A WHOLE GRAIN INTERVENTION IN OLDER AMERICANS NUTRITION PROGRAM PARTICIPANTS

by

Jeanna M. Ellis

(Under the Direction of James L. Hargrove)

ABSTRACT

The purpose was to determine the effects of a nutrition education intervention on improving the knowledge, attitudes, and intake of whole grain foods in participants receiving congregate meals in senior centers in north Georgia. A convenience sample of subjects completed a pre-test at Time 1 (n = 95), the nutrition education intervention of 5 lessons at senior centers, and the post-test at Time 2 (n = 84, mean age = 75 y, 91% female, 73% white, and 27% African American). Among participants who completed both Time 1 and Time 2 (n = 84), most agreed that eating more whole grain foods would help reduce their risk of cancer (69% and 76%, respectively), heart disease (76% and 79%), Type 2 diabetes (65% and 68%), and bowel disorders (82% and 83%). However, at Time 1, consumption of 11 whole grain foods was low (10.5 servings/week). Following the intervention, participants were somewhat more likely to be able to suggest ways to recognize whole grain foods, such as "first ingredient is whole grain" (5% vs. 20%, $P \leq 0.05$) and "whole grain logo is on the package" (20% vs. 32%, $P \leq 0.08$); had improved knowledge that 3 servings of whole grain foods are recommended daily (38% vs. 52%, $P \leq 0.06$); and had modest increases in the intake of 11 whole grain foods (10.5 vs. 11.7 servings/week, $P \leq 0.22$) and the sum of 3 commonly consumed whole grain foods (bread, cereal, and crackers: 5.8 vs. 6.9 servings/week, $P \leq 0.05$) by about 1 serving per week. Also, 75% felt "more strongly than before that eating whole grain foods will reduce the risk of disease." In conclusion, this intervention improved several aspects of the consumption of whole grain foods, but continued intervention is needed to increase intakes to the currently recommended number of servings. The curriculum is available for download at www.arches.uga.edu/~noahnet.

INDEX WORDS: Older Americans Nutrition Act Program, Congregate Meal Program, Senior Center, Older Adults, Whole Grains, Nutrition Education, Nutrition Intervention.

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B.S., Clemson University, 2001

A Thesis Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

MASTER OF SCIENCE

ATHENS, GEORGIA

2004

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August 2004

DEDICATION

I would like to dedicate this project to my father, Marcus K. Shumpert, and my mother, Charlene G. Shumpert for giving me the educational foundation early in life that I needed to be successful and to make it to this point in my life. You have always supported me in all my endeavors. It is a blessing to have you as parents. I love you both!

ACKNOWLEDGEMENTS

First, I would like to thank my Lord and Savior Jesus Christ for giving me the ability to complete this project. I can truly do all things through Christ who strengthens me. I would like to thank my major professor, Dr. James Hargrove, who was always supportive, ready and willing to help me with anything that I needed. I am also appreciative of my committee members Dr. Mary Ann Johnson for her patience, encouragement, and many hours spent reviewing my writing, and Dr. Joan Fischer for her expertise and interest in this project. A special thanks to Dr. Johnson's laboratory staff and fellow graduate students who assisted in developing and conducting the intervention. Finally, I would like to thank my husband, David Ellis, and my family for their continuous love and support.

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CHAPTER 1

INTRODUCTION

The fastest growing segment of the United States population is the elderly. According to projections made by the US Census Bureau, by the year 2020, people age 65 and older will make up about 21% of the population (U.S. Census Bureau, 2000). The state of Georgia has the sixth fastest growing 60+ population and the fastest growing 85+ population in the United States (Georgia Department of Human Resources, 2003).

The number of older Americans who will have a functional disability due to arthritis, stroke, diabetes, heart disease, or cancer is expected to increase at least 300% by 2049 (Boult et al., 1996). Although aging is usually associated with the development of chronic conditions, growing old does not mean disability is inevitable (Agency for Healthcare Research Quality, 2002). Many of the diseases that lead to disability can be delayed or decreased in severity through preventative strategies including nutrition education. Many epidemiological studies have cited an inverse relationship between diets high in whole grains and risk for chronic diseases such as heart disease, cancer, and type II diabetes (Liu et al., 1999; Jacobs et al., 1998*a*; Pereira et al., 1998; Liu et al., 2000; Meyer et al., 2000; Jacobs et al., 1998*b*).

Previously conducted research by the University of Georgia's Department of Foods and Nutrition has shown that Older Adults Nutrition Program (OANP) participants from northeast Georgia senior centers congregate meal programs are considered to be at an increased nutritional risk. Departmental studies have shown that over 50% of participants were at high nutritional risk (Brackett, 1999). Data from these studies as well the national evaluation data strongly indicate

that many OANP participants are at risk for poor health and nutrition-related problems. Targeting nutrition education interventions to older adults, such as increasing consumption of whole grain foods, is necessary to prevent or delay chronic disease and disability (Reicks, 2002). An intervention was designed to increase consumption of whole grain foods in this population by eliminating the barriers to consumption. The featured whole grain foods were selected because of convenience, availability, overall low consumption and the health benefits they provide based on epidemiological studies. A diet that includes whole grains has been associated with reduced risk for heart disease, stroke, diabetes, and certain cancers all of which are nutrition-related diseases often prevalent in the elderly population.

