EVALUATION OF MESSAGES TAILORED TO CANCER PREVENTION GUIDELINES

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ABSTRACT

LISA M. QUINTILIANI: Evaluation of messages tailored to cancer prevention
guidelines
(Under the direction of Marci K. Campbell)

Researchers using tailored messages in cancer prevention intervention studies have not
sufficiently studied how best to tailor messages about multiple behaviors. One important
question is whether behavioral change strategies and feedback should include only behaviors
participants indicate they most want to work on (i.e. a behavioral priority) or behaviors selected
on their behalf based on expert evidence of potential disease prevention benefit. Compared to
expert-based tailoring, tailoring to participants' behavioral priorities may be of greater relevance,
prompting information processing, and ultimately facilitating behavioral changes. This
dissertation included three lines of research. First, from six focus groups, we elicited
participants' perceptions about components of a healthy lifestyle and used this information to
design a tailored feedback graphic. Second, we conducted secondary analyses of data from two
large worksite intervention trials, in which subsets of female participants received tailored
messages. Results indicated that those who chose the 'healthy eating' priority and received a
tailored message increased servings of fruits and vegetables by 1.8-2.0 compared to women who
had also chosen 'healthy eating' but did not receive a tailored message. Building from these
results, we conducted a randomized web-based trial to directly evaluate tailoring to participant-
selected behavioral priorities versus expert-based health behaviors and a non-tailored comparison
group. Six cancer prevention guidelines for nutrition and physical activity were targeted.

Immediately before and after reading the tailored or non-tailored feedback on-screen, we measured guideline-specific intention, self-efficacy, goal commitment, and goal difficulty. Female college students (n=408), 74% non-Hispanic white, participated. Overall, support for tailoring to behavioral priorities was found for increasing fruits and vegetables and physical activity with statistically significant improvements in self-efficacy, goal commitment, and goal difficulty. Even stronger effects on these variables were found among participants randomized to the expert-tailored group, but only among those who received a message that happened to match their selected behavioral priority. Overall, results from this dissertation support tailoring to behavioral priorities and provide a tool to increase message effectiveness. Tailored health communications effective in facilitating healthful nutrition and physical activity choices have the potential to impact cancer incidence population-wide.

To my husband Chris Smith who was always available to listen and support me during graduate school. This dissertation is also dedicated to my parents Daniel and Frances Quintiliani who, throughout my entire life, fostered education as a value of primary importance.

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CHAPTER I

INTRODUCTION

I.A. Overview

Cancer risk may be influenced by many lifestyle behaviors. Applied on a population-basis, health communication interventions have the potential to bring behaviors in line with recommended guidelines and reduce diet and physical activity-related cancer incidence in the United States. Tailored messages have emerged as an effective method of health communication in which individualized feedback and theory-based strategies for behavior change are presented to an individual as one or a series of unique messages. Although literature reviews report tailored messages are generally better remembered, considered more trustworthy, and are more effective in changing a variety of behaviors compared to non-tailored messages, uncertainty exists as to how tailoring brings about these positive effects. One question is which variables should be used to tailor the message, for example gender, race, and/or stage of change. Based on its theoretical background, an important tailoring variable may be the participants own health behavior priority, which can be defined as tailoring message feedback and strategies to a health behavior topic chosen by a participant. However, limited empirical evidence exists to support this tailoring variable. Further research delineating how to improve the effectiveness of tailored messages would ultimately impact the ability of tailored health communications to be used on a population-wide basis to affect cancer risk behaviors.

Designing the graphics used to deliver feedback represents an early step in tailored message design and an opportunity to incorporate a participant's health priorities and perspectives. In the first aim of this research, through six focus groups, we asked participants to list and then group healthy lifestyle behaviors according to any common characteristic. We also tested three original versions of a graphic that simultaneously depicted a fictitious persons adherence to seven cancer prevention guidelines. We then incorporated these participant-identified common groups of behaviors into one newly revised graphic and again conducted testing in two different focus groups.

The second aim of this research used subsets of data from Health Works for Women [HWW] and Health Works in the Community [HWC], two large intervention trials conducted among female blue collar workers in eastern North Carolina. In both studies, while all participants indicated a health priority on which they most wanted to work, only certain groups of participants received messages tailored to their health priority. This secondary data analysis investigated the effects of not only choosing a health priority but also receiving a message tailored to that priority on fruit and vegetable intake, fat intake, and physical activity level after a 6 or 18 month time period.

Although this investigation capitalized on secondary data from two large and diverse study samples, the HWW and HWC studies were not originally designed to draw conclusions about the effectiveness of tailoring to behavioral priorities. Therefore, in the third aim of this research, an Internet-based randomized trial was conducted to directly compare the effect of messages tailored to participants' behavioral priority, messages tailored to a health topic chosen by an expert system, and a non-tailored message. Effects on intention, self-efficacy,

cognitive thoughts, goal commitment, and goal difficulty were measured immediately after reading the messages.

I.B. Specific aims

From these three lines of research, we developed three specific aims to address research gaps concerning tailoring to participant-selected behavioral priorities in multiple behavior interventions.

1. Using qualitative methods, define a method for incorporating participant-identified groups of healthy lifestyle behaviors related to nutrition and physical activity into a feedback graphic for use in tailored messages in the following two ways: (1) investigate if there is consistency as to how individuals group healthy lifestyle behaviors, and (2) develop, test, and revise a feedback graphic. This could potentially improve upon existing graphical displays in tailored messages.

2.a. Using data from the HWW and HWC trials, investigate if participants receiving a message tailored to their chosen behavioral priority report more improvement in that related behavior at follow-up compared to participants who received a message tailored to other behavioral priority choices (e.g. did those who received a message tailored to healthy eating report eating more fruits and vegetables than those who received a message tailored to other behavioral priorities).

2.b. Among participants who chose the same behavioral priority, investigate if those who received a message tailored to that behavioral priority increase their related behavioral outcomes at follow-up compared to those who did not receive any message (e.g. did those who chose healthy eating and received a tailored message report eating more fruits and vegetables than those who also chose healthy eating but did not receive a message).

3. Using data from an original trial, investigate the immediate effect on intention, self-efficacy, frequency of cognitive thoughts, goal commitment, and goal difficulty among college women in one of three randomized study groups: (1) the choice group in which the message is tailored to a participant-selected health priority; (2) the expert group in which the message is tailored to a health topic determined by an expert system; or (3) the comparison group in which the message is not tailored.

CHAPTER II

CONCEPTUAL FRAMEWORK

II.A. Introduction

This conceptual framework and model focuses mainly on the intervention trial described in chapter six, however the overall themes are relevant to each of the three dissertation studies. As an overview, this framework is centered around the Elaboration Likelihood Model [ELM], a model to understand how health communications can be designed to facilitate thoughtful consideration and persuasion through attitude change (Petty & Cacioppo, 1986). The framework of this dissertation also used selected constructs from the Transtheoretical Model (Prochaska & DiClemente, 1992), Social Cognitive Theory (Bandura, 1986), the Theory of Reasoned Action (Fishbein & Azjen, 1975) and the Health Belief Model (Rosenstock, Strecher, & Becker, 1988). These models have overlapping themes, for example the Theory of Reasoned Acton and the Social Cognitive Theory are similar in that both acknowledge the importance of factors besides knowledge in influencing future behavioral change (Fishbein & Azjen, 1975; Bandura, 1986). These models not only guided the behavioral change strategies used in the tailored messages but certain model constructs also served as the main study outcomes. From the Theory of Reasoned Acton and the Social Cognitive Theory, intention and self-efficacy served as the main psychosocial outcome variables. In addition to these, the goal setting variables of commitment and difficulty from Task Goal Theory also served as outcome variables (Locke & Latham, 1990).

These two variables provided further insight into how intentions and self-efficacy might translate into actual changes in healthy eating and physical activity behaviors.

II.B. The Elaboration Likelihood Model

The ELM provides a framework describing conditions under which health communication messages are likely to influence attitudes (Petty & Cacioppo, 1986). The first condition is message quality. Although the measurement of message quality is not specifically defined in the ELM, individuals' own perceptions are usually measured to indicate if they perceived the message to be of high or low quality. This can be formulated as a thought listing task, in which an individual reads a message, then writes down any thoughts he or she had. The individual then rates the thoughts as positive, negative, or neutral. In the second condition, attitudes can be influenced by cues contained in the message, such as references to celebrities or pictures of people the same gender, age, and race the respondent.

As a third condition, a message can elicit varying amounts of 'information processing' or careful thinking and consideration. Two primary routes to persuasion have been identified. When conditions facilitate increased information processing of message content, an individual will likely be led to attitude change through the 'central route'. But when an individual becomes convinced of the messages' acceptability through cues contained within the message, an individual's attitudes change through the 'peripheral route'. Degree of information processing can also be measured using the thought listing technique. Although both routes lead to attitude change, messages stimulating the central route are more likely to result in long-standing persuasion and achievement of behavioral change (Petty & Cacioppo).

The amount and type of information processing health communications can stimulate are influenced by several factors, for example prior subject knowledge. When an individual encounters a message mismatched to their pre-established position on a particular topic, the individual tends to defend his or her position (Petty and Cacioppo, 1986). When encountering a message matched to their established position, the individual tends to have more favorable thoughts about the message. The Model also suggests these relationships may be stronger among individuals with a large amount of subject knowledge. However two factors are particularly relevant to the design of tailored health messages. First, tailoring in general decreases the level of distracting information by eliminating extraneous variables. For example, in a message promoting physical activity, information motivating someone to start exercising would be distracting to an individual who is already exercising but is looking for information on how to increase the numbers of days on which they exercise. By decreasing distraction through tailoring, individuals are better able to focus on the most important information. Second, Petty and Cacioppo indicate that the perceived personal relevance of the message may be one of the most important variables stimulating information processing. This finding is reinforced by Kreuter, Oswald, Bull, and Clark (2000) who also reported the importance of perceived message relevance in their evaluation of tailored and non-tailored weight loss materials. In their study, tailoring was effective to the extent participants perceived the message to be personally relevant. If the non-tailored message was also perceived as highly relevant, the behavioral impact of the non-tailored message was the same as the tailored message. Therefore, tailored messages can utilize the factors of decreasing distraction and increasing relevance to promote 'central route' persuasion, which can in turn promote long-term attitude and behavior changes.

II.C. Psychosocial outcome variables

The construct of intention comes from the Theory of Reasoned Action, a value-expectancy health behavior model developed by Fishbein and Azjen (1975). Intention is an immediate, or proximal, determinant of performing a behavior and is primarily influenced by attitudes towards the behavior and subjective norms (i.e. how others impact your decisions and how much weight you place on the importance of others' opinions). Research suggests measurement of intentions needs to be matched to the specific behavior under question (Fishbein & Azjen). Overall, constructs from the Theory of Reasoned Action are only modestly correlated with predicting behaviors. In one review, the theory constructs predicted approximately 30% of the variance in fat intake behavior (Baranowski, Weber Cullen, & Baranowski, 1999). Similarly, in the same review, intention as well as other variables including self-efficacy was found to be predictive of 12% to 37% of variance in various fruit and vegetable consumption patterns. In another study by Faulkner and Biddle (2001), intention predicted approximately 27% of the variance in self-reported physical activity stage of change (i.e. readiness to become more physically active). Although these effects are modest, Fishbein and Azjen postulate three factors influence the strength of the relationship between forming an intention and performing the associated behavior. They are the measurement of intention and behavior with the same level of specificity, the stability of the intention over time, and the degree to which the behavior is under the individual's control. These are important factors to consider when interpreting the results of an intervention study.

The construct of self-efficacy comes from the Social Cognitive Theory developed by Bandura (1986). An inter-personal theoretical model, the Social Cognitive Theory describes behavior as a constant interaction between an individual's personal thoughts, their

environment, and the behavior. One specific construct, self-efficacy, is defined as " people's judgements of their capabilities to organize and execute courses of action required to attain designated types of performances." (Bandura). Like intention, measurement of self-efficacy must also be specific to the associated behavior.

Even 20 years ago, Bandura (1986) reported that research supported the link between self-efficacy and health behaviors. More recently, self-efficacy has been cited as one of the most commonly identified factors influencing intention and behavior change (Baranowski et al., 1999). Indeed, in a review by Sherwood and Jeffrey (2000), self-efficacy was a consistently strong predictor of both forming intentions to be physically active and the behavior itself. In two cross-sectional studies, self-efficacy was associated with fruit and vegetable intake (Steptoe et al., 2003) and purchase of healthy foods (Anderson, Winnett, & Wojcik, 2000).

II.D. Goal setting outcome variables

Goal setting may be an especially relevant tool for examining how to increase the relevance and effectiveness of a tailored message in the context of multiple health behaviors and for understanding the longer-term effects of the message on behavior change. Goal setting has been studied extensively under conditions of providing feedback (similar to tailoring mechanisms) on task performance (Locke & Latham, 1990), found to be an effective tool in organizational settings (Strecher et al., 1995), and has been recommended for dietary interventions (Weber Cullen, Baranowski, & Smith, 2001).

In the context of providing tailored feedback, Locke and Latham (1990) suggest two important mechanisms of goal setting in their Task Goal Theory. One, that goal setting is a mediator of performing actions (for example, behavior change) and two, that the feedback

presented modifies the effects of goal setting. The majority of research has been focused upon the modifying effects between a setting where feedback is provided compared to no feedback. Less research has been conducted to understand the types and amount of feedback necessary to impact goal setting. But, goal commitment and difficulty are two aspects of Task Goal Theory that have been researched extensively. The theory proposes high goal commitment predicts exceptional performance on a task only when the goal difficulty level is also high (Klein, Wesson, Hollenbeck, & Alge, 1999). Therefore, the interaction between perceived commitment and difficulty for each dietary and physical activity health topic in a tailored message intervention provides further insight into future behavioral change actions.

II.E. Explanation of conceptual model

The multiple theories and models presented in this dissertation's conceptual model posed both strengths and limitations. On one hand, when model constructs are used individually, the ability to draw explanatory conclusions from the original model is no longer possible. Furthermore, the selected variables may be most effective when used in combination with a variable that was not selected. However, Gebhardt and Maes (2001) stress the overlapping nature of the theories presented in this chapter, such as the Social Cognitive Theory, the Health Belief Model, and the Theory of Reasoned Action. In addition, they suggest combining these theories with models of goal setting may be most influential in promoting individuals to work on their goals.

The specific conceptual model for specific aim three of this dissertation research is depicted in the figure. In the first column, constructs from the models and theories specified guided the feedback provided in the tailored messages. Please see chapter six for more details on the specific tailoring variables used. The 'message groups' column identified the

three randomized study groups. In the 'processing variables' column, two mechanisms that measure degree of information processing from the ELM are presented. In this chapter, I described how tailoring in general interacts with the ELM. Please refer to the next chapter for an overview of the theoretical and empirical support underlying the pathways through which tailoring to participant-selected behavioral priorities is hypothesized to impact ELM and outcome variables. By impacting attitude change, four 'outcome variables' along the pathway to behavior were measured to demonstrate the impact of the three different message conditions. Finally, these outcome variables (guideline-specific intention, self-efficacy, goal commitment, and goal difficulty) are hypothesized to change nutrition and physical activity behaviors. However, behavior change was not a primary outcome in this short-term study.

Figure 2.1. Conceptual model

| Health behavior theories underlying tailored messages | Message groups | Processing variables | Outcome variables | Hypothetical outcomes |

Trans-theoretical Model
• Stage of change

Social Cognitive Theory
• Self-control
• Observational learning
• Self-efficacy

Health Belief Model
• Barriers

Theory of Reasoned Action
• Attitudes

Choice group
Message tailored to two participant-selected behavioral priorities

Expert group
Message tailored to two expert-based behaviors

Comparison group
Non-tailored message focused on stress reduction

Degree of elaboration
• Quanitative scale

Degree of message quality
• Thought listing of positive, negative, and neutral thoughts

Psychosocial variables
• Guideline-specific intention
• Guideline-specific self-efficacy

Guideline-specific goal setting variables
• Goal commitment
• Goal difficulty

Improvement in guideline specific nutrition and physical activity outcomes

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CHAPTER III

LITERATURE REVIEW

III.A. Health communication for cancer prevention

Health promotion programs have the potential to impact cancer prevention at several

points including policies, communities in which health decisions are encouraged or

discouraged, organizations that influence access to health care, and individual lifestyle

choices. The field of cancer communications is also broad. For example, research areas can

include building new data collection and analysis strategies, translating research findings to

practice settings, increasing access to cancer information, and hastening intervention

development and analysis. On the last topic, the development of innovative intervention

designs can further enable the spread of cancer prevention information and encouragement of

cancer preventive choices.

III.B. Why consider multiple cancer prevention guidelines?

A comprehensive report from the World Cancer Research Fund [WCRF] and the

American Institute for Cancer Research [AICR] reviewed the effects of diet on cancer

initiation, proliferation, and invasion and implicated dietary factors in approximately 35% of

deaths from all forms of cancer (WCRF & AICR, 1997). A second, updated review will be

published in 2007. Many factors have been named, broadly, these protective and risk factors

are contained in: food or food groups such as fruits and vegetables or whole grain items and

charred meats; nutrients such as calcium, beta-carotene, and alcohol; or food/nutrient

combinations (Kant, 1996). However, diets effective in decreasing cancer risk most likely do not depend on one food group or nutrient because of the interactions between biologically active nutrients present in food. Accounting for multiple food group interactions may also aid in the interpretation of results from epidemiological studies. In such analyses, effects for single foods or nutrients are determined, but discrepant interpretations may occur when different studies are compared. This is because foods can appear to be protective when eaten in combination with certain diets, but not with others (Gerber, 2001). One drawback to combining dietary variables during data analyses is rendering the effects of single foods or nutrients indistinct, thereby limiting the development of certain intervention methods such as pharmacological agents or fortification measures. However, several observational studies support the relationship between patterns of multiple behaviors and cancer risk.

For example, through factor analysis, Slattery and colleagues developed different dietary patterns: "western", "prudent", "substituter", and "drinker" (Slattery, Boucher, Caan, Potter, & Ma, 1998). In a case control study, the risk of colon cancer among those consuming a 'western" style diet, characterized by higher body mass index, total caloric energy, and cholesterol intake, had a risk higher than those with other diet patterns (Slattery et al., 1998). In contrast, a protective pattern was consuming a "prudent" diet, characterized by higher physical activity, lower body weight, higher fiber, and higher folate intake. In another study, the authors again focused on the "western" pattern and found the risk of this pattern increased with increasing age and among those with a family history of colon cancer (Slattery, Potter, Ma, & Caan, 2000). Importantly, the association between incidence of colon cancer was higher between the 'western' pattern compared with individual components of the pattern.

Other studies support the relationship between adherence to multiple behaviors and cancer prevention. Adherence to nine AICR cancer prevention guidelines related to diet, physical activity, smoking, and healthy weight were examined among 29,564, 55 to 69 year old women from the Iowa Women's Health Study (Cerhan et al., 2004). Women were followed between 1986 and 1998 for several endpoints including for cancer incidence and cancer mortality. Among all women, the risk of cancer incidence for those who followed no or only one guideline was 1.35 (95% CI: 1.15-1.58) times the risk of those who had followed six to nine guidelines. For cancer mortality, the risk for those who followed no or only one guideline was 1.43 times (95% CI: 1.11-1.85) times the risk of those who had followed six to nine guidelines. Harnack, Nicodemus, Jacobs, and Folsom (2002) also evaluated cancer incidence among the Iowa Women's Health Study cohort. They devised a scoring mechanism measuring adherence to the United States Department of Agriculture [USDA] and Department of Health and Human Services [DHHS] Dietary Guidelines for Americans (USDA & DHHS, 2000). Excluding the physical activity and healthy weight components, an evaluation of adherence to the Guidelines' dietary components revealed modest and mostly non-statistically significant multivariate-adjusted relative risk estimates for cancer incidence at several body sites. When the physical activity and healthy weight guidelines were added back into the model, those in the highest quintile of guideline adherence had 0.85 (95% CI: 0.77-0.93) times the risk of cancer at all sites combined compared to those in the lowest quintile of adherence. These studies highlight the importance of combining lifestyle behaviors, such as physical activity and obesity status, with dietary factors known to reduce cancer risk in intervention studies (McCullough & Stampfer, 2002).

Overall, results from epidemiological studies support the conclusion that multiple behaviors interact to predict cancer risk. The challenge is to communicate these multiple behavior change recommendations clearly and effectively to the public. Therefore, intervention research should focus on intervening on these multiple behaviors. However, interventions focused on multiple behaviors present new challenges to intervention design not present in interventions focused on single behaviors. For example, how should interventions present multiple behaviors to capitalize on their inter-connectivity but not overwhelm participants? And, which intervention strategies and methods are most effective and feasible for intervening on multiple behaviors? We suggest tailored health communications offer an adaptable method to communicate one, two, or many health behaviors either at once, sequentially, or simultaneously. Next, the history of tailored health communications will be reviewed.

III.C. The past, present, and future of tailored health communications

Message tailoring is the process of developing a specific behavior focused communication based on an assessment of individual characteristics (Kreuter, Strecher, & Glassman, 1999). Individual message tailoring characteristics can include demographics such as gender and residence; psychosocial variables such as perceived barriers and benefits of change; and behavioral factors such as dietary intake level (Kreuter, Bull, Clark, & Oswald, 1999).

The following example illustrates the tailoring process. An African American female patient at a medical clinic could complete a survey about colorectal cancer screening practices, intake of fruits and vegetables, and physical activity patterns. The patient reports having a fecal occult blood test five years ago, 5 to 7 fruit and vegetable servings per day,

and low recreational physical activity due to not liking to walk alone. After consenting to

participate, a tailored health pamphlet presenting pictures of people her same age, sex, and

race is sent to her home. It states she is overdue for colorectal cancer screening, meeting

recommendations for fruit and vegetable intake, and contains information designed to help

her increase physical activity by incorporating what specifically motivates her, i.e. walking

with a friend.

Brinberg and Axelson (1990) wrote one of the first articles about a tailored message

intervention to increase dietary fiber intake among college students. Since then, literature

reviews comparing tailored messages to non-tailored or no information generally indicate

tailored messages are perceived to be more trustworthy, thoroughly read, remembered, and

better able to modify dietary intake compared to non-tailored messages (Brug, Campbell, &

vanAssema, 1999; Kroeze, Werkman, & Brug, 2006; Skinner, Campbell, Rimer, Curry, &

Prochaska, 1999). Tailored health messages have also been studied across several different

behaviors such as cancer screening and physical activity promotion (Bull, Kreuter, &

Scharff, 1999; Kreuter & Strecher, 1996; Skinner, Strecher, & Hospers, 1994). As an

individual-level strategy, tailored messages can be used as a stand-alone intervention or be

incorporated as one component of intra-individual or community-based interventions

(Campbell & Quintiliani, 2006).

Several promising trials of tailored messages had been conducted when the NCI

convened a national panel in 1996 to determine future directions. The panel recommended

the "second generation" of tailored message research begin to examine other aspects of

tailored messages in order to refine and thus further improve tailored messages' effectiveness

and efficiency (Abrams, Mills, & Bulger, 1999). Thus, even though tailored messages have

been shown to be generally effective, there was a need for broadening the theoretical basis informing specific aspects of message design. This knowledge is essential if tailored messages are to be incorporated into large-scale interventions impacting populations to decrease cancer risk.

