are more appropriately targeted by stage of change. However, since the present study was cross-sectional in nature, further research should be longitudinal, following individuals for 1 or more years while intermittently collecting social psychological data, whether quantitatively or qualitatively, so as to further clarify the role of social psychological variables in the process of change of everyday eating patterns.

ACKNOWLEDGMENTS

The authors wish to thank Alan Kristal and Ann Fowler for supplying us with the software program to analyze the fat and fiber intake data. We also thank Tom Baranowski for many helpful comments on earlier drafts of this manuscript.

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