The purpose of this study was to evaluate a nutrition education intervention to increase whole grain consumption and improve knowledge and other barriers to consumption specifically tailored to meet the needs of OANP participants. Five educational modules were developed for this intervention and were delivered over a five month period in the nine participating counties. The major findings were that at Time 1, participants were highly aware of the relationship of low intake of whole grain foods and chronic disease. Also, after the intervention there were improvements in some, but not all, aspects of recognizing the labeling for whole grain foods; a trend for an increase in knowledge that three or more servings of whole grain foods daily are recommended (from 38% at Time 1 to 52% at Time 2); and a modest, but significant, increase in the total combined intakes of whole grain cereal, whole grain bread, and whole wheat crackers by about 1 serving per week.

Chapter 2 in this thesis is a review of literature pertaining to the benefits of and barriers to consumption of whole grain foods. Chapter 2 also reviews other nutrition education interventions in the older adult population as they relate to their ability to produce positive

behavior change. Chapter 3 is a manuscript that will be submitted to the Journal of Elderly Nutrition. The manuscript gives the methods, results, and a discussion of the results from the whole grain nutrition education intervention. All data tables are included as a part of the manuscript in Chapter 3. Chapter 4 summarizes the major findings of the intervention trial and states the general conclusion.

CHAPTER 2

LITERATURE REVIEW

Disease Risk and the Elderly Population

The older adult population is a rapidly growing segment of the US population. In the year 2000, approximately 35 million persons in the US were older than 65 years, and this number will almost double to 70 million by 2030 (US Census Bureau, 2000). Not only is the older population growing in numbers, life expectancy is also increasing. Persons age 65 in the year 2000 have an average life expectancy of another 18 years compared with persons age 65 in 1900 when the life expectancy was an additional 12 years (Federal Interagency Forum on Aging Related Statistics, 2000). With the increase in life expectancy comes a greater risk of acquiring certain diseases and disorders, and many seniors are affected by a number of chronic conditions that compromise their health and well-being (Ory & Cox, 1994).

The leading causes of death for older Americans are heart disease, cancer, and stroke (Centers for Disease Control, 2001). Chronic conditions among the elderly often lead to disability and are usually more costly and difficult to treat (National Academy on an Aging Society, 1999). Almost 75% of Americans age 65 and older suffer from at least one chronic condition and approximately 50% report having at least two chronic conditions (Calkins et al., 1999). It is projected that by the year 2049, the number of older adults having a functional disability as a result of arthritis, stroke, diabetes, coronary artery disease, cancer, or cognitive impairment will increase by 300% (Agency for Healthcare Research and Quality, 2002). These chronic conditions often increase with age and can limit the ability of elderly people to perform

the basic self-care skills or activities of daily living (ADLs) such as bathing, dressing, eating, walking, and getting in and out of bed (Schiller & Bernadel, 2004). According to the National Center for Health Statistics (NHCS) National Health Interview Survey 2002, about 10% of adults age 75 and older required help from another person with ADLs. Moreover, 20% required assistance with instrumental activities of daily living (IADLs) which include preparing meals, managing money, shopping for groceries or personal items, performing light or heavy housework, and using a telephone (Schiller & Bernadel, 2004). It is apparent that functional disabilities arising from chronic conditions can often lead to a need for assistance (Ory & Cox, 1994).

The health care system is becoming increasingly burdened by the high costs associated with hospital care and related services for the elderly and is associated with age and disability status. For example, more money is spent for health care for persons age 85 or older than persons ages 65-69 (Federal Interagency Forum on Aging Related Statistics, 2000). In general, older adults with incomes less than $20,000 are more likely to have conditions that are costly to treat when compared with incomes greater than $50,000. Also, poorer older adults were 3-4 times more likely to need help with ADL and IADLs. In the mid 1990s, the health care costs of chronic disease in older adults reached $470 billion and are expected to continue to increase (National Academy on an Aging Society, 1999).

Although the likelihood of acquiring a chronic condition that leads to disability increases with age, the risk can be decreased by the adoption of healthy behaviors. Many of the diseases that lead to disability can be delayed or decreased in severity through preventative strategies such as consumption of a nutritionally adequate diet (Drewnowksi and Evans, 2001).

The elderly population is a group that is susceptible to nutritional deficiencies caused by reductions in caloric intake, often in combination with the presence of chronic disease. Both obesity and malnutrition can result in decreased functional capacity, poor health, higher health care costs, and even death (Institute of Medicine, 2000). Many community-dwelling elderly do not get the amounts and types of foods that they need to meet essential nutrient and energy needs (Marshall et al., 2001; Ryan et al., 1992). Thirty-seven to 40% of older adults are considered at risk for nutritional deficiencies, with mean energy intakes below two-thirds of the RDA or have inadequate caloric intakes (Ryan et al., 1992). Physiological, psychological, and economical changes in later years can all contribute to poor nutrition and significant numbers of older adults are at moderate to high nutritional risk (Egg Nutrition Center, 1997).

Although some older adults are at risk for chronic disease because of genetic predisposition, gender, or age, other factors such as diet can be changed to reduce risk (National Academy for an Aging Society, 2000). Studies have shown that diets high in fruits and vegetables, high in whole grains, and low in saturated fat and cholesterol reduce the risk of developing chronic conditions. While many people believe that the older adult population is unwilling to make changes in the their health behavior, studies have shown that older adults are willing to make behavior changes in order to maintain their health and independence or if they believe that they are at an increased risk of developing a chronic disease (Contento et al., 1995). Many of the diseases that lead to disability can be delayed or decreased in severity through preventative strategies. A healthy diet along with other healthy lifestyle behaviors can reduce the risk of chronic disease. Nutrition education interventions can be utilized as a prevention strategy to eliminate or treat disease before disability occurs or at least slow the progression or enhance the quality of life for this vulnerable population (Reicks, 2002). Because of the poor nutritional

status and overall health of older adults in America, the US Surgeon General has recommended that intervention strategies be used to improve the nutritional status of older adults to reduce the risk of chronic disease (US Department of Health and Human Services, 1988).