Two studies offer insights into particular variables researchers should incorporate into tailored messages to potentially increase message effectiveness. For example, lack of awareness may be a factor impeding behavior change. Steptoe et al. (2003) investigated the importance of awareness of the dietary guideline of eating five or more servings of fruit and vegetables daily. Using self-reported intake and biomarkers among participants from an inner-city area of London, multivariate analyses revealed those who were aware of this guideline "ate 24% more fruits and vegetables and had 27% higher potassium excretion [in urine] and 15% higher [plasma] vitamin C" (Steptoe et al.). In another study, Brug, van Assema, Kok, Lenderink, & Glanz (1994) and colleagues asked a sample of Dutch women to subjectively rate their diets as being, high, medium, or low in fat. Using this subjective fat intake information, logistic regression models revealed that those who perceived their fat intake was high were 2.4 times more likely to have a high intention to reduce their fat intake compared to women who perceived their fat intake was low. These results indicated that for participants who incorrectly perceive their diet to be low in fat, feedback to increase their accuracy may result in greater intention to change their diets. Both studies point to the usefulness of incorporating methods to increase awareness of dietary intake, which can be easily incorporated into feedback mechanisms (such as graphs) in tailored messages.

Other intervention studies are examples of designs that offer insights into individual variables researchers should consider in the design of their tailored messages. For example,

in an intervention targeting advancement through the stages of change for smoking cessation, Dijkstra, DeVries, Roijackers, & van Breukelen (1998) designed a 2x2 factorial trial in which smokers were randomized to one of four study groups. One group received a message tailored to outcome expectations, the second group received a message tailored to building self-efficacy skills, the third group received a message tailored to both types of information, and the fourth group received no information. Results indicated that the different messages benefited participants differently according to their stage of change. Those in precontemplation and contemplation (i.e. not yet ready to change) benefited most from messages tailored to both variables and those in preparation (i.e. those planning to take action soon) benefited most from messages tailored to self-efficacy building information. In another study, Williams-Piehota, Pizarro, Schneider, Mowad, & Salovey (2005) identified participants' coping style as monitoring (i.e. actively seeking health information) or blunting (i.e. do not seek detailed health information) and tailored messages promoting mammography according to coping style. Results supported increased mammography use among participants who had received messages matched to their coping style, with the stronger effect reported for those with blunting style. In the last example, De Bourdeaudhuij, Brug, Vandelanotte, & Van Oost (2002) investigated the effect on fat intake between tailoring a nutrition health message to two family members (one parent and one child) versus one family member (one parent or one child). Psychosocial determinants of fat intake did improve, however no differences in fat intake were reported between the family-tailored versus individual-tailored study groups. Through these studies, 'second generation' tailoring research has broadened its scope and potential to improve the effectiveness of tailored messages by identifying and testing specific tailoring variables.

Another panel of experts convened at the Behavioral Oncology Interest Group of the American Society of Preventive Oncology and held a roundtable discussion in 2002 to discuss behavioral interventions for cancer prevention and control. One discussion topic was tailored interventions. Among several directions for future research discussed, one was the need to examine the effects of tailoring to different tailoring variables and in "studies where multiple behaviors are included in interventions (e.g. diet and physical activity), research should address how individuals choose and prioritize among these behaviors" (Miller et al., 2004). Based on these recommendations, we believe another important tailoring variable deserves, but has yet to receive, adequate empirical research. That is, when dealing with chronic health conditions such as cancer that are shown to be influenced by multiple behaviors, *how* should the researcher decide which behavior (e.g. cancer screening vs. fruit and vegetable intake vs. physical activity) to tailor the message to? One available method is having the participants' themselves choose the behavior(s) (i.e. a behavioral priority).

III.D. Expert-driven tailoring versus tailoring to a participant-identified behavioral priority

The generally positive effects of tailoring reported above have been based primarily on expert-driven tailoring. In an expert-driven system, tailored messages provide feedback on one or more behaviors with expert evidence of a disease prevention benefit. Studies have presented single health behaviors, like increasing fruit and vegetable intake (Heimendinger et al., 2005) or multiple behaviors. When multiple behaviors are presented, equal prioritization is often given for all behaviors (Campbell et al., 2004; Delichatsios et al., 2001; Emmons, Stoddard, et al., 2005). Equal prioritization is reflected by equal doses of intervention materials for each behavior targeted, even if they are delivered separately, such as four

tailored newsletters and videotapes targeting fruit and vegetable intake, physical activity, colorectal cancer screening, and fat intake (Campbell et al., 2004).

However, unlike expert-driven systems, tailoring feedback to a participant-identified behavioral priority draw on an individual's perceptions of dealing with and monitoring multiple recommendations. This provides a rich opportunity for the feedback to increase an individual's engagement, and potentially the persuasiveness, of the message. In favor of tailoring to participant-selected health behaviors, it has been suggested that accomplishing one behavioral change may act as a gateway to future, potentially more difficult, behavior changes (Emmons, Marcus, Linnan, Rossi, & Abrams, 1994; Kreuter, 1999). When approaching a series of multiple behaviors, an individual may select the behavior that he or she is already considering changing, the one they are more confident about changing, or the one they find least difficult to change (Kreuter, 1999).

As described in chapter two, tailored health messages in general are likely to increase information processing under the ELM by eliciting lower levels of distraction and higher levels of relevance compared to non-tailored messages. However, the personal relevance of a message tailored to participant-selected behavioral priorities may increased to an even greater extent compared to tailored messages in which the health topic is chosen by an expert-based system. These expert-based messages may not match the individuals' behavioral priority, thus providing less relevant information. This may result in less information processing, decreased likelihood of attitude change, and ultimately result in a less persuasive message.

Several studies provide empirical support for the practice of tailoring to participant-identified behavioral priorities (Campbell et al., 2000; Strecher, Wang, Derry, Wildenhaus, &

Johnson, 2002; Estabrooks et al., 2005). In an analysis of baseline data from an intervention study with female, blue collar employees, Campbell et al. (2000) asked women to choose the topic they were most interested in working on; this then became the subject of their tailored magazines. Strecher et al. (2002) also discussed this concept as part of a planned intervention among adult, racially diverse participants. In this study, participants are asked to choose among three different health topics for their tailored feedback (Strecher et al.). Although these studies have employed participant-selected health priorities in their tailored message design, the tailored messages were one intervention component of complex study designs ultimately designed to answer different research questions.

Another study more directly investigated this topic, in which participants selected a goal to reduce fat, increase fruits and vegetables, or increase physical activity (Estabrooks et al., 2005). Adult participants then received an interactive CD-ROM program for managing diabetes with targeted information, such as a comparison of their habits compared to recommended guidelines and strategies to overcome barriers. Results indicated participants who chose reducing fat indicated the greatest reduction in fat intake compared to those who chose goals of fruit and vegetables or physical activity. While this study provided promising results supporting the practice of allowing participants to select a behavioral priority, the program information was targeted and not specifically tailored. Therefore, a knowledge gap persists as to whether tailoring to participant-selected behaviors provides an advantage over tailoring to non-participant-selected behaviors. To our knowledge, this dissertation is the first to evaluate the direct effect of tailoring to participant-selected health behaviors versus tailoring to expert-based behaviors in the context of multiple behaviors for cancer prevention.

III.E. Summary

As stated in the NCI's 2007 plan for cancer research, one major research priority continues to focus on the need to accelerate the development of interventions for cancer prevention. Indeed, a quarter of prevention research focuses on impacting and changing behaviors (NCI, 2007). Tailored health communications represent an effective approach to facilitate healthy behavior choices, but more research is needed to refine the tailoring methodology so that it can be applied to large populations. Including multiple health behaviors in health communications is a logical approach to maximizing reduction in cancer incidence, but further research is need to determine how to best present these behaviors in a tailored message. There is theoretical support for the hypothesis that tailoring a message to participants' selected health behavior may result in a more effective tailored message. However, empirical support is lacking. This dissertation examined this approach through investigations of designing graphics tailored to participants' behavioral priorities, conducting a secondary data analysis of the effect of choosing a behavioral priority, and a direct comparison of tailoring to behavioral priorities versus expert-based behaviors. By better understanding the process of how to present tailored presentations of multiple health behaviors, health communications may provide participants with a more effective tool to improve adherence to cancer prevention guidelines in order to decrease cancer risk.

CHAPTER IV

QUALITATIVE RESEARCH ON PRESENTING MULTIPLE BEHAVIOR

FEEDBACK IN TAILORED CANCER PREVENTION MESSAGES AMONG

FEMALE COMMUNITY COLLEGE STUDENTS

IV.A. ABSTRACT

Certain behaviors patterns (e.g. high physical activity, intake of fiber, and folate) are

associated with lower cancer risk. Tailored messages can incorporate multiple behaviors to

facilitate healthful behavior changes to reduce cancer risk. However, tailored feedback is

typically driven by an expert system, in which feedback focuses on those behaviors with

confirmed cancer preventive benefit for which participant change would yield the greatest

benefit. Tailoring graphical feedback to participants' perceptions and health priorities may

increase the message's relevance and persuasiveness. This study sought to define a method

for incorporating participant-identified groups of healthy lifestyle behaviors related to

nutrition and physical activity into a tailored feedback graphic. We conducted six focus

groups to elicit perceptions of nutrition and physical activity behaviors contributing to

healthful lifestyles. We also developed and pretested three different graphics for use in

tailored messages. Participants were 30 female community college students, 47% White,

37% African American, 17% other race; most had a high school level education. Coding

analyses revealed participants frequently expressed categories outside of healthy foods and

exercise, such as lifestyle (e.g. reducing stress or maintaining friendships), how you eat, and

personal hygiene. Whereas the first three graphics presented different chart formats of only uncategorized established cancer prevention guidelines, a fourth revised graphic combined established cancer prevention guidelines with participant-identified behaviors and grouped them into categories. Participants recommended further changes to this fourth graphic. Tailoring feedback to how people think about multiple behaviors for a healthy lifestyle may increase the effectiveness of message tailoring. Future research should (1) transform the graphic into a web-based format based on participant recommendations and (2) using quantitative methods, directly test this graphic against a graphic using standard expert-driven feedback.

IV.B. INTRODUCTION

Food and physical activity recommendations make up a significant number of the Healthy People 2010 objectives for a healthier nation. These recommendations point to the increased recognition that multiple behaviors interact to prevent chronic diseases such as cancer. For example, the American Cancer Society's Guidelines for nutrition and physical activity put forth eight separate guidelines for individuals and another two for community action that address cancer prevention (Byers et al., 2002). One intervention strategy capable of incorporating multiple behaviors into participant feedback is message tailoring. Providing tailored (or individualized) feedback on current behavior levels and theory-based motivational strategies has been successful in promoting behavior change for several health-related areas such as smoking, diet, and physical activity (Skinner et al., 1999). However, in-depth research investigating how to maximize tailored health messages to best accommodate multiple behaviors has been lacking (Miller et al, 2004; Prochaska & Sallis, 2004). By defining methods on presenting multiple behaviors, tailored health messages will be better

able to engage individuals' interest in the message, prompt individuals' to recognize interactions between behaviors, and ultimately facilitate healthful choices for cancer prevention.

One way to potentially increase engagement and motivation is for researchers to provide tailored message feedback based on an individual's perceptions of thinking about and grouping multiple behaviors. The previously described positive effects of tailoring have been based primarily on expert-driven tailoring in which behaviors are selected because of expert evidence of their potential disease prevention benefit. However, there is indirect support provided by theoretical models, quantitative research, and qualitative research for the importance of tailoring to individuals' perceptions and priorities versus expert-driven tailoring (Furst, Connors, Bisogni, Sobal, & Falk, 1996; Campbell et al., 2000; Strecher et al., 2002; Margetts, Martinez, Saba, Holm, & Kearney, 1997; Falk, Sobal, Bisogni, Connors, & Devine, 2001; Estabrooks et al., 2005; Petty & Caccioppo, 1986). Evidence suggests that tailoring to participant perceptions and priorities decreases distraction and increases message relevance by eliminating information that does not apply to the intended recipient. This increase may elicit more thoughtful consideration of message content, thus facilitating behavior change through the central route of processing as suggested by the Elaboration Likelihood Model, a communication model of persuasion (Petty & Caccioppo, 1986).

Three quantitative studies also highlight the importance of tailoring messages to participant-identified behaviors (Campbell et al., 2000; Strecher et al., 2002; Estabrooks et al., 2005). In an analysis of baseline data from an intervention study with female, blue collar employees, Campbell et al. asked women to choose the topic they were most interested in working on; this then became the subject of their tailored magazines. Overall, this

intervention reported increases in diet and physical activity, however, because the tailored messages were part of a larger intervention, their individual effects were not reported separately. Strecher et al. also discussed this concept as part of a planned intervention among adult, racially diverse participants. In this study, participants are asked to choose among three different health topics for their tailored feedback (Strecher et al.). In another study, adults were asked to select a behavior that would be targeted through a computer-based intervention to improve diabetes self-management (Estabrooks et al.). Results indicated that the greatest reduction in fat intake was among participants who had selected reducing fat intake as their behavior to work on compared those who had chosen the other two behavior choices (fruit and vegetable intake or physical activity). Similar trends were also found for physical activity and fruit and vegetable intake, although they were not statistically significant.

In addition to tailoring to behavioral priorities, there may also be ways to group different behaviors together in a tailored message that would help participants think about interactions between multiple behaviors. Perceptions of what constitutes healthy eating across diverse populations have been identified and categorized by both quantitative (Margetts et al., 1997) and qualitative (Falk et al., 2001) studies. In the study by Falk et al., an analysis of 79 individual interviews among an ethnically diverse sample of women and men informed the construction of seven predominant themes to define healthy eating. The themes were: "(1) healthy eating is low fat, (2) healthy eating is eating natural/unprocessed foods, (3) healthy eating is balanced eating, (4) healthy eating is eating to prevent disease, (5) healthy eating in maintaining nutrient balance, (6) healthy eating is eating to manage an existing disease, (7) healthy eating is eating to control weight" (Falk et al.). While studies of

this type provide rich information about how individuals cluster with respect to healthy eating perceptions, there is a knowledge gap in terms of how to translate perceptions to meaningful interventions to impact food choices (Falk et al.; Paquette, 2005).

This knowledge gap was also highlighted in the recent controversy over the 2005 revision of the USDA Food Guide Pyramid, one of the most recognized nutrition graphics in the United States. As reported by Goldberg et al. (2004) "research is also needed to determine the most effective ways of using nutrition education tools, including the Pyramid, to achieve this goal [of helping consumers adopt healthy behaviors.]" Tailored graphics offer flexibility to approach individual's preferences for learning and grouping different health behaviors that the Pyramid can not. At the individual level, tailored graphics may act as a valuable nutrition education tool for promoting healthful nutrition behaviors.

One population in need of effective health interventions includes college age women due to two main factors (1) their increasing independence and control over food choices and (2) mounting evidence that diet and physical activity patterns worsen as adolescents transition into young adulthood (Harris, Gorden-Larsen, Chantala, & Udry, 2006). Because tailored messages have been effective in promoting healthful behaviors across several different demographic groups, tailoring may be applicable to and beneficial for community college students. As a population, these students are very diverse in terms of age and race and have a widespread prevalence of high-risk health behaviors. Among women attending 2-year institutions across the United States completing the National College Health Risk Behavior Survey in 1995, 75.3% reported eating less than five servings of fruits and vegetables per day and 25.3% were overweight (BMI based on self-reported height and weight >27.3) (CDC, 1995). These statistics were less favorable than those reported by their

counterparts in 4-year institutions. In North Carolina, among all students enrolled in curriculum-based education in 2-year colleges, the predominant age group is 20 to 24 years old (> 80,000 students), followed by 19 and under and 25-29 years old (both with approximately 40,000 students). Additionally, 65.7% are white, 26.3% are black, and 62.5% are female ("A Matter of Facts," 2005).

Designing graphics to deliver feedback represents an early step in tailored message design and an opportunity to investigate how tailored health messages can best accommodate multiple behaviors in order to increase overall message effectiveness. Therefore, using qualitative research, this study sought to define a method for incorporating participant-identified groups of healthy lifestyle behaviors related to nutrition and physical activity into a feedback graphic for use in tailored messages in the following two ways: (1) investigating if there is consistency in the types of groups individuals form when they group healthy lifestyle behaviors together, and (2) developing, testing, and revising a feedback graphic. This could potentially improve upon existing graphical displays in tailored messages.

IV.C. METHODS

This study used primarily qualitative methods (i.e. focus groups) supported by a quantitative measure (i.e. surveys) (Steckler, McLeroy, Goodman, Bird, & McCormick, 1992) and was divided into three phases as depicted in Figure 4.1.

Sample and recruitment.

Female students were recruited to participate in one of six focus groups through posted flyers and in person at the cafeteria or lobby on two community college campuses in North Carolina. Participants were eligible if they were female, 18 years of age or older, and

could read and write in English. Thus, groups were homogeneous based on gender and college status, but not race/ethnicity or age. A total of 30 women participated in this study.

Procedures.

All aspects of this study were approved by the university's public health institutional review board. Various conference rooms on the two campuses served as the location for the focus groups. A trained moderator conducted the focus groups according to a semi-structured interview guide; an assistant moderator was present to take notes during all groups. All groups were audio-taped. Each participant received $15 at the end of the group. No participant requested further written nutrition or physical activity information when the group concluded. Group duration ranged between one hour, five minutes to one hour, 48 minutes.

Phase 1.

Twenty-one women participated in the first four focus groups (range of 3 to 8 per group). Prior to the start of the group discussion, all participants read and signed an informed consent document. The moderator then reviewed the information in the consent document, laid out ground rules for the discussion, and asked participants to individually complete a one-page demographic questionnaire. Participants then completed an unstructured pile sort (Romney & Weller, 1988) in which each participant was directed to write down one component of a healthy lifestyle in terms of nutrition and physical activity on separate index cards. After they had written down all the components they could think of, participants were asked to group these cards into one, two, or more piles based on common characteristics. These piles were then discussed and collected at the end of the focus group. Romney and Weller (1988) report the pile sort method has adequate reliability with sample sizes of

between 30 to 40 people. Next, participants discussed several topics including their previous experience with nutrition education, depth of cancer prevention knowledge, and barriers to making nutrition and physical activity changes.

As a final task, we asked participants to review three graphics that provided tailored feedback for a fictitious person (Figure 4.2). Created with the help of a professional graphic designer, these graphics (a bar chart, a pie chart, and a scatter plot) depicted adherence to selected cancer prevention guidelines for healthy eating and physical activity established by the American Cancer Society (Byers et al., 2002). The bar and pie chart formats were selected based on common presentation formats of graphical information, while the scatter plot was based on an example of an innovative display of diet quality information presented at a recent conference.

Upon receiving each graphic, participants individually completed a quantitative survey with nine questions measured on a 7-point Likert scale measuring their perception of the graphics' appeal and understandability. This scale was previously used in a health communication study (Quintiliani & Carbone, 2005). A score of seven indicated high appeal/understandability. Then, as a group, participants discussed their initial reactions and provided suggestions to change the graphic.

Phase 2.

An investigator (LQ) conducted a preliminary review of the four interview transcripts. Though not formally coded at this stage, frequently mentioned lifestyle components, participant groupings of index cards, and comments about the graphic were systematically examined. We also determined which graphic should be chosen for further revision using two sources of information: the quantitative survey measuring graphic

appeal/understandability and by asking participants which graphic was their favorite. By indicating a favorite, participants gave their overall impression of the graphic thinking about message factors that were most important to them. Of 21 participants who reviewed the first three graphics, 16 were asked which graphic was their favorite. Nine indicated pie chart, four indicated bar chart, and four indicated scatter plot (one participant indicated two favorites). However, the bar and pie graphics had near equal mean appeal/understandability ratings (3.55 and 3.59, respectively) and the scatter plot had the lowest mean rating (3.19). According to this preliminary review, the bar chart and pie chart may be equally suitable candidates for revision, however, it seemed participants may have indicated the pie chart as a favorite more often because it contained brighter colors compared to the bar chart. In addition, following a discussion with a computer programmer, the bar chart would be more compatible with dynamically programmed bar chart software and thus more feasible for computer-based tailoring compared to the pie chart. So, the bar chart graphic was then extensively revised based on a preliminary analysis of participant feedback obtained up to this point and presented in the final two focus groups as the combination graphic (Figure 4.3).

Phase 3.

In phase three of this study, two final focus groups were conducted on only one college campus. One group had six and the other had three participants, all of whom were different from the first phase of four focus groups. These focus groups followed similar procedures as before including the pile sort activity, completing the quantitative appeal/understandability survey on the original bar graphic, and discussing reactions to the new combination graphic.

Analysis plan.

Audio recordings from each focus group were professionally transcribed verbatim and an investigator (LQ) checked them against the original recordings for accuracy. Notes from the assistant moderator were compared against the transcripts and combined when new information arose.

At the conclusion of all six focus groups, transcripts were entered into Atlas Ti qualitative data management software in order to investigate the first research question, the consistency of the pile sort groups. Using interpretative coding, an investigator (LQ) derived meaning from each pile sort group and formulated a corresponding code. Analyses were conducted using the transcript text supplemented by the written card piles. Occasionally, the same code would be applied to more than one pile for the same participant. The coding list evolved during this process, primarily because more specific overlapping codes were successively combined with each other to form the final list. For example, a code for 'taking care of the body' was combined with the 'directly physical' code that included similar concepts of factors that directly impacted the body like food, exercise, and good hygiene. We also stratified these codes according to those 35 and younger and those 36 and older.

To investigate the second research question, all text concerning the four message graphics were manually compiled into four Microsoft Word tables such that all text pertaining to bar chart was together, all text pertaining to pie chart was together, etc. Thus, even though the new combination graphic had already been developed and tested, comments from the original three graphics were re-analyzed in order to provide more structure to the comments and highlight any previously missed themes. These documents were systematically examined by noting common themes in the margin of each table.

Four techniques were used throughout the project to establish trustworthiness. Methods triangulation, a component of credibility, occurred through comparing participants' comments with the quantitative survey. A second investigator (KW) analyzed the transcripts for discussions of the pile sort using a code list (developed by LQ) and for feedback about the graphics which helped to establish consensus coding as well as dependability (Patton, 1999). Inter-rater reliability was not calculated, however, all coding discrepancies were resolved through discussing the issue and revising the code definition, reassigning the code as needed. In addition, we maintained a working list of codes to document our evolving analysis (a component of an audit trail) to help establish confirmability and described participants thoroughly to help establish transferability (Ulin, Robinson, Toley, & McNeil, 2002).

IV.D. RESULTS

Participant characteristics.

Participant characteristics are listed in Table 4.1 and show that approximately half of the female students in this sample were White, with the remaining students reporting Black or African American race (37%), and other race categories (17%). There was also substantial variability in age groups represented. Most participants were high school graduates.

Research question 1: Healthy lifestyle component groups.

Twenty-two women verbally described their card piles, five women completed the written pile sort but neither volunteered nor were asked to discuss them verbally, one woman did not have written card piles but did discuss them verbally, and two women had neither verbally discussed nor written down their cards. Thus, data on 28 women are available. Fourteen codes were created; a total of 74 piles were coded.

Codes with good consistency (between 9 and 12 piles).

Lifestyle, defined as lifestyle-related factors, for example having hobbies, reducing stress, and maintaining friendships-12 piles. One woman stated "*...I think stress tends to do with people eating unhealthy and not exercising, so not worrying about something helps a lot and talking to people if you have a problem*" (22 year old, Asian). Another stated "*doing things that are good for the soul like reading, going to church, having a hobby, some kind of sport or activity. Things that are positive and make you happy*" (35 year old, African American).

Exercise, defined as general or specific aspects relating to exercise or physical activity-12 piles. One woman stated "*people have an assumption that only if you exercise you're going to be fit, but instead you can do all kinds of small things even around the house and at the same time be fit...*" (29 year old, Asian).

How you eat, defined as different styles related to eating-9 piles. The themes of moderation, balance, and variety were frequently cited, for example "*you should make moderate portions of what you eat. For example, don't, you know, have two plates for you and two plates for your child...*" (22 year old, African American). And, "*...there's nothing wrong with red meat but you don't want to eat it all the time, or just variety and balance, I guess, go kind of together* (49 year old, White).

Positive things, defined as foods, drinks, or activities you should consume or do more of-9 piles. Cards frequently grouped together were drinking water, eating many fresh fruits and vegetables, and having a daily vitamin.

Codes with modest consistency (between 2 and 6 piles).

Directly physical, defined as factors that directly impact the body such as exercise, food, and good hygiene-6 piles. For example, one woman stated "*I have put skills on appropriate good hygiene…regular exercise, nutritional counseling…all that is directly physical*" (37 year old African American) Another stated "*…keep your home and your body clean, you know, that helps to maintain a healthy environment*" (41 year old, American Indian). Lastly, "*…I put personal hygiene and physical activity together because I think it's one of those things that's sort of like an external thing you do*" (26 year old, White).

Negative things, defined as foods, drinks, or activities you should consume or do less of-4 piles. Examples of cards grouped together were no soda, no fast food, and no red meat.

Healthy foods/drinks, defined as foods you should and shouldn't eat-5 piles. These piles included a combination of cards from the positive and negative food piles.

Medical system, defined as having contact with doctors-3 piles. One woman stated "*…if you have regular checkups and you have a close relationship with your doctor, the you're more likely to develop healthy relationships, to eat right, to know how much exercise your body needs, what kinds of foods are best for you, and kind of like you discover what your problem is specifically for what your body type is…*" (21 year old, African American).

Self-awareness, defined as knowing what the body needs to function-2 piles. As stated by one woman "*…know what's right for you personally and what's not. You know, what works for some people doesn't necessarily work for everyone. So that's a spiritual type of thing. Just knowing yourself*" (44 year old, African American). Though not a specifically coded pile, self-awareness was also noted as an overarching theme in discussions. For example, "a*ccording to your own body, you know, because we're all different, whatever is for me healthy would be taking care of whatever ailment I may have…It may not be your*

standard or your level of health but for me, individually, then that would be taking care of the things I know my body needs individually" (41 year old, American Indian).

Eating and emotion, defined as eating for emotion not hunger-2 piles. One woman stated "*…I noticed that when I get stressed out, like if I was getting ready to take a test or something, the first thing, I'd do…*[is] *go to that machine and get chips. I know that it's not eating because you're hungry…*" (49 year old, White).

Other codes.

One code, mix, also had modest consistency and was defined as a combination of components from the healthy eating, exercise, and/or lifestyle piles-7 piles. Other codes corresponding to only one pile were: goals, defined as making and focusing on a goal for yourself; money, defined as how money affects nutrition; and culture, defined as how sharing ideas and family traditions affect nutrition.

Consistency of codes separated by age group.

Near the end of one focus group, two participants noted differences between an individual's age and nutrition. One woman stated "*Age, mentality, mindset. It's just how I look at things…*" while another stated, "*I think it's interesting to have a younger member participant focus more on food and like I focus more on attitude*." Based on comments such as these, we stratified the codes among younger and older participants. The primary difference was in the "how you eat" code which was used twice among younger participants but seven times among older participants. All of the "self-awareness", "money", "culture", and "eating and emotion" codes were exclusively used by the older participants. There were also six "positive things" piles among younger participants compared to three in older participants. The items listed in the piles coded 'positive things' were more specific among

the older participants (daily vitamin, fruits many and vegetables) and more general among younger participants (healthy breakfast, eat correctly).

Research question 2: Revision of the feedback graphic

Revision suggestions for the original bar graphic were grouped into three main categories: appeal, clarity, and specificity. Under appeal, participants mentioned the addition of pictures, brighter colors, and larger font. For example, one participant noted "*it needs something to bring it out…I see it there, but if it was a little bit more like pictures…like something to catch my attention*." Under clarity, participants mentioned confusion about presentation of positive and negative guidelines together, need for more instructions, the unrealistic wording of the textbox, the dotted average line, and the orientation of the graphics. The positive and negative guidelines concern was mentioned in two focus groups, as questioned by one participant "*when it says one alcoholic drink per day or less, and that's low, does that mean that they drink a low amount or that* [they] *are following at a low percentage*?" Under specificity, concern over the vagueness of the labels of 'low', 'medium', and 'high' was brought up in all four focus groups. One participant stated "*I don't think it's defining. It says your pattern but nowhere does it say what the zero and what the 100% means. We're kind of inferring that it means…its not really said there right out because I think, maybe,* [you should] *define low, medium, and high*."

Based on this feedback, the original bar graphic was revised to form a combination graphic (see Figure 4.3) as follows: under appeal, we added pictures, used bright colors, and larger font. Under clarity, guidelines were rearranged to represent the positive condition (for example, instead of 'limit red meat', we used 'choose white meat or meatless meals'), changed the instructions, and removed the average. Under specificity, we changed the labels

to be applicable to all guidelines by replacing 'low', 'medium', and 'high', with 'guideline not met', 'on the right track', and 'meeting recommended guideline'. Drawing from preliminary analysis of the pile sort data from the first four focus groups, we also added guidelines mentioned frequently: water, stress, and eating in moderation. We grouped together three categories of guidelines under the labels 'internal', 'external', and 'mental'. These names came directly from one participant and seemed to adequately represent how participants were generally grouping cards in their pile sort. The new combination graphic was then subjected to a second round of testing in two more focus groups with nine women (see methods section for further details). The mean appeal/understandability rating of the combination graphic was 4.86 compared to the rating of 3.55 for the original bar chart graphic.

Overall, many issues related to the bar chart were viewed as improved in the combination chart, however, additional improvements were suggested. Under the appeal category, the addition of pictures was appealing but they "…*should be bigger…I think that would open the whole thing up.*" The colors were improved because "…*they kind of got [her] attention*" but they "…*all just kind of ran together.*" The font size appeared to be improved but it "…*is so thin and then there's so much white* [on the background]." Under the clarity category, the difficulty of understanding the positive and negative guidelines together brought up for the bar chart was not mentioned for the combination graphic and one participant stated "…[she liked] *the uniformity of how each…category is consistent, each one has a topic, each one has a guideline.*" The wording of the instructions was more "*clear*", "*concrete*", and "*straightforward*", but because of the black instructions against the blue background "*it did not stand out to me at all.*" Under the specificity category, the vagueness

of the labels used in the bar chart were not commented upon and when probed, participants thought they were adequate.

New areas of concern were also brought up for the combination graphic. A consistent theme was "…*my first impression when I looked at it, it looked like too many words. Too much going on. Too much information.*" Next, the three descriptors applying to each guideline (for example, "1-2, 3-4, 5+" for fruits and vegetables) were confusing to a couple participants in both groups because they thought the "1-2, 3-4, 5+" descriptors in the first row applied to each guideline. Two participants in one group thought all the descriptors were not specific enough stating "*to me, it's not really clear-cut. I don't like the abouts and the nearly…it seems too vague…*" Third, participants in both groups found the new groupings were of "internal, external, mental" to be somewhat unappealing because they "*didn't see it's significance*" or because the groupings should be presented horizontally instead of vertically. However, when asked if these groups reflected the pile sort groups they had formed at the beginning of the group, participants from both groups noted "*Yes. It would fit right in*" and "*It's very thorough. I think it's good."* Only one participant commented that the guidelines didn't fit the groupings by stating "*I don't see how eating in moderation is mental. I thought it would be internal as well.*" Finally, the idea of transforming this graphic into a web-based format was recommended in both groups.

IV.E. DISCUSSION

Participants frequently cited components outside of healthy foods and exercise when describing a healthy lifestyle. The pile sort presents one relatively simple activity that can be incorporated into formative research to have participants identify and group different health behaviors to derive information useful in multiple behavior interventions. Presenting health

behaviors feedback in meaningful groupings has the potential to be more relevant and engaging to the participant compared to providing feedback on established cancer prevention guidelines only. This potential is supported by, though not verified by the higher mean appeal/understandability of the combination graphic developed in this graphic compared to the original graphics.

Previous research may point to potentially needed changes to the layout and text of the graphic. Larger, simpler pictures that are readily connected to each guideline topic should be incorporated into the graphic which may improve the readers' recall and comprehension of the graphics' message (Houts, Doak, Doak, & Loscalzo, 2006). Also, the issue raised concerning the vagueness of the descriptors used to describe whether a guideline was met or not (such as 'about once a week' or 'nearly everyday') should be closely examined. A study by Clark and colleagues (Clark, AbuSabha, von Eye, & Achterberg, 1999) suggests that more concrete text leads to increased information recall. However, in this case, it is difficult to make these descriptors concrete based on epidemiological results which may not be specific enough for certain guidelines, such as frequency of red meat consumption.

Using both participant feedback and the results of the coding analyses of the pile sort from all six focus groups, further changes to the combination graphic were recommended. Based on our results of categories that had good or moderate consistency, seven categories were identified as meaningful to participants and should replace the labels 'internal', 'external', and 'mental'. First, a 'physical activity' category is necessary and relevant. Second, because most participants placed both foods you should eat more of and foods you should eat less of in the same pile (the 'healthy foods/drinks' code) or placed only foods you

should eat more of in the same pile (the 'positive things' code), an effective graphic should frame the guidelines as positive statements and label this category 'healthy foods and drinks.' A third category should be 'how you eat' to account for themes of moderation, balance, and variety that were consistently mentioned. The fourth category should be 'lifestyle' and include guidelines about sleep, stress management, and having hobbies. The fifth category should be 'directly physical' and include a personal hygiene guideline, which was the most frequent component included under this code. The sixth category should be 'medical system' and include feedback about visiting with or comfort level with one's doctor. The seventh category should be 'eating and emotion' and include feedback about how often an individual perceives he or she eats out of emotion and not hunger. Self-awareness as an overall theme should be built into the graphic in several places, such as the topic definitions, title, and instructions.

To accommodate differences according to age group, a tailored message designer should consider depicting guidelines according to younger and older age groups in community college student populations. For example, among older populations, the 'how you eat' category could be emphasized by placing it first. Or, among younger populations, categories could be deleted such as eating and emotion.

Finally, converting a feedback graphic to a web-based format may partially alleviate the information overload mentioned by participants. For example, on a web page, just the column of topics could be displayed with each topic acting as a link. When a participant is interested in and clicks on a particular topic, the row would appear presenting the guideline explanation and feedback on how well he or she is meeting the guideline. However, web format may limit access to and thus the use of the graphic's information.

This study benefits from the unstructured pile sort technique in which participants formed the number and types of groups without pre-determined limits. This lead to multi-dimensional data and the identification of components outside of the realm of healthy eating and exercise, however, the identification of these components raises the issue of how to treat health behaviors with little or no established relationship to the disease in question. In presenting behaviors not clearly established as 'guidelines', a graphic of this type may lead to confusion. But, it may also be a better representation of reality in terms of how people make choices and think about nutrition and physical activity behaviors in their daily life.

There are several study limitations. First, the original three and the new combination graphic were tested among different and an overall small number of participants. From this perspective, the quantitative survey is only useful in that it provides information on how the graphic was perceived by individual participants. This is important because in focus groups, discussions tend to lead people along the same line of thinking. Also, two focus groups had only three participants and are thus more like 'small group discussions'. In addition, actual written card piles were either lost from or not conducted by three participants, which lessened the amount of data from which we can draw conclusions. Also, the number of participants with pile sort data was just below the sample size range for adequate reliability noted by Weller and Romney (1988). Finally, although we recruited a diverse sample of women in terms of age and race, we can not generalize these results to all community college students or to men. However, this loss of generalizability is a trade off for more in-depth detailed data among our small group of participants.

Future research on graphics for use in tailored messages should focus on incorporating participants' more holistic and inclusive perceptions of a healthy lifestyle.

This approach could also be modified depending on the health condition targeted in order to more specifically identify the relevant behaviors as perceived by the target participants, for example, "what are the different factors that make up living well with diabetes?" Because the components may vary between groups of people and for different disease conditions, the addition of this pile sort method might be of benefit to formative research protocols prior to intervention development. The next step in this line of research would be to test two graphics, both of which provide individualized feedback: this graphic with participant-identified components and groups versus a standard graphic such as the USDA dietary guidelines. This test would contribute to understanding which graphic is more effective in facilitating healthy behavioral changes.

Table 4.1. Participant characteristics

	Number	%
Gender		
Female	30	100
Age in years		
18-25 years	11	37
26-35 years	7	23
36-45 years	5	17
46+ years	7	23
Race/ethnicity		
White	14	47
African American	11	37
Other race	5	17
Education		
High school or GED	19	63
2-year degree	4	13
4-year degree or more	7	23
Marital status		
Married	17	57
Not married	13	43
Number of children under 18 living in home		
0	19	63
1	9	30
2 or more	2	7
Total	30	100[1]

[1]Percentages may not equal 100 due to rounding.

Figure 4.1. Flow of participants and methods used in this study design

Phase 1:
4 focus groups
- 21 participants
- Pile sort activity
- Reviewed 3 graphics (i.e. bar, pie, and scatter charts) with established cancer prevention guidelines

Phase 2:
Preliminary analysis of pile sort
- Selected bar graphic
- Revised to create the combination graphic which incorporated three factors:
(1) participant-selected guidelines (e.g. water , stress, and eat in moderation)
(2) pile sort groups (i.e. internal, external, and mental)
(3) characteristics to improve appeal and understandability

Phase 3:
2 focus groups
- 9 participants
- Pile sort activity
- Reviewed only the combination graphic

Figure 4.2. The original three message graphics: the bar chart, the pie chart, and the scatter plot

Your Pattern

0%   50%   100%
LOW   MEDIUM   HIGH

5 fruits & vegetables per day
Choose whole grains
Limit red meat
Choose foods for healthy weight
5 days a week for 30 or more minutes
Balance food intake with activity
Lose weight if overweight
One alcoholic drink per day or less

Your average score: 44% "moderate"

Congratulations! You are meeting the recommended guidelines for choosing whole grains, physical activity, and losing weight. Read on for more information on how to meet all the guidelines!

Your Pattern

healthy weight
physical activity
limit alcohol
healthy foods
eat foods that maintain healthy weight
limit red meat
lots of whole grains
5 servings of fruits & vegetables

Optimal Pattern

needs improvement
on the right track

Green segments mean you are meeting a guideline. Aim for the center of the pie!

Congratulations! You are meeting the recommended guidelines for limiting alcohol and eating whole grains. Read on for more information on how to meet all the guidelines!

Your Pattern

balance intake with activity
be physically active 5+ days a week for 30+ minutes
lose weight if overweight
choose foods for healthy weight
limit red meat
one alcoholic drink per day or less
5 fruits & vegetables per day
choose whole grains

Optimal Pattern

The full circle is the optimal pattern for meeting guidelines for cancer prevention. Read on for more information on how to expand your circle!

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Figure 4.3. The combination message graphic

Here's how **YOU** are meeting each of the cancer prevention guidelines (from the inside...out!)

Instructions: Find a topic, then look across. The one that is circled ... is how *YOU* are doing.

topics	guideline explanation	guideline Not Met	on the right track	meeting recommedned guideline
fruit & veg	Have 5 + servings of a variety of fruits and vegetables every day	(1 – 2)	3 – 4	5 +
whole grain	Choose whole grains (like whole wheat bread or oatmeal) instead of other grains (like white bread, pastries, or sugary cereals).	about once a week	(about 2 – 4 times a week)	nearly every day
red meat	Choose white meat or meatless meals most of the time instead of red meat (beef *and* pork).	white meat about 1x/wk	(white meat some days)	white meat most days
Low calorie Low fat foods	Choose low–calorie low–fat foods most of the time instead of candy, pizza, burgers, and greasy foods.	(low fat & cal about 1x/wk)	low fat & cal some days	low fat & cal most days
alcohol	Have one or fewer alcoholic beverages daily, if you drink at all.	1 or more each day	about 0.5 – 1 each day	(<0.5 each day)
water	Have routine access to fluids to meet water needs.	not applicable	not applicable	(routine access)
weight	Be at a healthy weight based on your height.	very overweight (BMI > 30)	(overweight (BMI 25–30))	normal weight (BMI < 25)
exercise	Do 30 minutes or more of moderate or vigorous physical activity five or more days per week	(< 15 min each day)	15 – 30 min each day	30 + min each day
stress	Though not a risk factor for cancer, stress can trigger poor eating, drinking alcohol, and lack or exercise. Try to cope with or prevent stress in positive ways.	rarely	(sometimes)	most of the time
eat in moderation	Eating moderate portion sizes will help you limit calorie intake which can help with weight loss.	rarely	sometimes	(most of the time)
		3	**4**	You are meeting 3 guidelines

Internal — **External** — **Mental**

congratulations!

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CHAPTER V

A PROSPECTIVE ANALYSIS OF TAILORING CANCER PREVENTION MESSAGES TO PARTICIPANT-SELECTED BEHAVIORAL PRIORITIES

V.A. ABSTRACT

Tailoring messages to participant-selected topics is one approach to multiple risk behavior interventions, however, little quantitative research has examined this approach. In two large diverse worksite intervention trials, women were mailed messages tailored to behavioral priorities including: eating healthier, exercising more, both exercise and healthy eating, quitting smoking, cancer screening, or reducing stress. Using linear regression, we conducted a secondary data analysis to investigate whether participants receiving a message tailored to their behavioral priority (e.g. eating healthier) made greater changes in related behaviors (e.g. increased fruit/vegetable intake) compared to participants choosing a different behavioral priority. Models adjusted for race, age, education, and body mass index. Among participants choosing eating healthier, those who received a message tailored to this topic reported an increase of 1.8-2.0 greater servings of fruits and vegetables compared to those who did not receive a message (p<0.01). Similar, but non-significant, effects were reported for physical activity outcomes. Evidence supported tailoring to participant-selected topics for fruit and vegetable intake. In practice, behavioral priorities should be considered in tailored interventions aimed at multiple behaviors.

V.B. INTRODUCTION

Health communications can be tailored to an individual based on their specific

characteristics, such as demographic information and current behaviors. According to the

Elaboration Likelihood Model (Petty and Cacioppo, 1986), this individualization exposes the

message receiver to a more personally relevant message in which the receiver is likely to pay

greater attention to the information. Thus, the receiver may find the message more

trustworthy, readily remembered, and more persuasive compared to non-tailored messages

(Skinner et al., 1999). But precisely which methods are most effective in increasing

relevance constitutes a major knowledge gap in the tailored message literature (Kreuter &

Wray, 2003). This gap is magnified in interventions that include multiple behavior risks.

Clarifying these methods will help advance the dissemination of tailoring technology to

public health settings.

In designing tailored materials, researchers must make several decisions, for example

the communication channel (e.g. web or print) and the specific tailoring variables (e.g.

readiness to change or barriers). Decisions are usually based on formative research and

knowledge of behavioral change determinants. However, the design process becomes more

complex when addressing chronic diseases that involve multiple types of behavior change.

In particular, addressing multiple behaviors in a single health promotion intervention raises

the issue of behavior selection. That is, not only *what behaviors* to select for presentation in

a tailored message but also *what criteria* will be used to inform that decision?

To outline this design process, consider planning an intervention in a primary care

clinic to reduce colon cancer risk among patients who are 50 years old or greater. Patients

are given the opportunity to complete a baseline questionnaire about their family history,

diet, physical activity, and psychosocial factors related to lifestyle changes. A female patient indicates the following three items: she eats six daily servings of fruits and vegetables, she walks for about 30 minutes twice a week, and she identifies numerous perceived barriers to obtain a screening test. At this point, the tailored message designer needs to have decided how to present these multiple behaviors (nutrition, physical activity, and cancer screening) in the message structure by considering a few key questions. First, should the message focus only on encouraging her to obtain a screening test because that behavior might do the most to lower her risk? Or, second, should the message highlight her accomplishment in eating the recommended servings of fruits and vegetables which, in turn, might help motivate her to work on her low physical activity? Or, third, as done in one intervention to reduce colon cancer risk among patients diagnosed with adenomatous polyps, the message could also highlight inter-relatedness by presenting feedback on all the risk factors in a single tailored message simultaneously (Emmons, McBride, 2005). Finally, should she be offered the option of choosing the health behavior on which she is most interested in working?

In a report on applied cancer communication, Kreuter (1999) stressed the need for prioritizing multiple competing behaviors and outlined five possible methods: epidemiologic risk; readiness to enact changes; self-efficacy for making changes; objective difficulty of making the changes; and as gateways to future behavioral changes. As pointed out by Kreuter and Strecher et al. (2002), a key factor distinguishing between the use of epidemiologic risk alone versus other prioritization choices is the consideration of the participant's personal interest in the behavior. Assessing stage of readiness may not accomplish the goal of determining priority for change because participants may report contemplating multiple changes (Campbell et al., 2000). By directly asking what she or he is

most interested in working on, a participant-identified 'behavioral priority' may build on a participant's intrinsic motivation for the selected health behavior because it reflects characteristics most important to that participant at that time. Furthermore, accomplishing a participant-selected behavior change may act as a 'gateway behavior', leading the participant to further increase his or her self-efficacy and intention to begin other, potentially more difficult, behavior changes (Campbell et al., 2000; Strecher et al., 2002;). Overall, tailoring to a participant's behavioral priority may increase the personal relevance of the message.

But, what are other potential effects of allowing participants to direct a portion of their intervention dose by choosing a behavioral priority? Evidence as to whether the behavior of choice matches the behavior indicated by as most important in terms of epidemiologic risk has been mixed. In a cross-sectional study from the community-based intervention Health Works for Women (Campbell et al., 2000) smoking cessation, a very important behavior for cancer prevention, was chosen by only $1/3^{rd}$ of current smokers. However, in a dietary and physical activity intervention to improve diabetes self-management, the participant-chosen behavioral priorities tended to mirror the behaviors indicated by epidemiological risk. For example, those who chose a goal of reducing fat had the highest mean fat intake at baseline (Estabrooks et al., 2005).