Evaluation of Older Americans Nutrition Program

The Older Americans Nutrition Program (OANP) formerly known as the Elderly Nutrition Program, was established in 1972 by the Administration on Aging (AOA) and is available to Americans aged 60 years and older and their spouses (AOA, 2003). OANP serves three million people annually, and provides 30% to 50% of the older adults' daily nutrient intake. It provides preventative community and home-based nutrition related services to those in high-risk categories, targeting the poor, minorities, and frail elderly persons (Millen et al., 2002). On a national level, OANP participants have high rates of chronic disease and physical disabilities which also indicates that they are an at-risk population (Millen et al., 2002). Twenty-two percent of congregate meal participants and 48% of home delivered meal client are at increased risk for nutritional problems (Ponza et al., 1996). Likewise, the participants in the OANP in northeast and northwest Georgia Senior Centers are a population at risk of developing heart disease, type 2 diabetes, and certain cancers, due to nutritional deficiencies or inadequate intakes of certain nutrients (Johnson et al., 2003; Brackett, 1999; Redmond, 2004; Burnett, 2003). Because the average American is consuming 1 or fewer servings of whole grain foods per day (Adams & Engstrom, 2000), it is expected that OANP participants are not including many whole grains in their diets. Knowing that whole grains do in fact lower disease risk through their many phytochemicals, antioxidants, and other important nutrients (Slavin, 2001), it is imperative to implement a program within this population group to inform OANP participants about the importance and benefits of a diet that includes whole grain foods. The OANP provides an

excellent opportunity and a ready audience to implement a whole grain nutrition education intervention to prevent or reduce the risk of chronic disease in this vulnerable population.

Benefits of Whole Grain Intake

Recent studies have suggested significant health benefits to consuming whole grains. The 2000 US Dietary Guidelines has incorporated a specific whole grain message that urges Americans to "choose a variety of grains daily, especially whole grains" (Johnson & Kennedy, 2000). One of the objectives for Healthy People 2010 urges Americans to enjoy plenty of whole grains, fruits, and vegetables (US Department of Health and Human Services, 2001). In 1999 the Food and Drug Administration approved a health claim that "Diets rich in whole grains and other plant foods that are low in total fat, saturated fat, and cholesterol may reduce the risk of heart disease and some cancers" (US Federal Drug Adminstration, 1999). Whole grains are also an excellent source of total fiber, and the 2000 Dietary Reference Intakes adequate intake (AI) for total fiber for men ages 19-50 is 38g/day and 51+ is 30 g/day. The AI for total fiber for women ages 19-50 is 25g/d and 51+ is 21 g/day (Institute of Medicine, 2002). It is apparent that Americans fall short of whole grain intake in their diet. In fact, most Americans are eating less that the recommended minimum of 3 servings of whole grains per day, and the average daily intake of whole grain foods is 1 or fewer servings per day (Adams & Engstrom, 2000). Total fiber needs are also not being met with median total dietary fiber intakes ranging from 16.5 to 17.9 g/day for men and 12.1 to 13.8 g/day for women (US Department of Agriculture, 1998). Because most people are not consuming the recommended amounts of whole grains daily, they could be missing out on significant protection against many diseases that plague the US population. Whole grains which consist of the germ, bran, and endosperm provide a wide range of nutrients including fiber, vitamins, minerals, and phytochemicals that may work together to

optimize human health (Johnson & Kennedy, 2000). Although the exact mechanisms are not completely understood, research studies have shown that regular consumption of whole grains has been linked to a reduced disease risk for heart disease, type 2 diabetes, and certain cancers (Slavin, 2003).

Several epidemiological studies have emphasized the role of whole grains in health and longevity (Institute of Medicine, 2002). Data analyzed from the Iowa Women's Health Study showed an inverse relationship between intake of whole grains and mortality (Jacobs et al., 1999). Similarly, data from the Nurses' Health Study showed the same inverse relationship between whole grain intake and the risk of ischemic stroke and coronary heart disease (Liu et al., 2000; Liu et al., 1999). Moreover, in large studies of men and women, higher intakes of whole grain breads and breakfast cereals were linked to a reduced risk for type 2 diabetes due to lower fasting insulin levels (Pereira et al., 1998). Finally, in a meta-analysis of whole grain intake and cancer, whole grains were found to be protective in 43 of 45 citations that mention of cancer (Jacobs et al., 1998*b*). Mentioned cancers included colorectal, gastric, hormone-related, pancreatic, and others (Jacobs et al., 1998*b*).

Whole Grain Intervention Studies

Few studies have evaluated the effects of whole grain foods on clinical outcomes. Food fractions such as partially hydrolyzed guar gum and finely processed pea hull fiber help to alleviate constipation in residents of long-term care facilities (Patrick et al., 1998; Dahl et al., 2003). Oats and oat-containing foods have been shown in intervention trials to improve clinical outcomes such as reduced blood pressure and reduced total blood cholesterol. Pins et al. 2002 conducted a 12-week randomized trial and compared the effects of whole grain oat-based cereals with refined grain wheat cereals to determine their effects on people on antihypertensive

medications. They concluded that the soluble fiber from oats can reduce the need for antihypertensive medication and improve blood pressure control by lowering total cholesterol, LDL cholesterol, and blood glucose levels (Pins et al., 2002). A meta-analysis of the effects of oat products on blood cholesterol levels found support for the hypothesis that oat products cause a modest reduction in blood cholesterol levels (Ripsin et al., 1992). Studies have also shown that an increased intake of whole grain foods may increase insulin sensitivity (Liese et al., 2003; Pereira et al., 2002). Pereira et al. 2002 assessed the relationship between whole grain consumption and insulin sensitivity in overweight and obese adults. They found a 10% reduction in fasting insulin levels during the consumption of whole grain foods are compared to the refined-grain diet (Pereira et al., 2002). All together these studies suggest that changes in insulin sensitivity, reduction of total and LDL cholesterol, and lowered blood glucose levels, may be the mechanism by which whole grain foods reduce the risk of type 2 diabetes and heart disease.