Given these potentially unpredictable behavior choices, we believe the effects of tailoring to participant-selected behavioral priorities on behavioral outcomes warrants further research. Therefore, in the current study, subsets of data from two large health promotion interventions, Health Works for Women [HWW] and Health Works in the Community [HWC], were used to investigate two main questions:

(1) Did participants receiving a message tailored to their chosen behavioral priority report more improvement in that related behavior at follow-up compared to participants who received a message tailored to other behavioral priority choices (e.g. did those who received a message tailored to healthy eating report eating more fruits and vegetables than those who received a message tailored to other behavioral priorities)? [the 'behavioral priority effect']; and

(2) Among participants who chose the same behavioral priority, did those who received a message tailored to that behavioral priority increase their related behavioral outcomes at follow-up compared to those who did not receive any message (e.g. did those who chose healthy eating and received a tailored message report eating more fruits and vegetables than those who also chose healthy eating but did not receive a message)? [the 'message effect']

V.C. METHODS

The university's Public Health Institutional Review Board reviewed and approved all aspects of this study. All participants provided signed informed consent.

HWW and HWC intervention trials.

Description.

Data from two randomized trials were used. Participants in both trials were female blue-collar employees at light manufacturing, textile/apparel, and/or food processing workplaces, 18 years of age or older, and from counties in rural eastern North Carolina with minority populations making up 30% or more of the total population. A more thorough description and results from each of these trials have been published (Campbell et al., 2000; Campbell et al., 2002; Kelsey et al., 2006).

Briefly, HWW (1993 – 1998) was a two-group experimental design study with data collected at baseline, six months, and 18 months in which four (of nine) workplaces were randomized to the intervention (i.e. two tailored messages and social support activities with lay health advisers) and five worksites were randomized to a delayed intervention (i.e. one tailored message only after six month measurement period). The tailored messages were designed using feedback from focus groups and resembled women's magazines. The messages provided information about all health behaviors targeted in the study in the form of charts indicating adherence to each behavior. In addition, at baseline participants were asked to choose one behavioral priority and this then served as the basis for the magazine themes and tailored psychosocial feedback (i.e. strategies that were based on participants' stage of change, perceived barriers, outcome expectations, social support, community resources, and informational needs) included in the rest of the message (Campbell et al., 2000). At 18-month follow-up, participants in the intervention group reported statistically significant increases in fruit and vegetable intake and in strengthening and flexibility physical activity compared to participants in the delayed intervention group (Campbell et al., 2002).

Building on the successful results of HWW, HWC (1998 – 2003) replicated HWW and also introduced activities at the community and organization levels, expanding the participatory role between researchers and community members. HWC utilized a 2 x 2 quasi-experimental factorial design in which counties, composed of participants from three worksites each, received one of four different interventions. The first county received two tailored magazines and a natural helpers program (same as HWW); a second county received no tailored messages but worksites implemented employee wellness committees, Community Advisory Committees, and community projects (i.e. HWC only); a third county received both

interventions; and a fourth comparison county received unrelated health trainings. Tailored messages were very similar in design, layout, and content to the messages used in HWW.

Measures.

Participant characteristics. Age was collected as a continuous variable; for both studies age was categorized as 18 - 39, 40 - 49, and 50 and older. Education level was collected as a categorical variable in HWW and as years of education completed in HWC; for both studies education was collapsed into three categories of less than high school, graduated from high school, and more than high school. For both studies race/ethnicity was collapsed into three categories of White, African American, and other which included Hispanic, Native American, Asian, and other. Height and weight were self-reported; for both studies height and weight was transformed to body mass index.

Behavioral priority. Participants indicated their behavioral priority by answering '*which one of these would you like to work on the most*?' In HWW, participants chose from eating healthier, exercising, both exercise and healthy eating, quitting smoking, or learning more about breast and cervical cancer screening. In HWC, cancer screening was replaced with reducing stress because stress emerged from the formative research as a strong concern. In addition, a majority of these working women were up to date with breast and cervical cancer screening.

Diet. For both HWW and HWC, fruit and vegetable and fat intake were measured using a brief food frequency checklist that has been modified from previously validated instruments (Block et al., 1986; Campbell et al., 1994; McClelland, Demark-Wahnefreid, Mustian, Cowan, & Campbell, 1998). Medium referent portion sizes were provided as weights or measures (such as 4 oz of fried fish, 8 oz whole milk, 1 medium bowl green salad,

or 1/2 cup of broccoli, cabbage, or cauliflower). When responding, participants were instructed to think back over the past three months and indicate how often they usually ate or drank the listed item. In HWW there were seven frequency options: 3+ per day, 2 per day, about every day, 2 – 4 per week, 1 per week, 1 – 3 per month, never or almost never. In HWC, there were six frequency options: 2+ per day, about every day, 3 – 5 per week, 1 – 2 per week, 1 – 3 per month, and never or almost never. For fat, almost all of the individual food or food groupings overlapped, with 18 questions about fat intake in HWW and 17 corresponding questions in HWC. Total fat score was calculated by summing the product of the average total fat gram amount in the specified medium serving times the frequency consumed. With 10 questions about fruits and vegetables in HWW and 8 corresponding questions in HWC, the checklists differed mainly because some individual foods listed in HWW were combined in HWC. Total fruits and vegetables servings were calculated by summing the indicated frequency of servings consumed.

Physical activity. For both HWW and HWC, several types of physical activity were measured using a brief checklist drawn from existing instruments (Jacobs, Hahn, Haskell, Pirie, & Sidney, 1989; Lee, Paffenbarger, & Hsieh, 1992). In both checklists, participants indicated how often they performed the listed exercise (1 – 3 times per month, 1 time per week, 2 times per week, or 3 or more times per week) followed by their estimated duration (<15 minutes, 15 – 30 minutes, and >30 minutes). Participants also were allowed to write in an 'other' activity. The checklists differed in that for HWW, participants were first asked if they performed any exercise, and if they responded 'no', they were classified as sedentary and skipped the remaining frequency questions. However, we included physical activity data for 13 instances (total from baseline and follow-up measurements) in which participants

reported being completely sedentary but also reported frequency/duration activity data. For HWW, there were ten activity categories: walking or hiking, jogging or running, swimming, bicycling, aerobic dancing, other dancing, aerobic exercise classes, lifting weights/strength exercises, stretching exercises, and other. For HWC, participants were given the option of indicating never performing each individual activity. There were twelve activity categories: heavy housework, active childcare, yardwork/gardening, hard occupational physical work, active playing, walking or hiking, jogging/swimming/biking, aerobic exercise classes, dancing, lifting weights/strength exercises, stretching exercises, and other. The first five activity categories were eliminated from the current physical activity analyses in order to more closely resemble the physical activity measure in HWW.

The frequency responses were assigned weekly mean levels of 0 (never), 0.5 (1-3 times per month), 1 (1 time per week), 2 (2 times per week), and 3 (3 or more times per week); duration responses were assigned a mean minute level of 10 (less than 15 minutes), 22 (15 – 30 minutes), and 45 (more than 30 minutes). Frequency and duration levels were multiplied within each activity category and then summed to calculate total minutes of physical activity per week. Metabolic equivalent (MET) intensity levels were assigned to each activity category using the updated compendium of physical activities (Ainsworth et al., 2000). Activity categories with MET levels between 3 and 5.9 formed moderate to vigorous physical activity (MVPA); categories with MET levels of ≥6 formed vigorous activity (VPA). In HWW, both MVPA and VPA consisted of five activity categories. In HWC, MVPA consisted of four activity categories and VPA consisted of three.

Current study.

Data subset description.

This study used a subset of baseline and follow-up data from the HWW and HWC interventions to investigate the research questions. We did not consider the other behavioral priorities (i.e. smoking, cancer screening, and reducing stress) because approximately 80% of women chose a diet or physical activity priority resulting in small numbers of women in the other priority choice groups. We aimed to create similar subsets of data from the HWW and HWC studies which primarily compared groups of participants who received a tailored message versus groups of participants who did not receive a tailored message. In doing so, to measure the 'message effect', the full HWW dataset was limited to the 6-month follow-up measurement after only one tailored message had been received because after six months the delayed intervention worksites also received a tailored message. Because HWC lacked a similar measurement after the first tailored message had been received, HWC data subsets included the full 18-month follow-up period. Thus, the 'message effect' results from the HWC study reflect not only a longer measurement period but also the receipt of two messages. In addition, for HWC, we excluded the county that received both interventions (including tailored messages) and the county that received only community-level activities (HWC only) in order to more specifically isolate the message effect (HWW vs. comparison county) and make the analyses more comparable to the HWW study design. To measure the 'behavioral priority effect' in both HWW and HWC, datasets included data from full 18-month follow-up period. We investigated the effect of participants' first indicated behavioral priority, because by nature of being picked first, it may hold the highest intrinsic motivation for the individual participant.

Analysis.

Analyses were conducted using SAS Version 9.1 software. We excluded participants who were present at baseline and not at follow-up which resulted in 199 exclusions in HWW at 6 months and 442 exclusions in HWC at 18 months; we also excluded 232 participants from HWC who were present at follow-up but not at baseline. Multiple variable imputation using SAS procedure MI was used to assign five different values to missing instances of race (4 in HWC; 11 in HWW), education (18 in HWC; 3 in HWW), age (24 in HWC; 13 in HWW), and BMI (36 in HWC; 16 in HWW). Imputation was based on values from four other variables (behavioral priorities, fruit and vegetable intake, fat intake, and physical activity MET-hours/week).

Participant characteristics and outcome variables were compared between study groups at baseline using χ^2 and independent sample t-test analyses. Multivariate linear regression models were conducted using the SAS procedure REG for changes in outcomes (fruit and vegetable intake, fat score, and minutes of physical activity) as dependent variables. A p value of ≤ 0.05 indicated statistical significance. To address research question one, single indicator variables were created which estimated, among participants who received a tailored message, the effect of receiving the specified behavioral priority compared to those choosing other behavioral priorities. Similarly, for research question two, other single indicator variables were created which estimated, among those participants who chose the same behavioral priority, the effect of receiving a tailored message. All models were adjusted using a core set of variables (BMI, age, race/ethnicity, and education). Finally, intention-to-treat analyses were conducted for research questions one and two, assuming that participants who were not present at follow-up evaluation did not change their behaviors

from baseline evaluation. Thus, baseline data were substituted for follow-up data in these models.

V.D. RESULTS

Participant characteristics and behaviors.

At baseline, there were a few differences in participant characteristics between tailored message and comparison groups within both HWW and HWC (Table 5.1). In addition, mean minutes of activity reported in HWC were about twice as high as activity minutes reported in HWW. The majority of participants in both interventions chose both healthy eating and exercise as their behavioral priority.

Analyses of behavioral priority effects.

Table 5.2 shows results from analyses examining the behavioral priority effect. None of the behavioral priority results were statistically significant. Among those who chose healthy eating in HWC, a higher mean intake of fruit and vegetables was reported compared to those who read a message tailored to all other behavioral priorities (0.6 greater servings). There was a similar beneficial effect among participants choosing healthy eating/exercising in HWW. For physical activity, effects indicated a modest increase in total and MVPA minutes of physical activity. For fat intake, results were consistent across interventions and indicated that participants choosing healthy eating or healthy eating/exercising had an increased fat score compared to those who read a message tailored to all other behavioral priorities.

Analyses of message effects.

Table 5.3 shows results from analyses examining the message effect. Among all participants who chose healthy eating as their behavioral priority, those who received a

tailored message reported significantly higher mean servings of fruits and vegetables compared to those who did not receive a tailored message (1.8 in HWC and 2.0 in HWW, $p \leq$ 0.01 for both). Effects were diminished among those selecting healthy eating/exercising as a priority. Receiving a tailored message resulted in a non-significant increase in fat score among those choosing healthy eating and healthy eating/exercise. In HWC, increases in minutes of MVPA per week were reported among participants choosing only exercising more and among participants choosing healthy eating/exercising compared to those choosing the same priorities but not receiving a message. In HWC, among those choosing healthy eating/exercising, a decrease in total minutes of physical activity is seen that seems to reflect the statistically significant decrease in VPA minutes. In HWW, minutes of all physical activity categories increased among those getting receiving a tailored message compared to the comparison group.

Intention-to-treat analyses.

Analyses including the full set of participants available at baseline yielded attenuated estimates for each of the three outcomes, however, all statistically significant results reported in the previous section remained statistically significant in these analyses.

V.E. DISCUSSION

Results from analyses of two large, community-based interventions showed consistent support for tailored messages to positively impact both fruit and vegetable intake and minutes of moderate to vigorous physical activity. The impact on fruit and vegetable intake was most pronounced for the message effect with a 1.8 serving increase in HWC and a 2.0 serving increase in HWW among participants who chose healthy eating and received a message compared to those who chose healthy eating and did not receive a message. This

finding suggests that the results of the overall HWW intervention which showed a 0.7 increase in fruit and vegetable servings for the entire sample may have underestimated the interventions' impact on participants for whom healthier eating was a behavioral priority. These results reflect substantial increases in fruit and vegetable intake that may inform health communication strategies in future interventions. These increases were not replicated for those who chose the priority of both healthy eating and exercise, which may indicate that future studies should not offer a combination behavioral priority.

For fat, the behavioral priority and message effects showed no statistically significant relationships. In the overall HWW intervention (Campbell et al., 2002), at 6 months, participants in the intervention group reported small improvements in fat intake compared with those in the delayed intervention group (-3.00g vs. no change, $p = 0.01$). This improvement was not sustained at the 18-month follow-up. While research on total fat intake, as opposed to a specific type or contribution of fat calories, as a cancer risk factor is currently under investigation (Byers *et al*, 2002), we can not fully explain why the results for fat intake were not similar to those for fruit and vegetable intake. This is especially true because recent interventions have reported changes can be made concurrently for behaviors such as red meat, multivitamin, and fruit and vegetable intakes (Emmons, McBride, et al., 2005; Sorensen et al., 2005). It is possible that participants in the HWW and HWC studies considered the addition of fruit and vegetables to their daily lifestyle an easier undertaking than the potentially more difficult tasks of decreasing fat intake or increasing physical activity. In addition, in this Southern sample, it is also possible that additional fat in cooking and seasoning is added to ones' diet when adding more fruits and vegetables.

Regarding behavioral priority effects on their related behaviors independent of intervention group, our results are less consistent than the results provided by Estabrooks et al. (2005). In that study, the highest beneficial change for each outcome measured (reducing fat, increasing fruits and vegetables, and increasing days of moderate and vigorous physical activity) occurred among participants who had selected the corresponding goal. In our analyses, this trend was not significant and was most consistent only for fruit and vegetable intake and MVPA minutes per week not for other forms of physical activity or fat intake. However, the HWW and HWC study samples were more racially diverse with a lower level of education, thus suggesting tailoring that to behavioral priorities may be an effective strategy in multiple populations. It should also be noted that that in both HWW and HWC, all tailored messages contained a graphic depicting participants' adherence to the recommended behavioral guideline for all five behaviors. Thus, even though the majority of the messages' content was tailored on psychosocial variables linked to their behavioral priority, participants did receive behavioral feedback on all the behaviors. This difference may partially explain the non-significant effects for the behavioral priority analyses.

The positive behavioral changes reported in these analyses may have been achieved by increasing the personal relevance of the messages tailored to behavioral priorities, thereby increasing thoughtful consideration of the message content (i.e. elaboration) through the central route of processing, a process described by the Elaboration Likelihood Model (Petty & Cacioppo, 1986). However, neither message relevance nor elaboration were measured, thus we can not confirm this pathway specifically. An alterative to tailoring to a participant's behavioral priority is tailoring to behaviors chosen because of expert evidence of a disease prevention benefit. This method has the potential to maximize preventive benefit for the

participant and also has a theoretical backing in risk communication literature, which evaluates how one evaluates risk information and decides to act upon it. However, participant motivation to process information may be strongest when it coincides with their behavioral priority, as compared to when information is based solely on expert-decision rules.

Limitations.

Because the original HWW and HWC study designs were not designed to test message and behavioral effects directly, several limitations to our analyses were introduced. First, participants in study groups that received tailored messages also received a natural helpers program (i.e. a program to facilitate social support). This additional intervention may have affected behavioral changes. In addition, although the current analyses are strengthened by showing results across two large-scale interventions, this process introduced differences between the two studies. Notably, the physical activity measurements were not identical, with the activities listed separately in HWW being grouped in HWC. This may have contributed to the discrepancy in mean minutes of physical activity in HWC compared to HWW. Both because these specific versions of the physical activity checklists were not validated and because of the high standard deviation around the physical activity estimates, the physical activity results should be interpreted with caution. In addition, the number of messages and time period covered differed between HWW and HWC. Discrepancies also existed between the study groups within HWW and HWC on several demographic variables, which were adjusted for in the regression models. Finally, an intention-to-treat analyses suggests that participants who dropped out of the study did not substantially impact the results and implications of these analyses.

The potential benefit of identifying participant-chosen behavioral priorities should be added to the tailoring research agenda in which trials investigate specific tailoring methodology questions in-depth, thereby helping to define ambiguity surrounding how to maximize the relevance and effectiveness of tailored interventions. The potential variables (e.g. message relevance or elaboration) mediating behavioral changes should also be evaluated. Another research avenue would be to test the incorporation of behavioral priorities into different tailoring channels, for example, automated computer-based voice systems for nutrition and physical activity promotion (Friedman, 1998). Although other intervention activities could target a participants' behavioral priority, the use of tailoring is one promising approach to benefit from a participants' existing motivation for changing nutrition and physical activity behaviors.

Table 5.1. Baseline descriptive statistics of participants in the HWC Intervention (1998 – 2003) and

HWW Intervention (1993 – 1998)

	Health Works in the Community		Health Works for Women	
	Tailored message county n=124	Comparison county n=188	Tailored message workplaces n=362	Comparison workplaces n=298
Age, n (column %)				
18 – 39	38 (32.2)	76 (42.2)	213 (59.3)	146 (49.8)
40 – 49	53 (44.9)	58 (32.2)	93 (25.9)	88 (30.0)
50 +	27 (22.9)	46 (25.6)	53 (14.8)	59 (20.1)
Missing (n)	14		8	
Race, n (column %)				
African American	72 (58.5)	83 (44.6)[1]	184 (51.4)	190 (64.4)[2]
White	47 (38.2)	88 (47.3)	165 (46.1)	99 (33.6)
Other	4 (3.3)	15 (8.1)	9 (2.5)	6 (2.0)
Missing (n)	3		7	
Education, n (column %)				
LT high school	17 (14.3)	23 (12.6)	34 (9.4)	38 (12.8)[1]
High school	81 (68.1)	114 (62.6)	205 (56.8)	183 (61.6)
MT high school	21 (17.7)	45 (24.7)	122 (33.8)	76 (25.6)
Missing (n)	11		2	
BMI, mean (SD)	31.0 (7.1)	28.3 (6.6)[2]	28.5 (6.1)	29.3 (6.6)
Missing (n)	22		11	
Behavioral priorities, n (column %)				
Healthy eating	15 (12.9)	14 (7.7)	52 (14.4)	47 (15.9)
Exercising more	8 (6.9)	6 (3.3)	41 (11.4)	36 (12.2)
Healthy eating/	68 (58.6)	115 (63.2)	189 (52.3)	153 (51.7)

exercising				
Quitting smoking	9 (7.8)	11 (6.0)	37 (10.3)	21 (7.1)
Handling stress	16 (13.8)	36 (19.8)	--	--
Cancer screening	--	--	42 (11.6)	39 (13.2)
Missing (n)	14		3	
Fruit and vegetable servings/day, mean (SD)	2.4 (1.6)	2.7 (1.8)	2.8 (2.4)	3.4 (3.0)[2]
Fat score grams, mean (SD)	55.5 (31.2)	57.2 (38.8)	52.1 (31.6)	52.4 (32.1)
Physical activity minutes per week, mean (SD)				
Total	129.3 (134.0)	122.2 (121.9)	54.1 (80.7)	59.5 (90.6)
MVPA	89.7 (89.7)	97.1 (100.5)	43.0 (61.6)	47.9 (67.7)
Missing (n)	0		1	
VPA	39.6 (64.5)	25.0 (43.8)[1]	11.1 (35.5)	11.5 (35.7)
Missing (n)	0		2	

[1]$P \leq 0.05$, tailored message area vs. comparison area within each intervention.

[2]$P \leq 0.01$, tailored message area vs. comparison area within each intervention.

Table 5.2. Behavioral priority (BP) effects among participants who all received a tailored message on mean (SE) differences in fruit and vegetable intake, fat score, and physical activity from baseline to follow-up in the HWC Intervention (1998 – 2003) and HWW Intervention (1993 – 1998)

Outcomes	Among participants who received a tailored message		
	Chose healthy eating vs. Chose other BP	Chose exercising vs. Chose other BP	Chose both eating and exercise vs. Chose other BP
Health Works in the Community Study[3]			
Fruit and vegetable intake, servings/day	0.6 (0.5)	n/a	0.02 (0.4)
Fat score, grams/day	4.3 (8.7)	n/a	2.8 (6.1)
Physical activity, minutes/week			
Total	n/a	20.4 (52.6)	4.4 (27.6)
MVPA	n/a	17.1 (41.2)	18.9 (21.6)
VPA	n/a	3.4 (21.6)	- 14.5 (11.3)
Health Works for Women Study[3]			
Fruit and vegetable intake, servings/day	- 0.1 (0.4)	n/a	0.3 (0.3)
Fat score, grams/day	1.2 (4.7)	n/a	4.9 (3.6)
Physical activity, minutes/week			
Total	n/a	18.0 (15.4)	16.6 (9.4)
MVPA	n/a	12.4 (11.9)	10.1 (7.2)
VPA	n/a	5.6 (7.1)	6.5 (4.3)

[3]In HWC, all models had n=298; in HWW, fruit and vegetable and fat models had n=647, total physical activity and MVPA models had n=644, and the VPA model had n= 642. All models adjusted for age, race, education, and body mass index.

Table 5.3. Message effects among participants who chose the same behavioral priorities (intervention vs. comparison group) on mean (SE) differences in fruit and vegetable intake, fat score, and physical activity from baseline to follow-up in the HWC Intervention (1998 – 2003) and HWW Intervention (1993 – 1998)

Outcomes	Behavioral priority groups		
	Chose eating and received message vs. Chose eating and did not receive message	Chose exercise and received message vs. Chose exercise and did not receive message	Chose eat/ex and received message vs. Chose eat/ex and did not receive message
Health Works in the Community Study[4]			
Fruit and vegetable intake, servings/day	1.8 (0.7)[6]	n/a	0.4 (0.3)
Fat score, grams/day	19.8 (11.6)	n/a	1.2 (4.9)
Physical activity, minutes/week			
Total	n/a	13.7 (77.1)	- 4.0 (22.3)
MVPA	n/a	22.1 (60.4)	14.2 (17.4)
VPA	n/a	- 8.5 (31.7)	- 18.2 (9.1)[5]
Health Works for Women Study[4]			
Fruit and vegetable intake, servings/day	2.0 (0.6)[6]	n/a	0.05 (0.3)
Fat score grams/day	5.5 (7.1)	n/a	- 1.2 (3.9)
Physical activity, minutes/week			
Total	n/a	17.4 (20.9)	8.6 (9.9)
MVPA	n/a	13.3 (16.6)	2.6 (7.9)
VPA	n/a	4.3 (8.4)	6.0 (4.0)

CHAPTER VI

RESULTS OF A RANDOMIZED TRIAL TESTING MESSAGES TAILORED TO PARTICIPANT-SELECTED NUTRITION AND PHYSICAL ACTIVITY TOPICS

VI.A. ABSTRACT

Whereas tailored health communications have been shown to be effective overall compared to non-tailored messages, uncertainty exists as to how tailored messages bring about these positive effects. Identifying important tailoring variables may increase the effectiveness of tailoring. This Internet-based study included 408 female college students; all indicated the health topic on which they most wanted to work (i.e. their behavioral priority). Participants were randomized to one of three groups: (1) choice: message is tailored to a participant-selected health priority; (2) expert: message is tailored to a health topic determined by an expert system; or (3) comparison: non-tailored message. Immediate psychosocial outcomes were measured. Most participants chose to work on fruits and vegetables, eating low-calorie/low-fat foods, or physical activity. For the choice group, those choosing to work on fruits and vegetables demonstrated a statistically significant increase in self-efficacy. Positive effects in ease of goal difficulty and goal commitment for physical activity were also reported for those in the expert group who happened to receive a tailored message that matched their behavioral priority. Some support was found for incorporating participant-selected behavioral priorities in tailored messages. Future research may delineate for which gender, race/ethnic groups this tailoring variable may be most beneficial.

Improving the effectiveness and efficiency of tailoring will help disseminate tailored communications on a wide-scale.

VI.B. INTRODUCTION

Research on tailored health communications has been evolving over the past 15 to 20 years. Early studies demonstrated the effectiveness of printed tailored messages compared to non-tailored generic messages or no message control groups (Brinberg & Axelson, 1990; Campbell et al., 1994; Skinner et al., 1994; Brug, Steenhuis, van Assema, & DeVries, 1996). As new health communication technologies have emerged, tailored messages have been delivered through channels such as automated telephone systems (Delichatsios et al., 2001) and the Internet (Oenema, Brug, & Lechner, 2001). As opposed to tailored messages produced through a computer program and delivered as print materials, Internet-based tailored messages are delivered on-screen and may serve as a more efficient method of disseminating tailored health information to large populations. This may be especially true in college student populations where Internet use is high. For example, in a sample of 125 community college students > 85% accessed the Internet at least weekly (Hanauer, Dibble, Fortin, & Col, 2004). However, differences do exist, for example females and African American students accessed the Internet less frequently than males and all other race/ethnicities. In addition, diet/nutrition information and fitness/exercise were the two most common reasons reported when searching for health information.

Although literature reviews report tailored messages are generally better remembered, more trustworthy, and are more effective in changing a variety of behaviors compared to non-tailored messages (Kroeze et al., 2006; Skinner et al., 1999), uncertainty exists as to how tailored messages bring about these positive effects. Thus, an important avenue of tailored

communication research centers on identifying these factors. Some studies have focused on individual variables researchers should consider in the design of their tailored message (Dijkstra et al., 1998; Williams-Piehota et al., 2005). For example, in an intervention targeting advancement through the stages of change for smoking cessation, Dijkstra et al (1998) designed a 2x2 factorial trial in which smokers were randomized to one of four study groups. One group received a message tailored to outcome expectations, the second group received a message tailored to building self-efficacy skills, the third group received a message tailored to both types of information, and the fourth group received no information. Results indicated that the different messages benefited participants differently according to their stage of change. Those in precontemplation and contemplation (i.e. not yet ready to change) benefited most from messages tailored to both variables and those in preparation (i.e. those planning to take action soon) benefited most from messages tailored to self-efficacy building information. In another example, Williams-Piehota et al. (2005) identified participants' coping style as monitoring (i.e. actively seeking health information) or blunting (i.e. do not seek detailed health information) and tailored messages promoting mammography according to coping style. Results supported increased mammography use among participants who had received messages matched to their coping style, with the stronger effect reported for those with blunting style. We believe further research is warranted in the area of testing psychosocial variables that may be most relevant and effective to tailor on for given health behaviors and populations.

Given the increased focus of research addressing multiple behaviors in tailored interventions, an important tailoring variable to consider is *how* should the researcher decide on which behavior (e.g. cancer screening vs. fruit and vegetable intake vs. physical activity)

to tailor the message. Messages explicitly presenting feedback based on a health topic that a participant selects (choice-based behavioral priority) may have an advantage over messages that promote a health topic selected because of expert evidence of its potential disease prevention benefit (expert-based). In favor of choice-based messages, it has been suggested that accomplishing one behavioral change may act as a gateway to future, potentially more difficult, behavior changes (Emmons et al., 1994; Kreuter, 1999). When approaching a series of multiple behaviors, an individual may select the behavior that he or she is already considering changing, the one they are more confident about changing, or the one they find least difficult to change (Kreuter). In addition, health topics selected by the participant are likely to be highly relevant. The Elaboration Likelihood Model (Petty & Cacioppo, 1986) indicates communication needs to be personally relevant, useful and understandable if the individual is to thoughtfully consider the contents of the message (i.e. central processing). The act of centrally processing the message is then thought to increase the likelihood of future behavior change. However, messages that do not match participants' behavioral priority may narrow the focus of the message and provide less relevant information for that individual, ultimately resulting in a less persuasive message. Alternatively, if an individual selects a health behavior not likely to impact their disease risk (e.g. increasing water consumption), it might be beneficial to provide access to the expert-based guidelines in order to prompt the individual to consider a priority with a more established relationship to disease risk.

Although other studies have employed participant-selected health priorities in their tailored message design, these messages were embedded within complex studies, ultimately designed to answer different research questions (Campbell et al., 2002; Strecher et al., 2002).

To our knowledge, this is the first study to evaluate the specific effect of tailoring to participant-selected health priorities. Thus, the objective of this study is to investigate the immediate effect on intention, self-efficacy, frequency of cognitive thoughts, goal commitment, and goal difficulty among college women in one of three randomized study groups: (1) the choice group in which the message is tailored to a participant-selected health priority; (2) the expert group in which the message is tailored to a health topic determined by an expert system; or (3) the comparison group in which the message is not tailored.

VI.C. METHODS

Participants.

Recruitment was carried out among students at two community colleges and three public universities. Women who were currently enrolled in college (full-time or part-time, undergraduate or graduate students), were 18 years old or older, had access to the Internet, and had not participated in another Internet-based nutrition and physical study in the past six months were eligible to participate. Potential participants were recruited through teachers who verbally announced the study in class, passed out a study flyer, and/or emailed their class listserv. Other methods included university-wide mass emails or web-postings; posted flyers throughout campus; placing a notice in one campus newsletter; directly handing out flyers by study staff; and emailing participants from a previous research study. Interested participants were directed to contact the study staff with questions or proceed directly to the study website.

Study design.

Focus on Your Health was a 3-group randomized trial. All aspects of the study were approved by the University of North Carolina at Chapel Hill's Public Health Institutional

Review Board. A total of 412 participants logged onto the study website and were initially

enrolled in the trial. One participant was identified as male and three indicated they were not

students. Thus, in these analyses, 408 participants were randomized to one of three groups:

the choice group (n=143), the expert group (n=133), or the comparison group (n=132).

Sixty-eight participants did not complete any of the immediate follow-up survey, thus data

are available for 340 participants who completed at least part of the immediate follow-up

survey. Participants also completed a 1-month follow-up survey; these data are not reported.

All data collection occurred through on-line surveys on a secure study website

developed for this project. After reading about the general study procedure on the main

page, participants created a username and password, completed several demographic

questions, and read an on-line fact sheet about the study's benefits and risks. Participants

checked a certain box if they were willing to participate; this served as their informed

consent. Participants were then directed to the baseline survey. To lessen participant burden,

they could complete the baseline survey all at once or in parts by logging into and out of the

website over an unrestricted time period lasting the duration of the project if desired.

After completing the baseline survey, participants were immediately presented with

12 successive screens of tailored or non-tailored feedback based on their study group.

Participants were directed to read the feedback and then complete the immediate follow-up

survey on-line. Again, they could complete it all at once or in parts, however, they were

allotted a maximum of two weeks to complete the immediate follow-up survey once they had

received the feedback screens. An exception to this procedure occurred for the first

approximately 50 participants for whom the two-week rule did not apply because this

procedure was not in place at the start of the study. Thus the procedure was modified

because participant feedback indicated that it was too time-consuming to complete the survey at one sitting. Two weeks was chosen as the time frame in order to obtain 'immediate' feedback and to lessen the chance of participants changing their behaviors and thoughts in the interim. Among these 50 participants, about ten logged into and out of the website over a range of 2 to 8 weeks. Participants were contacted through email and phone up to five times to remind them to finish the baseline or immediate follow-up surveys (a maximum of 10 contacts each). After completing a second follow-up survey one month after baseline, participants were mailed a thank you letter and a $10 gift card to a local supermarket.

Formative research.

Focus groups were conducted at community colleges in central North Carolina (two groups on one campus and two on another) and were homogeneous in terms of gender and student status. Twenty-one women participated, with an average age of 31.2 years and representing a diversity of races (7 were African American, 10 were White, and 5 reported another race-one participant indicated two races). Aspects from the semi-structured guide used to inform the content of the tailored messages were under four main topic areas: previous experience with nutrition education, depth of knowledge about each of the targeted ACS guidelines, barriers to meeting these guidelines, and exploring three examples of graphics depicting guideline adherence (Quintiliani, Campbell, Haines, & Webber, 2006). These graphics presented adherence to all the guidelines simultaneously in one picture. Focus groups were audio-taped, professionally transcribed, and reviewed for information relevant to tailored message development. This information was incorporated into the tailored message content as described in the next section.

Intervention conditions: Tailored groups.

Tailored feedback messages were created for six health behaviors chosen from the American Cancer Society's [ACS] Guidelines for Nutrition and Physical Activity (Byers et al., 2002). The six guidelines were increasing fruit and vegetable intake, choosing whole grains over processed or refined grains, choosing white meat over red meat, eating low-calorie/low-fat foods to help maintain a healthful weight, performing physical activity for at least 30 minutes on five days per week, and limiting alcoholic beverages to one drink a day or less.

Two study groups received tailored messages. In the choice group, participants received messages based on the two topics they indicated at baseline they were most interested in working on [i.e. their behavioral priorities]. In the expert group, participants received messages based on the two topics determined by an expert-based algorithm to be of greatest importance for them specifically. To create this algorithm, we used methods from the Harvard Cancer Risk Index (Colditz et al., 2000). First, we calculated the proportion each individual cancer contributed to the total number of new cancer cases of 13 different cancers. These 13 cancers comprised 80% of the incidence of cancer in women using year 2000 Surveillance Epidemiology and End Results data. We then assigned 'risk points' (i.e. 5, 10, 25, or 50) for each exposure listed that corresponded with an ACS guideline. To calculate risk points for any cancer (as opposed to specific cancer sites), we took a weighted average of the risk points for each exposure, where the weights were the proportion each cancer contributed to total cancer incidence. The weighted averages were 10 for physical activity, 10 for red meat, 6.75 for obesity, 5.37 for fruits and vegetables, and 5 for alcohol. Therefore, the expert-based algorithm provided tailored feedback using this descending order

of priority and the participants' reported dietary and physical activity behavior at baseline. First, the message was tailored to physical activity and limiting red meat. If the participant reported already meeting either guideline, they received the next most important feedback focused on eating low-fat/low calorie foods. Even though this guideline does not have a corresponding exposure listed in the Risk Index, we made the decision to include this guideline for obesity reduction because obesity is the next variable in descending risk points. According to this system, the descending order of the remaining guidelines was increasing fruit and vegetable intake, moderating alcohol intake, and choosing whole grains. The whole grain guideline was not listed in the Risk Index, so it was placed in the last position in the expert-based tailoring list. If all guidelines were being met, the 'default' tailored message focused on maintaining physical activity and limiting red meat.

All tailored messages started with an introduction, a graph depicting the participants' adherence to the guideline, a testimonial of a successful change, a question and answer column, and an action plan for taking their next steps towards behavior change. These six screens were then repeated for the second health topic. The primary difference between messages received by the two tailored study groups was the introduction text. In the expert-based messages, the topic was introduced as: "*There are lots of solutions when it comes to improving health. However, experts in the field of health promotion can help guide a person towards the solutions that are most important for her specifically. This is where your eating and physical activity habits come into play. Based on your current nutrition and physical activity habits, one of things you should work on to help you prevent chronic disease like cancer most effectively is doing more…*" In the choice study group, the message topic was introduced as: "*There are lots of ways to improve health. You said you wanted to do more…*"

The main text of the tailored message used strategies designed to impact different constructs from several theoretical models. After the introduction, participants viewed an adherence graph comparing their behavior level at baseline to the recommended guideline. The graphs were extensively revised based on formative research to be more appealing (e.g. brighter colors) and clear (e.g. adherence to only one guideline was represented on each graph). For each health behavior, the graphs separated adherence into three categories labeled 'guideline not met', 'on the right track' and 'meeting guideline.' This feedback was designed to change participants' attitudes in regard to their current behavior, which acts as a determinant of forming behavioral intention as outlined in the Theory of Reasoned Action (Fishbein & Azjen, 1975). The graph may also help increase participants' perceived awareness and self-control (Bandura, 1986) over the behavior by clarifying the recommended guideline and emphasizing their adherence level. Next, participants read a testimonial showcasing the successful tips and strategies used by a fictitious female to accomplish the behavior change. The stories were compiled from different focus group participants' experiences with making successful diet and physical activity changes. This story data may serve as an observational learning task as outlined in the Social Cognitive Theory (Bandura). Next, participants read a question and answer column, which was tailored to their reported barriers to behavior change. Tips for addressing barriers were also taken from experiences reported during the focus groups. The column provided possible solutions to eliminating barriers, thus facilitating the likelihood of behavioral change (Rosenstock et al., 1988; Prochaska & DiClemente, 1992). Finally, participants read an action plan tailored to their stage of change, which served to provide motivational strategies to achieve or maintain behavior change (Prochaska & DiClemente). Overall, each of these strategies was aimed at

increasing a participant's self-efficacy, or confidence in performing the targeted behavior. The overall conceptual model of this study is presented in figure 6.1. Message text was based on the tailored message library used in the Health Works for Women study (Campbell et al., 2002) and formative research conducted for the Focus on Your Health study (Quintiliani et al., 2006).

A website front end and back end database programmed in Linux open source software matched participants' responses to the baseline survey to different pages of tailored text the study assigned study group. Examples of different screen shots from the website are shown in Appendix A. Although thousands of message combinations could have been generated, the actual number of possible tailored messages was restricted due to embedded decision rules. For example, once the program recognized a participant was in maintenance for physical activity, that participant could no longer receive an action plan written for someone in preparation for increasing physical activity.

Intervention conditions: Comparison group.

In the comparison group, participants also received 12 screens of messages, however, the information was not tailored. The content focused on reducing stress and included several components, for example a testimonial, a visualization exercise, and an action plan. These messages were drawn from a tailored message library from another study, Health Works for Women (Campbell et al., 2002).

Data collection.

Data were obtained at three time points: at the login page as the participant created a username and password for the site (2 questions), during the baseline survey (120 questions), and the immediate follow-up survey (80 questions). The baseline and immediate follow-up

surveys are shown in Appendices A and B. Participants could leave any question blank if they wished. Participants in all three study groups answered the same questions; questions were grouped according to each guideline (i.e. the psychosocial and goal commitment questions for fruits and vegetables, followed by the same questions for whole grain intake, etc). Before each health topic, we presented a clarifying explanation (e.g. "*All types of meat can be lower in fat if you select lean cuts and have smaller portions. Meats can also be lower in fat if you bake, broil, or poach them instead of frying or charbroiling them*"). Finally, each guideline was presented in a positive format, for example the ACS guideline of limit alcoholic beverages to 1 drink a day or less was presented as: "*do you limit your consumption of alcoholic beverages to one drink a day or less?*" In this way, higher values for psychosocial and goal setting questions indicate more intention, self-efficacy, commitment, and less goal difficulty. Additional measures collected but not discussed further in this article were implementation intentions, elaboration measured by a quantitative scale, and answers to open-ended questions about the feedback, such as its believability and appeal.

Measures.

The following measures were obtained from all study participants.

Demographic characteristics.

Age and race were measured in the login page. At the end of the baseline survey, participants also indicated their Hispanic/Latina ethnicity, race, marital status, number of children, highest level of education completed, college of enrollment, and location of residence.

Behavioral priority.

Participants were asked to indicate from a list of six health topics the two they would like to work on the most.

Dietary intake.

Diet was measured using the PrimeScreen food frequency questionnaire (Rifas-Shiman et al., 2001). Participants indicated how often on average they have eaten from 20 food categories in the past year. Portion sizes were not provided. The frequency categories are: "less than once per week', 'once per week', '2-4 times per day', 'nearly daily or daily', and 'twice or more per day'. Each frequency category was assigned a proportion of a day (i.e. 0.03, 0.14, 0.43, 1, and 2.5); these proportions were then summed for questions relating to each of four diet-related health topics: fruits and vegetables-six questions; whole grains-one question; red meat-two questions; low-calorie low-fat foods for healthful weight-seven questions. The supplement portion of the PrimeScreen was dropped.

The PrimeScreen was developed using data from the Nurses' Health Study and was compared against a 131-item semi-quantitative food frequency questionnaire and biomarkers among a sample of women (Rifas-Shiman et al., 2001). The average correlation coefficient for comparability between the Primescreen and the longer food frequency questionnaire for 18 foods or food groups was 0.61, whereas the correlation coefficients between Primescreen and plasma vitamin E, ß-carotene, and lutein/zeazanthin were 0.33, 0.43, and 0.43 respectively. The biomarker correlation coefficients were similar to those obtained from the longer food frequency questionnaire. These results demonstrate adequate comparability of the Primescreen questionnaire to other methods of dietary assessment. Primescreen has also been used in a diet intervention trial and was shown to have similar results to a 120-item food frequency questionnaire (Delichatsios et al., 2001). This brief questionnaire is intended to

place individuals into groups of dietary compliance and deliver the message within a short time frame without imposing overwhelming burden on the participant.

Alcohol consumption was measured using a subset of two alcohol-related questions from the 2005 Behavioral Risk Factor Surveillance Survey [BRFSS] (CDC, 2005). Participants first indicated on how many days in the past month they consumed an alcoholic beverage; in the following question, participants indicated how many drinks they had on average on the days they drank. Referent portion sizes were provided. Studies investigating the validity and reliability of BRFSS alcohol questions from 1993-2000 were reviewed by Nelson, Holtzman, Bolen, Stanwyck, & Mack (2001). The alcohol questions from the 1993-2000 time period are very similar to the 2005 time period. Overall, they found validity and reliability was moderate, although because different types of alcohol were grouped together into one question, consumption level may be an underestimate.

Physical activity.

Physical activity was also measured using a subset of questions from the 2005 BRFSS, including moderate and vigorous activities but excluding occupational physical activity. Participants first indicated if they did any moderate activities in a usual week for at least 10 minutes at a time. They then indicated on how many days per week they did these activities, followed by the average duration of these activities each day. The same three questions were repeated for vigorous activities. Examples of moderate and vigorous activities were provided. A review of several studies comparing questions similar to those used in BRFSS suggested moderate validity in ranking individuals with low and high physical activity levels; however no conclusions about validity could be drawn for moderate-

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level activities (Nelson et al., 2001). Nelson et al. also reported there was moderate

reliability for vigorous activities.

Psychosocial measures.

These variables included stage of readiness to change, barriers (both measured at

baseline only), intention, and self efficacy (both measured at baseline and immediate follow-

up). Because these variables apply to specific behaviors and tend to be more predictive of

behavior when applied to specific categories of food compared to general food groups

(Baranowski et al., 1999), each psychosocial measure was asked separately for each health

behavior.

The stage of readiness to change and barrier questions were drawn from the Health

Works for Women study (Campbell et al., 2002). For stage of change, participants indicated

if they performed the positive behavior: "*Do you eat 5 servings of fruits and vegetables per*

day?" Participants who indicated "*yes*" were asked to indicate if they have been doing the

behavior for less than six months (classified as action) or six months or longer

(maintenance). Participants who indicate "*no*" were asked if they were not thinking about

performing the behavior (precontemplation), were thinking about it (contemplation), or were

planning on taking action in the next 30 days (preparation). Barrier questions were presented

as "*It would be harder to do more* [of the recommended behavior] *than I do now because…*"

Participants then chose two barriers from a list of five.

To measure intention, two similar questions were used. They were: "*Do you intend to*

[do the recommended behavior] *in the future*?" and "*Are you likely to* [do the recommended

behavior] *in the future*?" Responses were measured on a scale from 1(strongly disagree) to 5

(strongly agree). Wording for these questions were adapted from Christian, Armitage, &

Abrams (2003). Two questions were used in order to bring about increased variability in answer response. The self efficacy question was: "*How sure or unsure are you that you have the ability to succeed in* [doing the recommended behavior] *for the next six months*?"; four response options ranged from very unsure to very sure. These questions were adapted from the Health Works for Women study (Campbell et al., 2002).

Goal setting.

These variables, specifically goal commitment and difficulty (both measured at baseline and immediate follow-up), were measured through a series of 6 questions. Five questions made up the total goal commitment score and were taken from a meta-analysis among 2918 participants (Klein et al., 1999). These five questions were refined from previously used nine-item and one-item scales. Importantly, this 5-item scale was found to be consistent across goals that are self-selected versus assigned (e.g. in a study setting) and across goals that are of high, medium, and low difficulty. Questions include "*It wouldn't take much for me to abandon this goal*" and "*Quite frankly, I don't care if I achieve this goal or not*". Responses are measured on a 5-point Likert scale. A question measuring goal difficulty, also measured on a 5-point scale, will follow, e.g. "*How difficult do you think it will be to achieve this goal?*"

Thought listing.

Immediately receiving the on-screen feedback, participants entered into six text boxes any thoughts, feelings, or ideas that occurred to them. Afterwards, participants were instructed to rate each item as positive, negative, or neutral. Thought listings have been used in cognitive research for over 30 years to allow participants to freely express their stream of thinking without the constraints of close-ended questions with pre-determined responses

(Cappioccio, von Hippel, & Ernst, 1997). In this study, the quantitative ratings were used to estimate participants' immediate reactions to the feedback; the qualitative text was not analyzed.

Statistical analyses.

All analyses were conducted using SAS version 8.02. First, we conducted one-way ANOVA (for continuous variables) and chi-square tests (for categorical variables) to compare participant characteristics across study groups. We then conducted six separate linear regression models for the dependent variables of intention to eat more fruits and vegetables, eat more whole grains, limit red meat, eat more low-fat/low-calorie foods, be more physically active, and limit alcohol. The independent variables were baseline level of behavior-specific intention and four indicator coded variables representing the study groups. These variables were a combination of behavioral priority selection and study group. For example, using the model evaluating the effect of study group on intention to eat more fruits and vegetables: if participants had chosen fruits and vegetables as their first behavioral priority, received fruit and vegetable feedback, and were in the choice group, they received a value of one on the choice variable. This was true for all participants in the choice group. If participants had chosen fruit and vegetables as their behavioral priority, received fruit and vegetable feedback, and were in the expert group, they received a value of one on the expert, matched variable. If participants had chosen fruit and vegetable as their behavioral priority, received something other than fruit and vegetable feedback, and were in the expert group, they received a value of one on the expert, unmatched variable. If participants had chosen fruit and vegetables as their behavioral priority, received non-tailored feedback on reducing stress, and were in the comparison group, they received a value of one on the comparison

variable. For those not choosing fruit and vegetables as their first behavioral priority, a missing value on the indicator variables was assigned. These groups were formed in order to more specifically isolate the effect of study group on the dependent variables.