Changes in whole grain consumption and related dietary patterns were evaluated in a two week intervention study in adults aged 25 to 40 years (Smith et al., 2000*a*, 2000*b*). Whole grain foods were provided directly to the participants (one whole grain food option for every meal) and, similar to the present intervention, Smith et al. provided education that emphasized the relationship between whole grain consumption and disease risk and identification of whole grain foods and how to incorporate them into their diet. During the intervention whole grain intakes increased in men (3.2 to 7.0 servings per day) and women (0.7 to 5.4 servings/day). This intervention showed that increased whole grain intakes increased consumption of non-starch polysaccharides (NSP), decreased the percentage of total fat, and increased total carbohydrate intake. The intervention improved participants' attitudes towards whole grain consumption, but their knowledge related to whole grain identification was not tested after the intervention. To our

knowledge, there are no educational interventions that have been conducted to improve the intakes of whole grain foods in the low-income elderly population. Thus, the proposed study will provide much needed information about whether or not nutrition education targeted to low income older adults will improve whole grain consumption, as well as knowledge and attitudes towards whole grain foods.

Barriers to Whole Grain Intake

Twenty-three to 29% of adults never eat whole grain food (Albertson & Tobelmann, 1995; Cleveland et al., 2000). When whole grain foods are consumed, breads and breakfast cereals have been cited as the most common food sources (Jacobs et al., 1999; Cleveland et al., 2000; Smith et al., 2001; Lang et al., 2003). Several barriers to consumption of whole grain foods have been identified through consumer surveys, focus groups, and national data on intakes. Barriers mentioned are: color of the bread, expensive price, dryness, texture, taste, low consumer awareness, and difficulty identifying whole grain products (Wheat Foods Council, 2001*a*). According to the USDA Continuing Survey of Food Intakes by Individuals, 1994-96, there are differences in consumption patterns among Caucasians, African Americans, and Mexican Americans. Older adult white males and females consume more whole grains daily than any other age group (males 1.3 servings/day, females 1.0 servings/day) (Wilson et al., 1997). The older adult shopper is also more likely to want information on fiber and whole grains (Prevention Magazine, 1999). Socioeconomic level is also appears to be a factor when it comes to whole grain consumption. Individuals under 131% of poverty consume 0.7 servings/day, while those between 131 to 350% of poverty consume 1.0 servings/day, and those over 350% of poverty eat 1.1 servings/day (Wilson et al., 1997).

Barriers to consumption must be identified and reduced. Authors have suggested the following ideas to help reduce the barriers to whole grain consumption: (1) Whole grain foods must be competitively priced and easily identified (Lang & Jebb, 2003), (2) Packaging, shelf-talkers and recipe tear pads can be placed near foods to communicate important messages (Adams & Engstrom, 2000), (3) The benefits of whole grains can be promoted through the FDA approved health claim (Adams & Engstrom, 2000), (4) A "consumer-friendly" whole grain definition should be developed with a whole grain logo (Marquart et al., 2003), and (5) Better tasting, softer, moister whole grain products must be developed to suit consumers' tastes (Adams & Engstrom, 2000). This study addresses the barriers to consumption of whole grain foods by emphasizing the health benefits of whole grains in disease prevention, educating participants' on how to identify whole grain foods by reading the food labels, and stressing the message that three servings of whole grain foods should be eaten daily for better health.

Promoting the Whole Grains Message

In order to effectively communicate to consumers that whole grains are a necessary part of a healthy diet and have implications for disease prevention, a coordinated effort with a plan of action should be developed. The "5-a-day" national program by the National Cancer Institute is an example of an effective model that has had success in raising consumer awareness through partnerships to help increase the intake of fruits and vegetables. The 2000 Dietary Guidelines, Food Guide Pyramid, Healthy People 2010, and the American Heart Association all represent nutrition and health campaigns that highlight the importance of whole grains. Grains advocates from academia, government, industry, public and private agencies should develop alliances to address issues related to increasing whole grain intakes in American. The "Grains for the health of It" symposium held in September 2001 was one such effort to bring grain advocates together

to discuss new ways to promote whole grain foods in the US. Topics included the future of whole grain research, how to communicate the whole grains message, and funding issues (Wheat Foods Council, 2001*b*). More meetings will be necessary between different agencies and industries to develop a unified whole grains action plan.