To compare differences in means between study groups, we used SAS procedure GLM to conduct multivariate linear regression to model the difference in intention by subtracting intention at baseline from intention at immediate follow-up as the dependent variable and entered the three indicator coded study groups as independent variables. The comparison group served as the referent group. We then tested contrasts between all study groups using t-test statistics (alpha was set at 0.05). These procedures were then followed for the remaining dependent variables of self-efficacy, goal commitment, and goal difficulty. For frequency of positive, negative, and neutral thought listings, indicator variables were created according to the four study groups but not separated by health behavior because this dependent variable was not a guideline-specific measure.

VI.D. RESULTS

Participant characteristics.

As shown in Table 6.1, there were no statistically significant demographic differences reported between the study groups, indicating randomization was successful. Table 1 also shows participants most frequently chose physical activity as their first behavioral priority (range: 52.9% – 59.4%). Fruits and vegetables and low-calorie/low-fat foods were the next most often chosen priorities. Whole grains, red meat, and alcohol were chosen by very few participants as a first priority (range: 0 to 5 participants). However, fruits and vegetables were the most frequently chosen second behavioral priority (range: 33.9% - 38.8%). Table 6.2 presents stage of change for the health topics. Whereas maintenance was the most

frequently reported stage for whole grains, red meat, low-calorie/low-fat foods, and alcohol,

contemplation and preparation were the most frequently reported stages for fruit and

vegetables and for physical activity. Baseline levels of behavior corresponding to the six

health topics are presented in Table 6.3. On average, participants most closely met

recommended guidelines for red meat, physical activity, and alcohol.

Effects on immediate outcomes.

Because of very low numbers of participants choosing certain priorities, the means

and estimates provided for the whole grain, red meat, and alcohol health topics are less

reliable than results provided for fruit and vegetables, low-cal/low-fat foods, and physical

activity. Therefore, analyses focused on the latter three topics.

As shown in Table 6.4, there were no statistically significant differences in intentions

between baseline and immediate follow-up across study groups for any health topic.

However, the change from baseline to immediate follow-up in intention to eat fruits and

vegetables and do more physical activity was highest among participants in the expert,

matched group (0.75 and 0.18, respectively on a 5-point scale). Results for self-efficacy are

shown in Table 6.5. There was a statistically significant increase of 0.68 (on a 4-point scale)

for fruit and vegetable intake in self-efficacy from baseline to immediate follow-up among

participants in the choice group compared to those in the comparison group who increased

0.05 and those in the expert, unmatched group who did not change ($p \leq 0.05$). Also, the

change in self-efficacy from immediate to baseline was -1.0 for eating low-cal/low-fat foods

among participants in the expert, matched group compared to no change in the choice group,

a -0.27 change in the expert, unmatched group, and a 0.11 increase in the comparison group.

For physical activity, the largest increase (0.28) in self-efficacy from baseline to follow-up was reported for the expert, matched group.

The majority of participants who started the immediate follow-up survey recorded at least one item during the thought listing exercise (n=331/340, or 97.3%). Results for differences in frequency of recording positive, negative, or neutral thoughts across study groups are reported in Table 6.6. Although not statistically significant, the largest number of positive thoughts (an average of 1.61 per person) were recorded among participants in the expert, matched group and the largest number of negative thoughts (an average of 0.92 per person) were recorded among participants in the expert, unmatched group. The most neutral thoughts (an average of 0.92 per person) were also recorded by participants in the expert, unmatched group and this was statistically significant when compared to the number of neutral thoughts recorded by members of the choice group (0.61) ($p \leq 0.05$).

Results for goal commitment are shown in Table 6.7. Although not statistically significant, the largest increases in goal commitment (measured on a 5-point scale) for fruit and vegetable intake were reported among those in the choice group (0.44 increase) and the expert, matched group (0.40 increase). However, this increase was statistically significant for physical activity, in which participants in the expert, matched group reported an increase of 0.29 compared to an increase of 0.10 in the choice group and 0.02 in the comparison group. Goal commitment to eat low-calorie low-fat foods from baseline to immediate follow-up decreased among all study groups. Results for goal difficulty are shown in Table 6.8. For fruit and vegetables, participants in the choice group reported the largest increase (0.56) in the goal difficulty scale (measured on a 5-point scale), which indicates they perceived the goal of eating 5 or more fruits and vegetables became easier at immediate

follow-up. Participants in all four study groups also reported increases in the goal difficulty scale, which indicates the goal of eating mostly low-fat/low-calorie foods became easier at immediate follow-up. For physical activity, there was a statistically significant increase (0.51) in the goal difficulty scale among participants in the expert, matched group compared to participants in the comparison group (0.03) ($p \leq 0.05$), indicating the goal of being physically active became easier at immediate follow-up for those in the expert, matched group.

VI.E. DISCUSSION

Overall, support for tailoring to a participant's behavioral priority was found for two health topics, eating more fruits and vegetables and being more physically active. However, equally strong or stronger support was found among participants randomized to the expert group, but only among participants who received a message matched to their behavioral priority. Thus, the expert, matched group essentially simulated the choice group, except that these participants also benefited from having their tailored feedback framed as something experts in the field of health promotion recommend they "*should work on to help…prevent chronic disease like cancer most effectively.*" Therefore, with regard to participant-selected priorities, the most effective tailored message may be the one in which the match between a participant's behavioral priority and expert advice regarding what they should be working on is stated explicitly. When this match is not possible, the results of this study suggest tailoring the message to the participant's behavioral priority would be a better option than tailoring the message to an expert's recommendation.

Potentially deleterious effects of giving expert, unmatched messages is supported by the high number of neutral thoughts reported by participants in the expert, unmatched group

compared to the other three study groups. According to the Elaboration Likelihood Model, negative thoughts are consistent with a perception of low message quality (Petty & Cacioppo, 1986). This can in turn decrease the effect on attitude change and persuasion among participants in the expert, unmatched group. The Elaboration Likelihood Model also proposes that when an individual encounters a message mismatched to their established position, the individual tends to defend his or her established position. When encountering a message matched to their established position, the individual tends to have more favorable thoughts about the message. These relationships support our results in terms of the choice and expert, matched study groups (message matched to established position) and the expert, unmatched study group (message mismatched to established position). Finally, the Elaboration Likelihood Model also suggests these relationships may be stronger among those with a large amount of subject knowledge. However, this can not be specifically evaluated because knowledge was not measured in this study.

These results were not consistent for the health topic of eating low-calorie low-fat foods where, in several cases, psychosocial and goal commitment variables worsened for those in the choice or expert, matched group. It is possible that because eating low-calorie low-fat foods was also tied to maintaining a healthful weight, study outcomes were influenced by participants' perceptions of the difficulty to not only eat low-calorie/low-fat foods but also to lose weight. This may have led to increased anxiety among these participants. In future research, health priority choices and messages for participants should attempt to separate these health topics.

Study limitations include the inability to draw conclusions on immediate outcomes from three of the health topics, which were whole grains, red meat, and alcohol intake. This

was due to less interest (as reflected by few participants choosing these as their first behavioral priority) in those topics. A second limitation is the small intervention dose of a one-time message. Although some early studies have shown positive effects from exposure to one tailored message (Campbell et al., 1994; Skinner et al., 1994), more recent tailoring research uses multiple tailored messages in the context of other intervention activities (Emmons, McBride, et al., 2005; Heimendinger et al., 2005). A third limitation is the lack of precision in measuring dietary intake with food frequency questionnaires (Willett, 1998). However, the primary outcomes were not behavior change in the current study. In this study, we provided graphical feedback split into three adherence levels: 'guideline not met', 'on the right track' and 'meeting guideline.' However, defining these specific levels was difficult because the guidelines were not specific enough, changed, or were not possible to calculate from our dietary measure. As two examples, there is not a specific recommendation regarding how much red meat is acceptable and the fruit and vegetable daily recommendation has increased from five to approximately 9 to 12 servings. The adherence levels used were based on the expert knowledge of this research team and what was practical given our brief dietary measure chosen to lessen participant burden. For our purposes, diet and physical activity data just needed to be ranked, which is a less demanding task for a brief food frequency questionnaire than determining accurate behavioral performance. As long as the information is relevant and believable to participants, we would expect the tailoring to be accurate. Nevertheless, if the ranking of behavior levels was extremely poor, participants may have paid less attention to the feedback and overall message they received, thereby limiting the accuracy of our tailoring. Finally, this sample had limited racial and ethnic

diversity. It is possible that cultural differences in response to choice and expert-based tailoring may exist between different race and ethnic groups.

Although this study consisted of physical activity and six diet-related health topics, future research directly investigating the effect of participant-selected priorities should explore other health topics in addition to diet and physical activity such as smoking and cancer screening. This could maximize the messages' cancer prevention effect. In addition, future research should investigate if the importance of having the option of selecting a behavioral priority differs according to gender, age, or race/ethnicity. In this way, not only the effectiveness but also the efficiency of tailoring will ultimately improve as we gain more knowledge about which components of tailoring are necessary for different populations. This will ultimately aid in disseminating tailored messages on a population-wide basis either as a stand-alone intervention or as one component of a multi-component effort to improve behaviors for cancer prevention.

Table 6.1. Participant characteristics

	Choice group (n=143)		Expert group (n=133)		Control group (n=132)		
	Frequency	%	Frequency	%	Frequency	%	p
Age, years							0.58
18-21	67	46.9	73	54.9	70	53.0	
22-29	57	39.9	46	34.6	43	32.6	
30 or older	19	13.3	14	10.5	19	14.4	
Total missing = 0							
Ethnicity, Hispanic/Latina[1]							0.31
Yes	3	2.4	5	4.1	8	7.0	
No	119	96.7	114	94.2	107	93.0	
Don't know/not sure	1	0.8	2	1.7	0	0	
Total missing = 49							
Race							0.10
Non-Hispanic White	100	81.3	78	64.5	87	75.7	
Non-Hispanic Black	6	4.9	12	9.9	11	9.6	
Asian	11	8.9	15	12.4	7	6.1	
Multi-racial	3	2.4	7	5.8	3	2.6	
Other	3	2.4	9	7.4	7	6.1	
Total missing = 50							
Education							0.75
Some high school	13	10.6	15	12.4	13	11.3	
Completed high school/GED	58	47.1	65	53.7	60	52.2	
Some college	52	42.3	41	33.9	42	36.5	
Total missing = 49							
Marital status[1]							0.15
Married	27	21.9	13	10.7	18	15.7	
Never married	66	53.7	85	70.3	71	61.7	
Unmarried couple	26	21.1	18	14.9	23	20.0	
Divorced/separated	4	3.3	5	4.1	3	2.6	
Total missing = 49							
Number of children							0.78
0	98	79.7	95	78.5	97	84.3	
1	10	8.1	14	11.6	10	8.7	
2	7	5.7	7	5.8	4	3.5	
3 or more	8	6.5	5	4.1	4	3.5	
Total missing = 49							
Residence							0.83
On-campus	33	26.8	31	25.6	27	23.5	
Off-campus or other	90	73.2	90	74.4	88	76.5	
Total missing = 49							

First behavioral priority[1]							0.55
Fruits & vegetables	27	21.9	22	18.2	23	20.0	
Whole grains	1	0.81	3	2.5	2	1.7	
Limit red meat	1	0.81	0	0	2	1.7	
Low-calorie/low-fat foods	28	22.8	19	15.7	19	16.5	
Physical activity	65	52.9	72	59.5	66	57.4	
Limit alcohol	1	0.81	5	4.1	3	2.6	
Total missing = 49							
Second behavioral priority[1]							0.94
Fruits & vegetables	45	36.6	47	38.8	39	33.9	
Whole grains	10	8.1	7	5.8	11	9.6	
Limit red meat	6	4.9	3	2.5	4	3.5	
Low-calorie/low-fat foods	31	25.2	31	25.6	31	27.0	
Physical activity	28	22.8	32	26.5	27	23.5	
Limit alcohol	3	2.4	1	0.83	3	2.6	
Total missing = 49							

[1]One or more cells have expected counts less than 5; chi sq may not be a valid test.

Table 6.2. Stage of change

	Choice group (n=143)		Expert group (n=133)		Control group (n=132)		
	Frequency	%	Frequency	%	Frequency	%	p
Stage of change							0.15
Fruits & vegetables							
Precontemplation	9	6.6	10	7.9	5	3.9	
Contemplation	52	38.2	59	46.5	58	48.0	
Preparation	30	22.1	13	10.2	13	11.8	
Action	6	4.4	9	7.1	5	3.9	
Maintenance	39	28.7	36	28.3	41	32.3	
Total missing = 21							
Whole grains							0.82
Precontemplation	15	11.5	20	16.3	21	16.7	
Contemplation	16	12.3	18	14.6	19	15.1	
Preparation	12	9.2	7	5.7	13	10.3	
Action	11	8.5	9	7.3	9	7.1	
Maintenance	76	58.5	69	56.1	64	50.8	
Total missing = 32							
Limit red meat							0.57
Precontemplation	12	9.7	13	11.3	16	13.3	
Contemplation	11	8.9	10	8.7	9	7.5	
Preparation	7	5.7	9	7.8	4	3.3	
Action	5	4.0	5	4.3	11	9.2	
Maintenance	89	71.8	78	67.8	80	66.7	
Total missing = 52							
Low-calorie/low-fat foods							0.95
Precontemplation	7	5.4	4	3.3	6	5.0	
Contemplation	18	13.9	18	14.9	16	13.3	
Preparation	26	20.2	18	14.9	25	20.8	
Action	8	6.2	7	5.8	7	5.8	
Maintenance	70	54.3	74	61.2	66	55.0	
Total missing = 41							
Physical activity							0.54
Precontemplation	1	0.8	3	2.5	2	1.7	
Contemplation	33	26.2	42	34.7	32	26.7	
Preparation	42	33.3	44	36.4	46	38.3	
Action	10	7.9	8	6.6	9	7.5	
Maintenance	40	31.7	24	19.8	31	25.8	
Total missing = 44							
Limit alcohol							0.85
Precontemplation	16	12.7	21	17.7	17	14.4	
Contemplation	5	4.0	4	3.4	8	6.8	
Preparation	4	3.2	4	3.4	4	3.4	
Action	11	8.7	7	5.9	6	5.1	
Maintenance	90	71.4	83	69.7	83	70.3	
Total missing = 48							

Table 6.3. Baseline behavior levels

	Choice group (n=143)		Expert group (n=133)		Control group (n=135)		
	Mean	SD	Mean	SD	Mean	SD	p
Fruits & vegetables, serv/day	2.1	1.5	2.1	1.4	1.9	1.3	0.38
Total missing = 4							
Whole grains, serv/day	0.83	0.81	0.77	0.74	0.69	0.66	0.31
Total missing = 14							
Red meat, serv/day	0.40	0.56	0.42	0.41	0.42	0.54	0.92
Total missing = 17							
High-cal/high-fat foods, serv/day	2.2	1.8	2.5	2.0	2.4	1.8	0.31
Total missing = 15							
Physical activity, min per day	56.6	52.3	61.4	84.4	63.4	67.2	0.71
Total missing = 19							
Alcohol, serv/day	0.51	0.85	0.51	1.1	0.47	0.73	0.93
Total missing = 14							

Table 6.4. Behavioral intention for the four study groups at baseline and immediate time points

Study groups	Eat 5 or more servings fruit and vegetables		Choose whole grains more often than processed		Limit consumption of high fat & processed red meats		Choose foods to maintain a healthful weight		Exercise 30 minutes or more at least 5 times per week		Limit consumption of alcohol to one drink or less per day	
	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.
Baseline[2]												
Choice	3.66	0.75	5.00^3	--	3.50^3	--	4.54	0.50	3.90	0.92	4.50^3	--
Expert, matched	3.50	0.71	5.00^3	--	$--^4$	--	3.50	0	3.57	1.09	2.50^3	--
Expert, unmatched	3.25	0.75	4.50	0.71	$--^4$	--	4.40	0.66	4.28	1.00	3.63	1.11
Control	3.87	1.05	3.50	0.71	4.00	1.41	4.64	0.59	4.03	0.94	5.00	0
Immediate[2]												
Choice	4.06	0.71	4.50^3	--	3.50^3	--	4.56	0.56	3.99	0.87	4.50^3	--
Expert, matched	4.25	0.87	5.00^3	--	$--^4$	--	3.50	0	3.75	1.10	3.00^3	--
Expert, unmatched	3.86	0.76	5.00	0	$--^4$	--	4.37	0.58	4.28	0.94	3.00	1.63
Control	4.08	0.87	3.00	0	4.00	1.41	4.67	0.51	4.03	0.87	5.00	0
p-value for contrasts of differences between study groups												
Choice vs. E, M	0.43		0.37		$--^4$		0.95		0.46		0.61	
Choice vs. E, U	0.41		0.62		$--^4$		0.69		0.71		0.44	
Choice vs. control	0.45		1.00		$--^4$		0.95		0.52		1.00	
E, M vs. E, U	0.76		0.62		$--^4$		0.91		0.46		0.20	
E, M vs. control	0.23		0.62		$--^4$		0.93		0.18		0.56	
E, U vs. control	0.14		0.29		$--^4$		0.67		0.97		0.33	

[2]Adjusted means of two questions measured from 1 (low intention) to 5 (high intention)

[3]S.D. based on only one individual so no S.D. calculated

[4]No participants in this group so unable to conduct analyses

Table 6.5. Self-efficacy for the four study groups at baseline and immediate time points

	Eat 5 or more servings fruit and vegetables		Choose whole grains more often than processed		Limit consumption of high fat & processed red meats		Choose foods to maintain a healthful weight		Exercise 30 minutes or more at least 5 times per week		Limit consumption of alcohol to one drink or less per day	
	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.
Baseline[5]												
Choice	2.36	0.76	4.00[6]	--	1.00[6]	--	3.36	0.70	2.81	0.87	3.00[6]	--
Expert, matched	3.00	0.82	3.00[6]	--	--[7]	--	3.00	0	2.47	0.92	2.00[6]	--
Expert, unmatched	2.61	0.92	3.50	0.71	--[7]	§	3.20	0.68	3.44	0.53	2.75	1.50
Control	2.95	0.85	3.50	0.71	4.00	0	3.50	0.86	3.03	0.84	4.00	0
Immediate[5]												
Choice	3.04[8]	0.54	3.00[6]	--	2.00[6]	--	3.36[8]	0.70	2.89	0.81	3.00[6]	--
Expert, matched	3.00	0.82	4.00[6]	--	--[7]	--	2.00[9]	1.41	2.75[8]	0.91	2.00[6]	--
Expert, unmatched	2.61[9]	0.98	4.00	0	--[7]	--	2.93[8]	0.80	3.33	0.71	2.50	1.29
Control	3.00[9]	0.82	3.00	0	3.00	1.41	3.55[8]	0.61	3.03[9]	0.82	4.00	0

p-value for contrasts of differences between study groups

	Eat 5 or more servings fruit and vegetables	Choose whole grains more often than processed	Limit consumption of high fat & processed red meats	Choose foods to maintain a healthful weight	Exercise 30 minutes or more at least 5 times per week	Limit consumption of alcohol to one drink or less per day
Choice vs. E, M	0.08	0.18	--[7]	< 0.01	0.15	1.00
Choice vs. E, U	< 0.01	0.23	--[7]	0.11	0.45	0.63
Choice vs. control	< 0.01	0.62	0.45	0.72	0.54	1.00
E, M vs. E, U	1.00	0.62	--[7]	0.05	0.14	0.63
E, M vs. control	0.89	0.23	--[7]	< 0.01	0.05	1.00
E, U vs. control	0.82	0.29	--[7]	0.07	0.67	0.54

[5]Adjusted mean from one question measured from 1 (low self-efficacy) to 4 (high self-efficacy)

[6]S.D. based on only one individual so no S.D. calculated

[7]No participants in this group so unable to conduct analyses

[8,9]Change in self efficacy (immediate follow-up – baseline) for each study group is statistically different than change in self efficacy for study groups with a different superscript at $p \leq 0.05$.

Table 6.6. Frequency of positive, negative, and neutral thought listings

	Number self-rated positive thoughts		Number self-rated negative thoughts		Number self-rated neutral thoughts	
	M	S.D.	M	S.D.	M	S.D.
Immediate						
Choice	1.29	1.21	0.71	1.00	0.61[10]	0.97
Expert, matched	1.61	1.38	0.77	0.93	0.79	0.94
Expert, unmatched	1.42	1.21	0.92	1.14	0.92[11]	0.97
Control	1.34	1.41	0.80	1.23	0.70	0.93
p-value for contrasts of differences between study groups						
Choice vs. E, M	0.10		0.70		0.21	
Choice vs. E, U	0.56		0.25		0.05	
Choice vs. control	0.73		0.49		0.48	
E, M vs. E, U	0.44		0.47		0.45	
E, M vs. control	0.18		0.86		0.51	
E, U vs. control	0.74		0.52		0.16	

[10, 11]Change in frequency of thoughts at immediate follow-up is statistically different than change in frequency of thoughts for study groups with a different superscript at $p \le 0.05$.

Table 6.7. Goal commitment for the four study groups at baseline and immediate time points

	Eat 5 or more servings fruit and vegetables		Choose whole grains more often than processed		Limit consumption of high fat & processed red meats		Choose foods to maintain a healthful weight		Exercise 30 minutes or more at least 5 times per week		Limit consumption of alcohol to one drink or less per day	
	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.
Baseline[12]												
Choice	3.83	0.71	5.00[13]	--	3.80[13]	--	4.56	0.53	4.01	0.69	4.60[13]	--
Expert, matched	3.75	0.81	4.40[13]	--	--[14]	--	4.20	0	3.73	0.92	2.80[13]	--
Expert, unmatched	3.72	0.64	4.70	0.42	--[14]	--	4.53	0.44	4.15	0.72	4.15	0.53
Control	4.02	0.79	4.10	0.71	4.00	1.41	4.54	0.51	4.33	0.60	4.40	0.28
Immediate[12]												
Choice	4.27	0.52	4.80[15]	--[13]	4.20[13]	--	4.50	0.53	4.11[15]	0.75	4.60[13]	--
Expert, matched	4.15	0.70	4.80[16]	--[13]	--[14]	--	4.10	0.99	4.02[16]	0.89	3.20[13]	--
Expert, unmatched	3.90	0.55	4.70[17]	0.42	--[14]	--	4.44	0.60	4.15	0.95	3.85	1.12
Control	4.29	0.71	4.10[18]	0.71	3.20	1.41	4.44	0.73	4.35[15]	0.58	4.60	0.57
p-value for contrasts of differences between study groups												
Choice vs. E, M	0.88		<0.01		--[14]		0.91		0.04		0.79	
Choice vs. E, U	0.09		<0.01		--[14]		0.83		0.60		0.80	
Choice vs. control	0.27		<0.01		< 0.01		0.79		0.42		0.88	
E, M vs. E, U	0.41		<0.01		--[14]		0.99		0.12		0.57	
E, M vs. control	0.64		<0.01		--[14]		1.00		0.01		0.88	
E, U vs. control	0.55		<0.01		--[14]		0.97		0.91		0.60	

[12] Adjusted means of five questions measured from 1 (low commitment) to 5 (high commitment)

[13] S.D. based on only one individual so no S.D. calculated

[14]No participants in this group so unable to conduct analyses

[15, 16, 17, 18]Change in commitment (immediate follow-up – baseline) for each study group is statistically different than change in commitment for study groups with a different superscript at $p \leq 0.05$.