Health Belief Model

Many theoretical frameworks exist that can be applied for nutrition education in the elderly. However, few of the nutrition education studies have cited a theoretical basis or model for their interventions and even fewer have attempted to motivate the elderly to make nutrition related behavior changes. In order to explain why and how people are able to make health behavior changes, this study design will include the Health Belief Model (HBM) developed by Rosenstock and Hochbaum in the 1950's (Rosenstock, 1974). This model is based on the idea that people are willing to make nutrition related behavior changes when they believe that their diet is placing them at increased risk for chronic illness. According to the HBM, changes in health behavior are based on (1) Perceived susceptibility- one's opinion of getting the condition, (2) Perceived severity- one's opinion of how serious a condition and the consequences are, (3) Perceived benefits- one's opinion of the efficacy of the advised action to reduce risk or seriousness, (4) Perceived barriers- one's opinion of the tangible and psychological costs of action, (5) Cues to action- strategies to activate readiness, and 6) Self-Efficacy- Confidence in one's ability to take action (Rosenstock, 1974). Whether or not an individual is able to make a dietary change is mostly based on the perceived barriers to taking action and self-efficacy. Barriers to whole grain consumption for older adults might include lack of knowledge about benefits of consumption, price, dryness, texture, and taste. Also, the inability to determine what is a whole grain product is another barrier (Wheat Foods Council, 2001*a*). Self-efficacy is a

strong predictor of dietary behavior and is associated with nutrition attitudes and willingness to make dietary changes (Rosenstock, 1974). Older adults, like the OANP participants who live in rural areas, are considered low-income, and have medical needs to make dietary changes should be more positively affected by an education program (Contento et al., 1995). The HBM assumes that good health is important to most people, and people are willing to make behavior changes to eliminate or reduce the perceived serious consequences of chronic conditions (Shumaker et al., 1998). In order to be successful for behavior change, the recommended dietary changes need to be easy to implement and should result in a detectable risk reduction (Coulston et al., 2001).

Rationale, Specific Aims, Hypotheses

Most Americans on average consume 1 serving of whole grain foods per day, which is 1/3 of the recommended 3 servings per day (Slavin et al., 2001). Epidemiological studies have cited the benefits of whole grain consumption (Jacobs et al., 1999; Liu et al., 2000; Liu et al., 1999; Pereira et al., 1998; Jacobs et al., 1998*a,b*). Currently, there is not a national program that promotes whole grain consumption like the 5 A Day Health Coalition (started in 1991 by the National Cancer Institute in conjunction with the Produce for Better Health Foundation) that promotes fruit and vegetable intake (National Cancer Institute, 2000). Common and convenient whole grain foods include whole grain bread, whole grain cereal, oatmeal, etc. Recent studies have suggested that whole grains may be quite protective against chronic disease. Almost 17% of the US population ages 65-74 is affected by diabetes (Centers for Disease Control, 2001). Moreover, heart disease and cancer rank #1 and #2 respectively for causes of death in the US and 71% of the victims are 65 and older (Centers for Disease Control, 2001). Lack of knowledge of protection against disease is a strong barrier to whole grain consumption. The Health Belief Model predicts that participants will feel motivated to change behavior if they feel that their diet

is putting them at risk for disease, and if they feel behavior change is possible (Rosenstock, 1974).

Another reason for the lack of whole grain consumption in the US population, specifically in the elderly population, is low consumer awareness (Wheat Foods Council, 2001*a*). Education programs may help older adults change their behavior with messages that are clear and relevant with consistent reminders (Adams & Engstrom, 2000). Barriers to consumption include lack of consumer awareness of the health benefits, difficulty in identifying whole grain foods in the grocery store, perceived inferiority of taste, lack of monetary resources, and lack of familiarity with preparation methods (Kantor et al., 2001). This study will use the Health Belief Model to explain dietary behavior change and intends to eliminate barriers to whole grain consumption while increasing intake. Older adults will require sufficient knowledge and information to motivate them to change their whole grain consumption patterns.

It is likely that this nutrition education program will improve intake, knowledge and attitudes related to whole grains in the target population based on our previous studies in which education programs decreased A1c in those with diabetes (Burnett, 2003; Redmond, 2004), decreased modifiable risk factors for osteoporosis (Cheong et al., 2003), and improved nutrition knowledge and barriers to exercise (McCamey et al., 2003). The present study was conducted in Northeast Georgia OANP congregate meal participants, a population at risk of nutrition- related diseases. A whole grain nutrition education intervention was developed and delivered and the outcomes related to whole grain consumption patterns were asssessed.

The specific aims of this study were:

1. To determine knowledge, attitudes, and intakes of whole grain foods.

2. To determine the effects of a nutrition education intervention on improving the knowledge, attitudes, and intake of whole grain foods.

The hypotheses were:

1. Prior to the nutrition education intervention knowledge, attitudes, and intakes of whole grain foods would be low.

2. The nutrition education intervention would improve knowledge, attitudes, and intake of whole grain foods.

CHAPTER 3

A WHOLE GRAIN INTERVENTION IN OLDER AMERICANS NUTRITION PROGRAM PARTICIPANTS[1]

[1] Ellis, J., M.A. Johnson, J.G. Fischer, and J.L. Hargrove. To be submitted to Journal of Nutrition for the Elderly.

Abstract

This study examined the effects of a nutrition education intervention on improving the knowledge, attitudes, and intake of whole grain foods in participants receiving congregate meals in senior centers in north Georgia. It was hypothesized that prior to the nutrition education intervention knowledge, attitudes, and intakes of whole grain foods would be low, and the nutrition education intervention would improve knowledge, attitudes, and intake of whole grain foods.

Participants were a convenience sample selected from north Georgia senior centers (n=84, mean age = 75 years, 91% female, 73% Caucasian, and 27% African American). Among participants who completed both Time 1 and Time 2 (n = 84), most agreed that eating more whole grain foods would help reduce their risk of cancer, heart disease, Type 2 diabetes, and bowel disorders. However, at Time 1, consumption of 11 whole grain foods was low (10.5 servings/week). Following the intervention, participants were somewhat more likely to be able to suggest ways to recognize whole grain foods, such as "first ingredient is whole grain" (5% vs. 20%, $P \leq 0.05$) and "whole grain logo is on the package" (20% vs. 32%, $P \leq 0.08$); had improved knowledge that 3 servings of whole grain foods are recommended daily (38% vs. 52%, $P \leq 0.06$); and had modest increases in the intake of 11 whole grain foods (10.5 vs. 11.7 servings/week, $P \leq 0.22$) and the sum of 3 commonly consumed whole grain foods (bread, cereal, and crackers: 5.8 vs. 6.9 servings/week, $P \leq 0.05$) by about 1 serving per week. In conclusion, this intervention improved several aspects of the consumption of whole grain foods, but continued intervention is needed to increase intakes to the currently recommended number of servings. The curriculum is available for download at www.arches.uga.edu/~noahnet.

Introduction

Grains form the base of the Food Guide Pyramid, and more recently there has been an increasing emphasis on whole grains as an important part of a healthful diet (Slavin et al., 2001). Whole grains contribute many nutrients that are believed to work together to prevent disease (Slavin, 2003). These nutrients are found in the three layers that make up whole grains. The outside layer, the bran, provides fiber, B-vitamins, minerals, protein, and phytochemicals. The middle layer is the endosperm which contains carbohydrates, proteins, and small amounts of B-vitamins. The innermost part is called the germ, and it contains high concentrations of minerals, B-vitamins, vitamin E, and other phytochemicals (Smith et al., 2003). Problems arise during the refining process when the bran and germ are removed from the grain leaving mostly endosperm, which is void of many nutrients and phytochemicals that help prevent chronic disease (Slavin et al., 2001). Numerous epidemiological studies provide evidence that the consumption of the intact whole grain may reduce the risk of heart disease (Liu et al., 1999; Jacobs et al., 1998*a*), type 2 diabetes (Pereira et al., 1998; Liu et al., 2000; Meyer et al., 2000), and certain cancers (Jacobs et al., 1998*b*) although the exact mechanisms are not completely understood. Researchers believe that one to three servings or more of whole grain foods daily is associated with a reduced risk of chronic diseases (Jacobs et al., 1998*b*, 1999; Liu et al., 1999, 2000). However, intake of whole grain foods is low in the U.S. with most Americans consuming less than one serving per day (Adams & Engstrom, 2000). Due to the lack of consumption of whole grains in the US population, it is necessary to identify the barriers to whole grain consumption and understand how to enable people to make dietary changes. Few educational interventions have focused on addressing the nutritional status of the elderly (Contento et al., 1995). Even fewer efforts have been aimed at poor or less educated older adults from rural areas who are at the greatest risk for

nutritionally linked diseases (Wellman et al., 2002; Millen et al., 2002). One subgroup of older adults who might benefit from a whole grain nutrition education intervention is participants in the Older Adults Nutrition Act Program (OANP) congregate meals program. They are a population at increased risk of chronic diseases that have been associated with low whole grain intakes. In a national survey of OANP congregate meal recipients, 18% had diabetes, 28% had heart disease, and 13% had cancer (Ponza et al., 1996). Therefore, it may be beneficial to increase whole grain intake in this vulnerable elderly population.

The University of Georgia Department of Foods and Nutrition has identified several nutrition-related problems and successful nutrition interventions in older adults receiving congregate meals from senior centers in Georgia. Nutritional problems include high nutritional risk, obesity, diabetes, vitamin deficiencies, and low intakes of fruits and vegetables (Accettura, 2000; Aspinwall, 2000; Brackett, 1999; Wade, 2003; Johnson et al., 2003). Nutrition, physical activity, and health education interventions targeted to these elders decreased modifiable risk factors for osteoporosis (Cheong et al., 2003), increased fruit and vegetable intake (Wade, 2003), decreased hemoglobin A1c and improved self-care in elders with diabetes (Burnett, 2003; Redmond, 2004), and improved general nutrition and physical activity habits (McCamey et al., 2003).

In our ongoing contact with seniors in congregate meal programs in north Georgia, we observed that whole grain foods are generally not served with the congregate meal and that whole grain foods are not typically consumed at other meals. Therefore an educational intervention was developed to increase consumption of whole grain foods. The intervention was based on the Health Belief Model that suggests people will feel motivated to change behavior if they feel that their diet is putting them at risk for disease, and if they feel behavior change is

possible (Rosenstock, 1974). The whole grain foods selected for the intervention were convenient, readily available at most grocery stores, and have been identified as having health benefits. The goals of this educational intervention and evaluation were to determine (1) the knowledge, attitudes, and intakes of whole grain foods and (2) the effects of a nutrition education intervention on improving the knowledge, attitudes, and intake of whole grain foods.

Methods

Recruitment of the Sample

A convenience sample of older adults aged 59 and older was recruited from senior centers in seven counties in northern Georgia. The counties, Barrow, Franklin, Greene, Loganville, Oconee, Morgan, Newton, Jackson, and Cherokee, were selected because of local interest in the project and availability of their centers at the time of the intervention program. All participants were community dwelling and received congregate meals at the senior centers. There were no exclusion criteria, but participants needed to be able to comply cognitively with testing procedures. Participants were recruited through the directors of the senior centers who assisted with advertising and enrollment. Approval for the study was obtained from the Institutional Review Boards of the Georgia Department of Human Resources and The University of Georgia for all procedures. Before the protocol began, the consent form was read aloud to the participants and written informed consent was obtained individually from each participant. By signing the consent form, they agreed to participate in the nutrition education intervention at their senior center and to answer questions about their nutritional and health status. Participants were informed that they could withdraw at any time from the study with no adverse effects on their participation in the congregate meal program or any other services available at their senior center.