Table 6.8. Goal difficulty for the four study groups at baseline and immediate time points

	Eat 5 or more servings fruit and vegetables		Choose whole grains more often than processed		Limit consumption of high fat & processed red meats		Choose foods to maintain a healthful weight		Exercise 30 minutes or more at least 5 times per week		Limit consumption of alcohol to one drink or less per day	
	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.
Baseline[19]												
Choice	2.76	0.88	2.00[20]	--	1.00[20]	--	3.04	1.34	2.36	1.02	2.00[20]	--
Expert, matched	2.25	0.50	2.00[20]	--	--[21]	--	1.00	0	1.98	1.11	4.00[20]	--
Expert, unmatched	2.72	1.13	4.50	0.71	--[21]	--	2.13	0.91	3.22	1.09	2.50	1.29
Control	3.10	1.20	4.00	1.41	4.00	1.41	2.89	1.60	2.74	1.16	4.50	0.71
Immediate[19]												
Choice	3.32	0.95	4.00[22]	--[20]	1.00	†	3.20	1.26	2.54	1.16	3.00[20]	--
Expert, matched	2.00	0	3.00	--[20]	--[21]	--	1.50	0.71	2.49[22]	1.23	4.00[20]	--
Expert, unmatched	2.94	0.80	4.50	0.71	--[21]	--	2.27	0.80	3.22	1.09	2.00	0.82
Control	3.68	1.00	3.50[23]	2.12	4.00	0	3.28	1.36	2.77[23]	1.18	5.00	0
p-value for contrasts of differences between study groups												
Choice vs. E, M	0.08		0.30		--[21]		0.62		0.06		0.49	
Choice vs. E, U	0.20		0.08		--[21]		0.93		0.59		0.22	
Choice vs. control	0.94		0.05		1.00		0.43		0.40		0.69	
E, M vs. E, U	0.32		0.24		--[21]		0.60		0.13		0.66	
E, M vs. control	0.08		0.13		--[21]		0.87		0.01		0.69	
E, U vs. control	0.21		0.42		--[21]		0.43		0.92		0.28	

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[19]Adjusted mean of one question measured from 1 (very difficult) to 5 (not at all difficult)

[20]S.D. based on only one individual so no S.D. calculated

[21]No participants in this group so unable to conduct analyses

[22, 23]Change in difficulty (immediate follow-up – baseline) for each study group is statistically different than change in difficulty for study groups with a different superscript at $p \leq 0.05$.

Figure 6.1. Conceptual model

| Health behavior theories underlying tailored messages | Message groups | Processing variables | Outcome variables | Hypothetical outcomes |

Trans-theoretical Model
• Stage of change

Social Cognitive Theory
• Self-control
• Observational learning
• Self-efficacy

Health Belief Model
• Barriers

Theory of Reasoned Action
• Attitudes

Choice group
Message tailored to two participant-selected behavioral priorities

Expert group
Message tailored to two expert-based behaviors

Comparison group
Non-tailored message focused on stress reduction

Degree of elaboration
• Quanitative scale

Degree of message quality
• Thought listing of positive, negative, and neutral thoughts

Psychosocial variables
• Guideline-specific intention
• Guideline-specific self-efficacy

Guideline-specific goal setting variables
• Goal commitment
• Goal difficulty

Improvement in guideline specific nutrition and physical activity outcomes

CHAPTER VII

SUMMARY AND RECOMMENDATIONS

VII.A. Summary of findings

Together, results from these three lines of research provide detailed information about the practice of tailoring to participant-selected behavioral priorities. This dissertation research draws from the strengths of three different data sources: in-depth qualitative data, secondary analyses of data from two large-scale interventions, and an original data collection. Through these data, this dissertation contributes to the understanding of tailored health communications for multiple behaviors in the context of cancer prevention among women in several ways: (1) by providing further support for receiving a tailored message as compared to not receiving a tailored message; (2) by reviewing the research and theoretical rationale for tailoring to participant-selected behaviors; and (3) by identifying two different methods (i.e. directly as a tailoring variable or within a feedback graphic) to incorporate participant-selected behaviors into tailored message design.

In the first line of research, as presented in chapter four, focus groups provided an in-depth look into how tailored message graphics can be adapted to coincide with individuals' perceptions of the multiple behaviors that relate to a healthy diet. A pile sort was used to identify these healthy behaviors; the behaviors were then grouped into consistent categories across participants. Using data from the pile sort, we observed good consistency for two groups of behaviors outside of the realm of healthy foods and exercise, namely lifestyle-

related behaviors and behaviors relating to how you eat. In addition, we developed and pre-tested four examples of graphics depicting adherence to multiple behaviors. In summary, we presented the pile sort approach as a method to incorporate meaningful groups of participant-selected health behaviors into a tailored message graphic. By potentially increasing the appeal, understandability, and relevance of a tailored graphic, individuals may become more engaged in the content of tailored message, thus facilitating change for the targeted healthful behaviors.

In the second line of research, presented in chapter five, we created subsets of data from two large, intervention trials conducted among blue collar women in eastern North Carolina. We investigated whether the act of choosing a particular behavioral priority resulted in changes in the related behavior among those women who received a tailored message. While promising trends were found, no statistically significant relationships were reported. We also investigated if receiving a message tailored to a participants' behavioral priority resulted in changes in the related behavior compared to women who did not receive a tailored message. For this question, we found substantial increases for choosing the healthy eating behavioral priority and fruit and vegetable intake. This study provides empirical support for the practice of tailoring to behavioral priority in message for nutrition and physical activity in the context of cancer prevention.

In the third line of research, presented in chapter 6, we developed and implemented a randomized trial in order to directly test the effects of tailoring to participant-selected health priorities and expert-based health behaviors. Because the purpose was not to assess behavioral change, we measured several variables such as intention, self-efficacy, goal commitment, and goal difficulty to provide information about the interventions'

effectiveness. Results indicated tailoring to a participant-selected behavioral priority was effective; however, stronger support was found on some outcome variables for tailoring to an expert-based behavior which happened to match the participants' behavioral priority. This trial represents one of the first direct evaluations of tailoring to a participant-selected behavioral priority and provides an intriguing argument for incorporating this variable into future tailored messages.

Another finding from this dissertation research is worth noting. First, data collection for the randomized trial consisted of 120 questions at baseline and 80 questions at immediate follow-up. While specific data was not collected as to how long participants' spent completing the surveys, 340 out of 408 (83%) participants completed at least part of the immediate follow-up survey. Even though the response rate is adequate, finding methods to decrease the number of questions asked in studies of multiple behaviors is needed. One method is intermittent data collection where participants are only asked questions about the behaviors being tailored on in that particular message, withholding additional questions until the next tailored message is created. Or, in contrast to our trial in which all participants answered all of the questions even for behaviors on which they did not receive a message, Internet-based studies could be programmed to bring up only the questions needed to tailor the current participant's message.

VII.B. Recommendations

Overall, this dissertation research leads to two recommendations:

(1) When planning formative research for a multiple behavior intervention study using tailored feedback, researchers should consider conducting a pile sort asking participants to list and then group components relevant to the targeted health condition. For health

conditions such as cancer, cardiovascular disease, and diabetes, this type of pile sort information could then be used to modify the graphical presentation and content of feedback on adherence to recommended guidelines. In this way, a graphic would reflect components identified by the participants as important and how participants are already thinking about the interaction of multiple behaviors on specific disease risk.

(2) In studies among women, tailored feedback on a participant-selected health behavior should be added as one of many demographic, psychosocial, and behavioral variables used to create a message. When appropriate and feasible in multiple behavior interventions, researchers should also determine which behavior might be of greatest importance for each participant in order to capitalize on instances in which the participant-selected behavioral priority and the expert-based behavior match. Then, in interventions presenting feedback on multiple behaviors, researchers could first consider tailoring to this matched behavior (both the priority and the expert-based behavior), and when this match is not possible, consider tailoring to the participant-selected behavioral priority and avoid expert-advice that is not matched to the participants' priority or interest.

VII.C. Future research needs

While contributing information to several topic areas, this dissertation also leads to future avenues of research:

(1) A graphic tailored to participant-selected behaviors and groups of behaviors should be compared against a traditional graphic tailored to only expert-based behaviors without any groupings of behaviors. Measures of appeal, understanding, and elaboration should be taken. If this evaluation yields positive results for the participant-selected graphic, the

next research step would be to incorporate this graphic into a tailored message and test it against a tailored message with the expert-based graphic. Effects of behavior could then be measured.

(2) Similar to the randomized trial conducted in the third line of research, another trial should be conducted replicating the direct comparison of tailoring to participant-selected behavioral priorities versus expert-based behaviors but over a longer time period. This new trial should measure the effect of this type of tailoring on long-term behavior changes among a diverse sample. To accomplish this goal, this trial should use multiple tailored messages. A secondary analysis should also be conducted to determine if positive effects of tailoring to participant-selected topics are more prevalent among certain subgroups in terms of gender, education, or race/ethnicity.

(3) Further research could be conducted to provide empirical evidence to establish the process of 'behavioral gateways.' That is, if accomplishing a certain behavior, even if it does not have a strong relationship to the targeted disease, leads to increased confidence and likelihood of accomplishing another, potentially more difficult behavior changes. This evidence would help clarify the long-term implications of tailoring to participant-selected behavioral priorities.

APPENDIX A. FOCUS ON YOUR HEALTH SCREEN SHOTS

8%

percent complete

For the next questions, please answer by filling in the blanks or clicking on the box next to the answer that comes closest to describing you.

21. A drink of alcohol is 1 can or bottle of beer, 1 glass of wine, 1 can or bottle of wine cooler, 1 cocktail, or 1 shot of liquor. During the past 30 days, how many days per week or per month did you have at least one drink of any alcoholic beverage?

☐ Days in past 30

☐ No drinks in past 30 days

22. On the days when you drank, about how many drinks did you drink on average?

☐ Number of drinks

46%

percent complete

guideline: eat 5 or more servings of fruits & vegetables each day

guideline met — 5+

on the right track — 2–4.9

you

below guideline — 0–1.9

goal
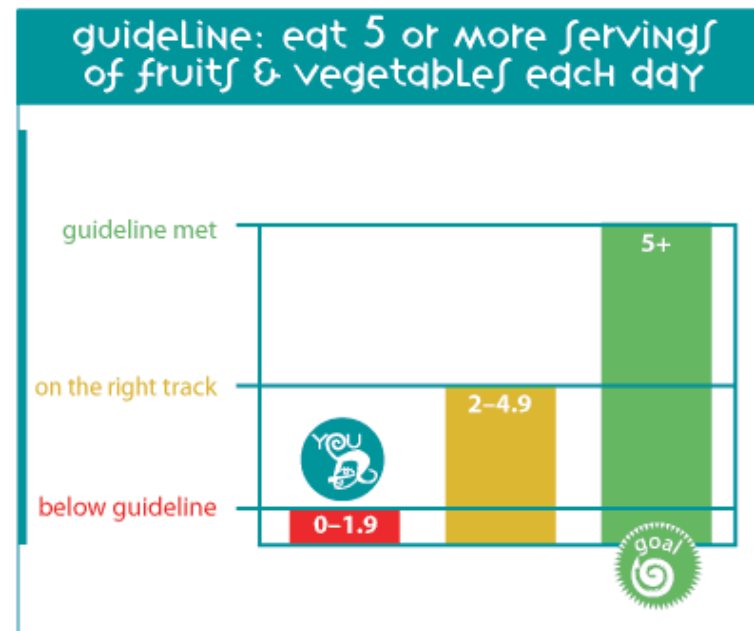
Based on the information you told us about your eating habits, you are currently eating 2 or fewer servings of fruits and vegetables combined each day. This is below the recommended guideline of eating 5 or more servings per day. Read on for information and tips to help you fit more fruits and vegetables into your day!

116

Next

65%

percent complete

Thought Listing

1. In the spaces below, list all of the thoughts, feelings, and ideas that you had about all the information you just read. Write the first thought that comes to mind in the first box, the second thought in the second box, and so forth. You might have had positive, negative, or neutral thoughts, feelings and ideas about the information. All are fine. Short phrases and statements are fine, too.

You do not have to fill every box. Remember, put only one thought, feeling or idea in each box.

Thoughts, Feelings, and Ideas: Rating:

○ Positive
○ Negative
○ Neutral

○ Positive
○ Negative
○ Neutral

FOCUS ON YOUR HEALTH BASELINE SURVEY

Instructions
The next questions are about the foods you eat. For each question, click on the circle next to the answer that indicates how often **on average** you have eaten the items **during the past year**. Remember to include things you cook with. These questions are not intended to assess your total diet; you may not find all the foods you eat listed.

As before, the following questions refer to your **usual** food intake **during the past year.**

1. Dark Green Leafy Vegetables (spinach, romaine lettuce, kale, turnip greens, bok choy)
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

2. Broccoli, Cauliflower, Cabbage, Brussel Sprouts
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

3. Carrots
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

4. Other Vegetables (e.g., peas, corn, green beans,
tomatoes, squash)
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

5. Citrus Fruits (e.g., orange juice or grapefruit
juice, oranges, grapefruit)
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

6. Other Fruits (e.g., fresh apples or pears, bananas, berries, grapes, melons)
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

7. Whole Milk Dairy Foods (whole milk, hard cheese, butter, ice cream)
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

8. Low-fat Milk Products (e.g., low-fat/skim milk, yogurt, cottage cheese)
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

9. Whole eggs
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

10. Margarine (stick-type not tub)
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

11. Whole Grain Foods (e.g., whole grain breads,
brown rice)
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

12. Pasta, Rice, Noodles
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

13. Baked Products (donuts, cookies,
muffins, crackers, cakes, sweet rolls, pastries)
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

14. Beef, Pork or Lamb as Main Dish
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

15. Processed Meats (sausages, salami,
bologna, hot dogs, bacon)
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

16. Fish/Seafood (not fried, but broiled,
baked, poached, canned)
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

17. Deep Fried Foods (deep fried chicken,
fish or seafood; French fries, onion rings)
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

18. How often do you add salt to food at
the table?
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

19. Regular soda, fruit drink/punch, or Kool-
Aid
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

20. Regular potato chips, popcorn with
butter, nacho chips, or corn chips?
Less than once per week
Once per week
2-4 times per week
Nearly daily or daily
Twice or more per day

For the next questions, please answer by filling in the blanks or clicking on the circle next to the answer that comes closest to describing you.

21. A drink of alcohol is 1 can or bottle of beer, 1 glass of wine, 1 can or bottle of wine cooler, 1 cocktail, or 1 shot of liquor. During the past 30 days, how many days per week or per month did you have at least one drink of any alcoholic beverage?

__ __ Days in past 30
No drinks in past 30 days

22. On the days when you drank, about how many drinks did you drink on average?

__ __ Number of drinks

23. We are interested in two types of physical activity - vigorous and moderate. Vigorous activities cause large increases in breathing or heart rate while moderate activities cause small increases in breathing or heart rate.
Now, thinking about the activities you do when you are not working…In a usual week, do you do moderate activities for at least 10 minutes at a time, such as brisk walking, bicycling, vacuuming, gardening, or anything else that causes some increase in breathing or heart rate?

Yes
No (skip questions 24 and 25)

24. How many days per week do you do these moderate activities for at least 10 minutes at a time?
_ _ (enter a number between 1 and 7)
Do not do any moderate physical activity for at least 10 minutes at a time

25. On days when you do moderate activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities?
_:_ _ Hours and minutes per day

26. Now thinking about the vigorous activities you do when you are not working…In a usual week, do you do vigorous activities for at least 10 minutes at a time, such as running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate?

Yes
No (skip questions 27 and 28)

27. How many days per week do you do these vigorous activities for at least 10 minutes at a time?

__ __
Do not do any vigorous physical activity for at least 10 minutes at a time

28. On days when you do vigorous activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities?
_:_ _ Hours and minutes per day

For the next questions, one serving of fruits or vegetables is a small piece of fresh fruit, 1/2 cup of vegetables or fruit, or a small glass of juice.

29. Do you eat 5 or more servings of a variety of fruits and vegetables on most days?

Yes
No (skip question 30)

30. How long have you been eating 5 fruits and vegetables a day?

Less than 6 months (skip question 31)
6 months or longer (skip question 31)

31. Which one sentence describes you best?
(Please read all sentences before deciding which one described you best)

I am not thinking of starting to eat more fruits and vegetables
I am thinking about eating more fruits and vegetables
I am definitely planning to eat five fruits and vegetables a day starting in the next 30 days

32. How sure or unsure are you that you have the ability to succeed in eating five or more servings of a variety of fruits and vegetables a day for the next six months?

Very *un*sure
Kind of *un*sure
Kind of sure
Very sure

33. It would be hard to eat more fruits and vegetables than I do now because...
(Please choose two items)

I don't like how they taste and besides they don't satisfy my hunger as much as other foods
I don't have time to make fruits and vegetables
Fruits and vegetables cost too much, especially because they can spoil quickly
I eat out most of the time and can't find fruits and vegetables where I eat
I can't get fruits and vegetables at work or school

34. Do you intend to eat 5 or more servings of a variety of fruits and vegetables on most days in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

35. Are you likely to eat 5 or more servings of a variety of fruits and vegetables on most days in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

Thinking about a goal of eating *5 or more servings of a variety of fruits and vegetables* on most days...

36. It's hard to take this goal seriously (eating 5 or more fruits and vegetables a day).

1   2   3   4   5
strongly   strongly
disagree   agree

37. Quite frankly, I don't care if I achieve this goal or not (eating 5 or more fruits and vegetables a day).

1   2   3   4   5
strongly   strongly
disagree   agree

38. I am strongly committed to pursuing this goal (eating 5 or more fruits and vegetables a day).

1   2   3   4   5
strongly   strongly
disagree   agree

39. It wouldn't take much to make me abandon this goal (eating 5 or more fruits and vegetables a day).

1   2   3   4   5
strongly   strongly
disagree   agree

40. I think this is a good goal to shoot for (eating 5 or more fruits and vegetables a day).

```
1     2     3     4     5
strongly              strongly
disagree              agree
```

41. In your honest opinion, what is the level of difficulty of this goal (eating 5 or more fruits and vegetables a day)?

```
1     2     3     4     5
very                  not at all
difficult             difficult
```

Many grains come in two forms: **whole grains** like brown rice, whole wheat bread and pasta and cereals like mini-wheats and oatmeal; and **processed (refined) grains** including white bread, white rice, pastries, and sweetened cereals.

42. Are most of the grains you eat whole grain?

Yes
No (skip question 43)

43. How long have you been eating mostly whole grains?

Less than 6 months (skip question 44)
6 months or longer (skip question 44)

44. Which one sentence describes you best?
(Please read all sentences before deciding which one described you best)

I am not thinking of starting to eat more whole grains
I am thinking about eating more whole grains
I am definitely planning to eat more whole grains starting in the next 30 days

45. How sure or unsure are you that you have the ability to succeed in choosing whole grains more often than processed (refined) grains and sugars for the next six months?

Very *un*sure
Kind of *un*sure
Kind of sure
Very sure

46. It would be hard to eat more whole grains than I do now because...
(Please choose two items)

Whole grain products don't taste good; some things don't taste right on whole grain bread like hot dogs and garlic bread
My friends and family don't want to eat more whole grains
I am unfamiliar with them, I grew up eating other kinds of grains like white bread
Harder to digest (bloating)
Whole grain products cost more than other grains

47. Do you intend to choose whole grains more often than processed (refined) grains and sugars in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

48. Are you likely to choose whole grains more often than processed (refined) grains and sugars in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

Thinking about a goal of *choose whole grains more often than processed (refined) grains and sugars* on most days...

49. It's hard to take this goal seriously (choosing mostly whole grains).

1   2   3   4   5
strongly   strongly
disagree   agree

50. Quite frankly, I don't care if I achieve this goal or not (choosing mostly whole grains).

1   2   3   4   5
strongly   strongly
disagree   agree

51. I am strongly committed to pursuing this goal (choosing mostly whole grains).

1   2   3   4   5
strongly   strongly
disagree   agree

52. It wouldn't take much to make me abandon this goal (choosing mostly whole grains).

1   2   3   4   5
strongly   strongly
disagree   agree

53. I think this is a good goal to shoot for (choosing mostly whole grains).

1   2   3   4   5
strongly   strongly
disagree   agree

54. In your honest opinion, what is the level of difficulty of this goal (choosing mostly whole grains)?

1   2   3   4   5
very   not at all
difficult   difficult

The next questions are about the different types of meat that you eat. Please think of high fat & processed red meat (such as **beef, pork, and lamb**) as the following three types: (1) large portions of ribs, prime rib, and 95% or more fat ground hamburger; (2) processed meats like sausage, bacon, and hotdogs; and (3) meats that are fried or charred on the grill. Other types of meat are small portions of fish, chicken, or beans that are baked or broiled.

55. When you eat meat, do you usually eat other types of meat in place of high fat & processed red meats?

Yes
No (skip question 56)

56. How long have you been eating other types of meat in place of high fat & processed red meats?

Less than 6 months (skip question 57)
6 months or longer (skip question 57)

57. Which one sentence describes you best?
(Please read all sentences before deciding which one described you best)

I am not thinking of starting to eat other types of meat in place of high fat & processed red meats
I am thinking about eating other types of meat in place of high fat & processed red meats
I am definitely planning to eat other types of meat in place of high fat & processed red meats in the next thirty days

58. How sure or unsure are you that you have the ability to succeed in eating other types of meat in place of high fat & processed red meats in the next six months?

Very *un*sure
Kind of *un*sure
Kind of sure
Very sure

59. It would be hard to eat less high fat & processed red meat than I do now because...
(Please choose two items)

My friends and family don't want to eat low fat red meat or chicken, fish, or beans
Low fat red meat or chicken, fish, or beans don't as taste good
I really love to eat these kinds of red meats
I am not in the habit of eating low fat red meat or chicken, fish, or beans, it's part of our culture
I will be limiting my meal options and be bored if I eat low fat meat or chicken, fish, or beans

60. Do you intend to limit your consumption of high fat & processed red meats in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

61. Are you likely to limit your consumption of high fat & processed red meats in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

Thinking about a goal of *limiting your consumption of high fat & processed red meats*...

62. It's hard to take this goal seriously (limiting high fat & processed red meats).

1   2   3   4   5
strongly   strongly
disagree   agree

63. Quite frankly, I don't care if I achieve this goal or not (limiting high fat & processed red meats).

1   2   3   4   5
strongly   strongly
disagree   agree

64. I am strongly committed to pursuing this goal (limiting high fat & processed red meats).

1   2   3   4   5
strongly   strongly
disagree   agree

65. It wouldn't take much to make me abandon this goal (limiting high fat & processed red meats).

1   2   3   4   5
strongly   strongly
disagree   agree

66. I think this is a good goal to shoot for (limiting high fat & processed red meats).

1   2   3   4   5
strongly   strongly
disagree   agree

67. In your honest opinion, what is the level of difficulty of this goal (limiting high fat & processed red meats)?

1   2   3   4   5
very   not at all
difficult   difficult

There are different ways foods can help you maintain a healthful weight. You can substitute vegetables, fruits, and other low-calorie foods for calorie-dense foods such as French fries, cheeseburgers, pizza, ice cream, doughnuts, and other sweets. You can also eat smaller portions of these high-calorie foods.