The Intervention Program

Nutrition experts (three faculty members and one research coordinator in The University of Georgia's Food and Nutrition department) reviewed and edited the questionnaires used at Time 1 and Time 2 to ensure content validity. Trained staff from the Department of Foods and Nutrition administered the questionnaires. The interviewers read the questions to the participants and recorded their responses. At Time 1, questionnaires were administered in order to collect information on cognitive status, selected whole grain food consumption patterns and barriers to consumption, body weight and height (self-report), and other nutrition and health questions. Questions were selected based on past nutrition questionnaires that were developed for this population of Older Americans Nutrition Program participants and key issues related to whole grain consumption patterns and barriers to consumption. The cognition measure entitled, Short Orientation-Memory Concentration, is a validated 6-item tool that discriminates cognitive function as being normal or minimally impaired (score of 8 or less), moderately impaired (score of 9 to 19) or severely impaired (score of 20 or more) (Katzman, 1983). Participants were required to perform tasks such as counting backwards from 20 to 1, naming the months of the year in reverse order, naming the current month and year, and repeating a phrase that was read to them at the beginning of the testing session. The food frequency questionnaire contained 19 questions about consumption patterns of specific whole grain foods. The whole grain foods were selected based on their availability in the grocery stores in the area and epidemiological findings of whole grains associated with reduced chronic disease risk. Frequency categories were: less than 1 serving per week, 1 per week, 2 per week, 3 per week, 4 per week, 5 per week, 6 per week, 1 per day, 2 per day, and missing/don't know. Participants also were asked about their awareness of the link between whole grains and chronic disease, knowledge and attitudes

towards whole grain foods using free recall, yes/no, and true/false formats, as well as specific barriers to whole grain consumption. Information about current or past disease conditions was obtained (heart disease, cancer, diabetes, hypertension, blood cholesterol, and bowel troubles).

Nutrition and Health Education Curriculum

After completing the questionnaires at Time 1, the Whole Grains and Your Health Program was implemented. Three messages were emphasized in each lesson: (1) How to identify a whole grain food, (2) Whole grains protect against diseases, and (3) Three are Key!- eat three servings of whole grain foods daily. The curriculum included five lessons: (1) Getting the whole grain story, (2) The whole truth about whole grain bread, (3) The great whole grain cereal and oatmeal chapter, (4) The brown rice bonus, and (5) The final chapter- don't forget these grains. The first lesson covered the definition of a whole grain, how to identify whole grain foods, and the health benefits gained from whole grain consumption. The second lesson covered how to identify whole grain breads and compared the nutritional benefits of eating whole grain bread to those of white bread. The third lesson addressed how to identify whole grain cereals and creative ways to include them in the diet. The fourth lesson focused on how to cook and store brown rice. The fifth lesson covered healthy snacking ideas using whole grain foods and identified some less common grains. One to two lessons were administered each month over a period of 5 to 6 months. Nutrition experts (three faculty members and one research coordinator in The University of Georgia's Food and Nutrition department) assisted in developing and reviewing the curriculum. Each lesson had a lesson plan and handouts including tips on how to include more whole grains in the diet. Each topic constituted one lesson. One to two lessons were taught per month. The curriculum is available for download at www.arches.uga.edu/~noahnet.

Post Intervention

After conducting the entire curriculum, a Time 2 post-test was administered to assess behavior modification, knowledge, and attitudes about whole grain foods, as well as overall satisfaction with the program. The post-test was administered from 1-3 months after the last lesson so as to allow participants time to make behavior changes. The Time 2 post-test was very similar to the Time 1 pre-test, except that open-ended questions were added to the post-test to allow participants to further describe changes in consumption and knowledge after the intervention program.

Statistical Analysis

The data were analyzed using the Statistical Analysis System Data (SAS, 2001).Only one person coded all questionnaires and entered all data to ensure consistency. Data files were checked twice for accuracy. Descriptive statistics, including frequencies, means, standard deviations, and Spearman correlation coefficients were generated at Time 1 (pre-test) and Time 2 (post-test). Data from Time 1 and Time 2 were compared using the Signed Rank Test, paired T-tests, and Chi-square analyses to identify changes that were statistically significant ($P \leq 0.05$). All comparisons of mean changes from Time 1 to Time 2 were evaluated with the Signed Rank Test for non-normally distributed data, unless otherwise indicated (Student's T-test for normally distributed data). With a sample size of n=84, this study was powered to detect a change of about 20 percentage points in intakes, behavior, knowledge, and attitudes related to whole grains. A sample size of up to n=136 would be needed to detect changes of 15 percentage points.

Results

The participants' mean age was 77 years, 82% were women, 25% were African American, and 75% were Caucasian (Table 1, n = 95). Nearly 70% of participants were

overweight or obese with a Body Mass Index (BMI) ≥ 25. About 72 to 75% of participants shopped for their own groceries, planned the meals they eat, or cooked their own meals. Between 87 and 91% of participants used a microwave and stove at home. Only 7% used tobacco products. Chronic diseases and their risk factors were very prevalent: 22% had cancer, 31% had diabetes, 34% had heart disease or heart attack, 51% reported high blood cholesterol and 69% reported high blood pressure or hypertension. Over one-third of participants mentioned a bowel disorder. Eleven participants did not complete the intervention because 3 died, 4 moved, 3 could not be reached for Time 2 post-testing, and 1 declined to complete the post-test.

Among the variables discussed in these analyses (Tables 1-5), the only significant difference between the 11 who did not complete the intervention and the 84 that did was that those who completed the intervention ate whole grain English muffins more often (0.3 vs. 0 times/week, $P < 0.001$). At Time 1, completers and non-completers were of similar ($P > 0.70$) age (77 vs. 75 years), gender (88% vs. 91% female), and ethnicity (24% and 27% African American), and had similar mean intakes of whole grain foods (10.5 vs. 9.7 servings/week).