68. Most of the time, do you choose foods that can help you maintain a healthful weight?

Yes
No (skip question 69)

69. How long have you chosen foods that can help you maintain a healthful weight?

Less than 6 months (skip question 70)
6 months or longer (skip question 70)

70. Which one sentence describes you best?
(Please read all sentences before deciding which one described you best)

I am not thinking of starting to choose foods for a healthful weight
I am thinking about choosing foods for a healthful weight
I am definitely planning to choose foods for a healthful weight

71. How sure or unsure are you that you have the ability to succeed in choosing foods that can help you maintain a healthful weight in the next six months?

Very *un*sure
Kind of *un*sure
Kind of sure
Very sure

72. It would be hard to eat more 'healthy foods' like vegetables, fruits, and other low-calorie foods and fewer 'junk foods' like French fries, cheeseburgers, pizza, ice cream, doughnuts, and other sweets because...
(Please choose two items)

My friends and family don't want to eat healthy foods
My friends and family serve unhealthy foods, and it's hard for me to say no
I have cravings for unhealthy foods
There is usually only unhealthy foods being served at school or work
I run out of time and it is hard for me to cook healthy foods when I get home; it's easier for me to pick up something at a restaurant

73. Do you intend to choose foods that can help you maintain a healthful weight in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

74. Are you likely to choose foods that can help you maintain a healthful weight in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

Thinking about a goal of ***choosing foods that can help you maintain a healthful weight***...

75. It's hard to take this goal seriously (choosing foods for a healthful weight).

1   2   3   4   5
strongly   strongly
disagree   agree

76. Quite frankly, I don't care if I achieve this goal or not (choosing foods for a healthful weight).

1   2   3   4   5
strongly   strongly
disagree   agree

77. I am strongly committed to pursuing this goal (choosing foods for a healthful weight).

1   2   3   4   5
strongly   strongly
disagree   agree

78. It wouldn't take much to make me abandon this goal (choosing foods for a healthful weight).

1   2   3   4   5
strongly   strongly
disagree   agree

79. I think this is a good goal to shoot for (choosing foods for a healthful weight).

1   2   3   4   5
strongly   strongly
disagree   agree

80. In your honest opinion, what is the level of difficulty of this goal (choosing foods for a healthful weight)?

1   2   3   4   5
very   not at all
difficult   difficult

For the next questions, *exercise* means any activity that causes you to get your heart rate up, breathe harder, or work up a sweat.

81. Which one of these sentences describes you best?
(Please read all sentences before deciding which one described you best)

I am not thinking about starting to exercise
I am thinking about starting to exercise
I am planning to exercise five times a week starting within the next thirty days
I have been exercising at least five times a week for less than six months
I have been exercising at least five times a week for six months or longer

82. How sure or unsure are you that you have the ability to succeed in exercising 30 minutes or more at least five times a week for the next six months?

Very **un**sure
Kind of **un**sure
Kind of sure
Very sure

83. It would be hard to exercise more than I do now because…
(Please choose two items)

I don't have the time to do more exercise
I don't have any place or anyone to exercise with
Sometimes I am too lazy or tired to exercise, I know I should take the stairs but I get on the elevator anyway
I have young children at home and no one to watch them when I exercise
My muscles hurt after I exercise

84. Do you intend to exercise 30 minutes or more at least five times a week in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

85. Are you likely to exercise 30 minutes or more at least five times a week in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

Thinking about a goal of *exercising 30 minutes or more* at least five times a week...

86. It's hard to take this goal seriously (exercising 30 minutes or more at least fives times a week) .

```
1     2     3     4     5
strongly            strongly
disagree            agree
```

87. Quite frankly, I don't care if I achieve this goal or not (exercising 30 minutes or more at least fives times a week).

```
1     2     3     4     5
strongly            strongly
disagree            agree
```

88. I am strongly committed to pursuing this goal (exercising 30 minutes or more at least fives times a week).

```
1     2     3     4     5
strongly            strongly
disagree            agree
```

89. It wouldn't take much to make me abandon this goal (exercising 30 minutes or more at least fives times a week).

```
1     2     3     4     5
strongly            strongly
disagree            agree
```

90. I think this is a good goal to shoot for (exercising 30 minutes or more at least fives times a week).

```
1     2     3     4     5
strongly            strongly
disagree            agree
```

91. In your honest opinion, what is the level of difficulty of this goal (exercising 30 minutes or more at least fives times a week)?

```
1     2     3     4     5
very                not at all
difficult           difficult
```

For the next questions, one drink of alcohol is one glass of wine, one bottle of beer, or a shot of hard liquor. Average out the amount of drinks you have in a week to estimate the amount of alcohol you have per day.

92. Do you limit your consumption of alcoholic beverages to one drink or less per day?

Yes
No (skip question 93)

93. How long have you been limiting consumption to one drink or less per day?

Less than 6 months (skip question 94)
6 months or longer (skip question 94)

94. Which one sentence describes you best?
(Please read all sentences before deciding which one described you best)

I am not thinking of limiting alcoholic beverages to one drink or less a day
I am thinking limiting alcoholic beverages a day
I am definitely planning to limit alcoholic beverages to one drink or less a day in the next thirty days

95. How sure or unsure are you that you have the ability to limit your consumption of alcoholic beverages to one drink per day for the next six months?

Very *un*sure
Kind of *un*sure
Kind of sure
Very sure
I do not drink alcoholic beverages

96. It would be hard to limit alcoholic beverages to 1 or fewer a day because...
(Please choose one items)

I like to drink when I am out at a bar or at a party
I have trouble just having one drink; having one usually leads to having another
I like to drink when eating dinner at home or at a restaurant with friends or family
I thought having a little alcohol each day was good for me
I like the feeling of getting drunk

97. Do you intend to limit your consumption of alcoholic beverages to one drink or less per day in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

98. Are you likely to limit your consumption of alcoholic beverages to one drink or less per day in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

Thinking about a goal of *limiting your consumption of alcoholic beverages to one drink or less* per day...

99. It's hard to take this goal seriously (limiting alcoholic beverages to one or less per day).

1   2   3   4   5
strongly   strongly
disagree   agree

100. Quite frankly, I don't care if I achieve this goal or not (limiting alcoholic beverages to one or less per day).

1   2   3   4   5
strongly   strongly
disagree   agree

101. I am strongly committed to pursuing this goal (limiting alcoholic beverages to one or less per day).

1   2   3   4   5
strongly   strongly
disagree   agree

102. It wouldn't take much to make me abandon this goal (limiting alcoholic beverages to one or less per day).

1   2   3   4   5
strongly   strongly
disagree   agree

103. I think this is a good goal to shoot for (limiting alcoholic beverages to one or less per day).

1   2   3   4   5
strongly   strongly
disagree   agree

104. In your honest opinion, what is the level of difficulty of this goal (limiting alcoholic beverages to one or less per day)?

1   2   3   4   5
very   not at all
difficult   difficult

The next questions are about you and how you handle different situations.

105. Which one of these sentences describes you best?
(Please read all sentences before deciding which one described you best)

I am not thinking about how to lower my stress
I am thinking about how to lower my stress
I am definitely planning to try lowering my stress within the next 30 days
I have been working on lowering my stress for the less than six months
I have been working on lowering my stress for at least six months or longer

106. How sure or unsure are you that you have the ability to succeed in handling your stress better?

Very **un**sure
Kind of **un**sure
Kind of sure
Very sure

Thinking about your work and home life in the last month, how often have you:

107. Felt nervous and "stressed"

1   2   3
None of the   Some of the   Most of the
time   time   time

108. Found yourself worried about all that you have to get done

1   2   3
None of the   Some of the   Most of the
time   time   time

109. Felt confident about your ability to handle your personal problems

1   2   3
None of the   Some of the   Most of the
time   time   time

110. Found that you could not cope with all the things that you had to do

1	2	3
None of the time	Some of the time	Most of the time

Finally, please answer a few questions about yourself.

111. Are you Hispanic or Latino?

Yes
No
Don't know/not sure

112. Which one of these groups would you say best represents your race?

White
Black or African American
Asian
Native Hawaiian or Other Pacific Islander
American Indian or Alaska Native
Multiracial
Other [specify] _____

113. How do other people usually classify you in this country? Would you say White, Black or African American, Hispanic or Latino, Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native, multiracial or some other group?

White
Black or African American
Hispanic or Latino
Asian
Native Hawaiian or Other Pacific Islander
American Indian or Alaska Native
Multiracial
Other
Don't know/Not sure

114. Are you…?

Married
Divorced
Widowed
Separated
Never married
Or
A member of an unmarried couple

115. How many children less than 18 years of age live in your household?

__ __ Number of children
None

116. What is the highest grade or year of school you completed?

Never attended school or only attended kindergarten
Grades 1 through 8 (Elementary)
Grades 9 through 11 (Some high school)
Grade 12 or GED (High school graduate)
College 1 year to 3 years (Some college or technical school)
College 4 years or more (College graduate)

117. Are you currently a student of:

University of North Carolina at Chapel Hill
Durham Technical Community College
Wake Technical Community College
Other college
Not a student of a college

118. Do you live:

On-campus
Off-campus
Other (fill-in)_____

For the next two questions, please choose two items you are most interested in working on. Several scientific organizations (like the American Cancer Society) have agreed that the items listed are generally thought to help prevent cancer.

119. Which of the following are you **most** interested in working on?

Eating more fruits and vegetables
Eating more whole grains
Limiting how much red meat you eat
Eating low-calorie and low-fat foods
Doing more physical activity
Drinking fewer alcoholic beverages

120. Which are you **second** most interested in working on? (please choose something different than what you chose above)

Eating more fruits and vegetables
Eating more whole grains
Limiting how much red meat you eat
Eating low-calorie and low-fat foods
Doing more physical activity
Drinking fewer alcoholic beverages

THANK YOU FOR ANSWERING THESE QUESTIONS!

APPENDIX C

FOCUS ON YOUR HEALTH IMMEDIATE FOLLOW-UP SURVEY

Thought Listing

1. In the spaces below, list all of the thoughts, feelings, and ideas that you had about all the information you just read. Write the first thought that comes to mind in the first box, the second thought in the second box, and so forth. You might have had positive, negative, or neutral thoughts, feelings and ideas about the information. All are fine. Short phrases and statements are fine, too. ***Participants can type in answers into boxes here***

You do not have to fill every box.

Remember, put only one thought, feeling or idea in each box.

Thoughts, Feelings, and Ideas: Rating

	positive negative neutral
	positive negative neutral
	positive negative neutral
	positive negative neutral
	positive negative neutral

Thought Rating

Now, go back through all the thoughts, feelings, and ideas you listed and check the circle to indicate if the thought was POSITIVE, NEGATIVE, or NEUTRAL.

Make sure you rate every thought, feeling and idea on your list. It is fine to have positive, negative and/or neutral thoughts.

For the next questions, please answer by clicking on the circle next to the answer that comes closest to describing how you feel.

Thinking about the information you just read in this program...

2. How important was the topic of this program to you personally?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

very
important

not important
at all

3. How motivated were you to read to the information?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

very
motivated

not motivated
at all

4. What was written about this topic held my attention.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

strongly
disagree

strongly
agree

5. How difficult to understand was the information presented?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

too difficult

too simple

6. During the program, I was distracted from thinking about the topics at hand.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

strongly
disagree

strongly
agree

7. There was enough time in the presentation to think about the topics at hand.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

strongly
disagree

strongly
agree

8. The program made good points about the topics at hand.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

strongly
disagree

strongly
agree

9. To what extent did you try hard to evaluate the information provided?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
tried a great extent   did not try at all

10. To what extent did you find the information well-organized and easy to follow?

1   2   3   4   5   6   7
very organized/   not organized or
easy to follow   easy to follow at all

11. To what extent did you find it difficult to concentrate on the program?

1   2   3   4   5   6   7
very   not
difficult   difficult at all

12. In your estimation, how logical and accurate was the information presented?

1   2   3   4   5   6   7
very   not at all
logical/accurate   logical/accurate

13. How would you rate the quality of the program's information?

1   2   3   4   5   6   7
excellent   very poor

For the next questions, one serving of fruits or vegetables is a small piece of fresh fruit, 1/2 cup of vegetables or fruit, or a small glass of juice.

14. How sure or unsure are you that you have the ability to succeed in eating five or more servings of a variety of fruits and vegetables a day for the next six months?

Very *un*sure
Kind of *un*sure
Kind of sure
Very sure

15. Do you intend to eat 5 or more servings of a variety of fruits and vegetables on most days in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

16. Are you likely to eat 5 or more servings of a variety of fruits and vegetables on most days in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

Thinking about a goal of eating *5 or more servings of a variety of fruits and vegetables* on most days...

17. It's hard to take this goal seriously (eating 5 or more fruits and vegetables a day).

1   2   3   4   5
strongly   strongly
disagree   agree

18. Quite frankly, I don't care if I achieve this goal or not (eating 5 or more fruits and vegetables a day).

1   2   3   4   5
strongly   strongly
disagree   agree

19. I am strongly committed to pursuing this goal (eating 5 or more fruits and vegetables a day).

1   2   3   4   5
strongly   strongly

disagree   agree

20. It wouldn't take much to make me abandon this goal (eating 5 or more fruits and vegetables a day).

1   2   3   4   5
strongly   strongly
disagree   agree

21. I think this is a good goal to shoot for (eating 5 or more fruits and vegetables a day).

1   2   3   4   5
strongly   strongly
disagree   agree

22. In your honest opinion, what is the level of difficulty of this goal (eating 5 or more fruits and vegetables a day)?

1   2   3   4   5
very   not at all
difficult   difficult

Many grains come in two forms: **whole grains** like brown rice, whole wheat bread and pasta and cereals like mini-wheats and oatmeal; and **processed (refined) grains** including white bread, white rice, pastries, and sweetened cereals.

23. How sure or unsure are you that you have the ability to succeed in choosing whole grains more often than processed (refined) grains and sugars for the next six months?

Very **un**sure
Kind of **un**sure
Kind of sure
Very sure

24. Do you intend to choose whole grains more often than processed (refined) grains and sugars in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

25. Are you likely to choose whole grains more often than processed (refined) grains and sugars in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

Thinking about a goal of *choose whole grains more often than processed (refined) grains and sugars* on most days...

26. It's hard to take this goal seriously (choosing mostly whole grains).

```
1    2    3    4    5
strongly            strongly
disagree            agree
```

27. Quite frankly, I don't care if I achieve this goal or not (choosing mostly whole grains).

```
1    2    3    4    5
strongly            strongly
disagree            agree
```

28. I am strongly committed to pursuing this goal (choosing mostly whole grains).

```
1    2    3    4    5
strongly            strongly
disagree            agree
```

29. It wouldn't take much to make me abandon this goal (choosing mostly whole grains).

```
1    2    3    4    5
strongly            strongly
disagree            agree
```

30. I think this is a good goal to shoot for (choosing mostly whole grains).

```
1    2    3    4    5
strongly            strongly
disagree            agree
```

31. In your honest opinion, what is the level of difficulty of this goal (choosing mostly whole grains)?

```
1    2    3    4    5
very                not at all
difficult           difficult
```

The next questions are about the different types of meat that you eat. Please define high fat & processed red meat (such as **beef, pork, and lamb**) as the following three types: (1) large portions of ribs, prime rib, and 95% or more fat ground hamburger; (2) processed meats like sausage, bacon, and hotdogs; and (3) meats that are fried or charred on the grill. Other types of meat are small portions of fish, chicken, or beans that are baked or broiled.

32. How sure or unsure are you that you have the ability to succeed in eating other types of meat in place of high fat & processed red meats in the next six months?

Very **un**sure
Kind of **un**sure
Kind of sure
Very sure

33. Do you intend to limit your consumption of high fat & processed red meats in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

34. Are you likely to limit your consumption of high fat & processed red meats in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

Thinking about a goal of *limiting your consumption of high fat & processed red meats*...

35. It's hard to take this goal seriously (limiting high fat & processed red meats).

1   2   3   4   5
strongly   strongly
disagree   agree

36. Quite frankly, I don't care if I achieve this goal or not (limiting high fat & processed red meats).

1   2   3   4   5
strongly   strongly
disagree   agree

37. I am strongly committed to pursuing this goal (limiting high fat & processed red meats).

1   2   3   4   5
strongly   strongly
disagree   agree

38. It wouldn't take much to make me abandon this goal (limiting high fat & processed red meats).

```
1     2     3     4     5
strongly            strongly
disagree            agree
```

39. I think this is a good goal to shoot for (limiting high fat & processed red meats).

```
1     2     3     4     5
strongly            strongly
disagree            agree
```

40. In your honest opinion, what is the level of difficulty of this goal (limiting high fat & processed red meats)?

```
1     2     3     4     5
very               not at all
difficult          difficult
```

There are different ways foods can help you maintain a healthful weight. You can substitute vegetables, fruits, and other low-calorie foods for calorie-dense foods such as French fries, cheeseburgers, pizza, ice cream, doughnuts, and other sweets. You can also eat smaller portions of these high-calorie foods.

41. How sure or unsure are you that you have the ability to succeed in choosing foods that can help you maintain a healthful weight in the next six months?

Very *un*sure
Kind of *un*sure
Kind of sure
Very sure

42. Do you intend to choose foods that can help you maintain a healthful weight in the future?

```
1     2     3     4     5
strongly            strongly
disagree            agree
```

43. Are you likely to choose foods that can help you maintain a healthful weight in the future?

```
1     2     3     4     5
strongly            strongly
```

disagree   agree

Thinking about a goal of *choosing foods that can help you maintain a healthful weight*...

44. It's hard to take this goal seriously (choosing foods for a healthful weight).

1   2   3   4   5
strongly   strongly
disagree   agree

45. Quite frankly, I don't care if I achieve this goal or not (choosing foods for a healthful weight).

1   2   3   4   5
strongly   strongly
disagree   agree

46. I am strongly committed to pursuing this goal (choosing foods for a healthful weight).

1   2   3   4   5
strongly   strongly
disagree   agree

47. It wouldn't take much to make me abandon this goal (choosing foods for a healthful weight).

1   2   3   4   5
strongly   strongly
disagree   agree

48. I think this is a good goal to shoot for (choosing foods for a healthful weight).

1   2   3   4   5
strongly   strongly
disagree   agree

49. In your honest opinion, what is the level of difficulty of this goal (choosing foods for a healthful weight)?

1   2   3   4   5
very   not at all
difficult   difficult

For the next questions, *exercise* means any activity that causes you to get your heart rate up, breathe harder, or work up a sweat.

50. How sure or unsure are you that you have the ability to succeed in exercising 30 minutes or more at least five times a week for the next six months?

Very **un**sure
Kind of **un**sure
Kind of sure
Very sure

51. Do you intend to exercise 30 minutes or more at least five times a week in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

52. Are you likely to exercise 30 minutes or more at least five times a week in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

Thinking about a goal of ***exercising 30 minutes or more*** at least five times a week...

53. It's hard to take this goal seriously (exercising 30 minutes or more at least fives times a week).

1   2   3   4   5
strongly   strongly
disagree   agree

54. Quite frankly, I don't care if I achieve this goal or not (exercising 30 minutes or more at least fives times a week).

1   2   3   4   5
strongly   strongly
disagree   agree

55. I am strongly committed to pursuing this goal (exercising 30 minutes or more at least fives times a week).

1   2   3   4   5
strongly   strongly
disagree   agree

56. It wouldn't take much to make me abandon this goal (exercising 30 minutes or more at least fives times a week).

1   2   3   4   5
strongly   strongly
disagree   agree

57. I think this is a good goal to shoot for (exercising 30 minutes or more at least fives times a week).

1   2   3   4   5
strongly   strongly
disagree   agree

58. In your honest opinion, what is the level of difficulty of this goal (exercising 30 minutes or more at least fives times a week)?

1   2   3   4   5
very   not at all
difficult   difficult

For the next questions, one drink of alcohol is one glass of wine, one bottle of beer, or a shot of hard liquor. Average out the amount of drinks you have in a week to estimate the amount of alcohol you have per day.

59. How sure or unsure are you that you have the ability to limit your consumption of alcoholic beverages to one drink per day for the next six months?

Very *un*sure
Kind of *un*sure
Kind of sure
Very sure
I do not drink alcoholic beverages

60. Do you intend to limit your consumption of alcoholic beverages to one drink or less per day in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

61. Are you likely to limit your consumption of alcoholic beverages to one drink or less per day in the future?

1   2   3   4   5
strongly   strongly
disagree   agree

Thinking about a goal of *limiting your consumption of alcoholic beverages to one drink or less* per day...

62. It's hard to take this goal seriously (limiting alcoholic beverages to one or less per day).

1   2   3   4   5
strongly   strongly
disagree   agree

63. Quite frankly, I don't care if I achieve this goal or not (limiting alcoholic beverages to one or less per day).

1   2   3   4   5
strongly   strongly
disagree   agree

64. I am strongly committed to pursuing this goal (limiting alcoholic beverages to one or less per day).

1   2   3   4   5
strongly   strongly
disagree   agree

65. It wouldn't take much to make me abandon this goal (limiting alcoholic beverages to one or less per day).

1   2   3   4   5
strongly   strongly
disagree   agree

66. I think this is a good goal to shoot for (limiting alcoholic beverages to one or less per day).

1   2   3   4   5
strongly   strongly
disagree   agree

67. In your honest opinion, what is the level of difficulty of this goal (limiting alcoholic beverages to one or less per day)?

1	2	3	4	5
very				not at all
difficult				difficult

The next question is about you and how you handle different situations.

68. How sure or unsure are you that you have the ability to succeed in handling your stress better?

Very *un*sure
Kind of *un*sure
Kind of sure
Very sure

73. We want you to choose one day in the next week to start working on your goals for a healthy lifestyle. You are free to choose the day you wish to start. Type in the box below which day you choose, and formulate in as much detail as possible what exactly you will eat, drink, and do during the day. Therefore, compose your plan for that day, and try to be as realistic as possible.

<div style="border:1px solid black; padding:10px;">

The day I will start:

Breakfast

In-between breakfast and lunch

Lunch

In-between lunch and dinner

Dinner

After dinner

</div>

Please answer the following questions as completely and honestly as possible. We are interested in all of your opinions. The boxes will expand as you type.

[Lee: Participants can type in answers into boxes here]

74. What parts of this program did you like best?

75. What parts of the program did you like the least?

76. What could be done to improve this program?

77. Please list the specific sections of the program that you found easy to understand.

78. Please list the specific sections that you found difficult to understand (include any words or phrases that were unfamiliar or confusing).

79. What could be done to make these sections more understandable?

80. Please list the information in the program that was new to you.

81. Please list the parts of the program that you thought were written for someone like you.

82. Please list the parts of the program that you thought were not written for someone like you.

83. Did we do a good job in designing this program to meet your needs?

84. Is there anything else about this program that you would like to tell us?

THANK YOU FOR ANSWERING THESE QUESTIONS!

You may now log out of the website. You will be contacted again in about a month so that you may complete the second (and final part) of the Focus on Your Health study.

[End of survey]

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