Among those who completed both Time 1 and Time 2 (n = 84), the consumption of whole grain foods from highest to lowest consumption at Time 1 was whole grain bread (2.9 servings/week), oatmeal (2.3 servings/week), whole grain cereal (2.1 servings/week), popcorn (1.0 servings/week), whole wheat crackers (0.8 servings/week), whole grain pasta or noodles (0.4 servings/week), whole grain granola bar (0.3 servings/week), brown rice (0.3 servings/week), whole grain English muffins (0.3 servings/week), and whole grain bagels (0.1 servings/week) (Table 2). After the intervention, there were significant ($P \leq 0.05$) decreases in mean intake of whole grain pasta and noodles. Also, after the intervention, there was a trend ($P \leq 0.06$) for a decrease in the mean intake of white bread from 2.2 to 1.6 servings per week. After

the intervention there was an increase in the mean intake of the top three (sum of whole grain cereal, whole grain bread, and whole wheat crackers) and the top four (whole grain cereal, whole grain bread, whole wheat crackers, and oatmeal) most frequently consumed whole grain foods of more than 1 serving per week ($P \leq 0.05$).

Sixty-five to 76% of the participants who completed Time 1(n = 84) thought that eating more whole grain foods would reduce their risk of cancer, heart disease, and type 2 diabetes (Table 3). Additionally, 82% believed that eating more whole grain foods would reduce their risk of bowel disorders, and 81% of participants thought that if they improved their diets, then they would be healthier people. There were no statistically significant changes after the intervention.

When participants were asked at Time 1 (n = 84) to suggest ways of identifying whole grain foods, 5 to 20% were able to make correct suggestions (whole grain logo or health claim identification, 100% whole wheat or whole grain in the product name, or the first ingredient is whole grain) (Table 4). Up to 24% of participants made incorrect suggestions about ways to identify whole grain foods at Time 1. These incorrect suggestions included identifying whole grains by their brown color, and when "wheat", "multigrain", or "stoneground" is in the name. Fourteen percent of participants were not able to give any suggestions about how to identify a whole grain food product. After the intervention, there was a significant increase from in the ability of participants to correctly suggest that a food is whole grain if the "first ingredient is a whole grain" ($P \leq 0.05$). The maximum score was 4 for the variable "whole grains recognition correct," and the percentage of participants who were able to correctly recognize one or more statements about whole grain foods increased significantly from 45% at Time 1 to 62% at Time 2 ($P \leq 0.05$).

In the "True, False, Don't Know" section of the questionnaire, at Time 1, approximately 65% of participants knew that a food is whole grain if the whole grain logo or health claim is on the package (Table 5). Fifty-six percent of participants knew that the statement "bread is always whole grain if it is brown in color" was false. Also, at Time 1, 31 to 45% of participants knew that "wheat", "multigrain", and "stoneground" bread was not always whole grain. Eighty-five percent of participants thought that their grocery store has a wide selection of whole grain foods. After the intervention, the number of participants who were able to identify the statement "All 100% whole wheat bread is whole grain" as true, increased significantly from 65% at Time 1 to 82% at Time 2 ($P \leq 0.01$). The percentage of people who answered correctly that three servings of whole grain foods are recommended per day also increased from 38 to 52%, but this increase was not statistically significant. There were no other statistically significant changes after the intervention.

At Time 2, almost 50% of participants said that they had increased their overall consumption of whole grain foods, and almost 60% could name some diseases or conditions that might be decreased by a diet high in whole grain foods (Table 6). As a result of the intervention, 38% have tried a whole grain food that they "didn't like before but now like." Seventy-five percent eat more whole grains because they think that they will benefit their health by reducing disease risk. Eighty-one percent mentioned that they had tried to follow a healthier diet, and 23% made a recipe from one of the lessons. Most participants (46%) rated their overall level of satisfaction with the whole grain nutrition education program as "good".

Whole grain intake was correlated with smoking, diseases, knowledge and attitudes at Time 1 and Time 2 (Table 7). At Time 1, intake of whole grains was positively correlated with self-report of diabetes, liking the taste of whole grain foods, knowledge of whole grain labeling,

knowledge of recommended whole grain intake, thinking that eating more whole grains would reduce risk of cancer and heart disease, but was negatively correlated with smoking and self-report of cancer, and preferring the taste of white bread to whole grain bread. At Time 2, intake of whole grains was positively correlated with self-report of diabetes, knowledge of recommended whole grain intake, thinking that eating more whole grains would reduce the risk of cancer, heart disease, and bowel disorders, but was negatively correlated with self-report of cancer and preferring the taste of white bread to whole grain bread.

Changes in intake of whole g rains were correlated with Time 1 smoking, taste and self-reported diseases, as well as changes in knowledge and attitudes between Time 1 and Time 2. Partial correlations are reported as indicated in Table 7. Changes in whole grain intake were significantly and positively correlated with changes in thinking that eating more whole grains would reduce the risk of bowel disorders and feeling more strongly at Time 2 that whole grain foods will reduce the risk of disease.

Age, gender, race cognition (OMC), and BMI were not associated with the intake of whole grain foods, the 3 whole grain foods with the largest increases after the intervention (WGTop3), or the change in whole grain intake and WGTop3 in univariate (Spearman correlations) or multivariate analyses (regression) (n=84 and n=95). OMC was not correlated with any of the five summary measures of knowledge (xx).

Discussion

To our knowledge, this is the first study that attempted to increase the intake of whole grain foods in older people receiving nutrition services from their local senior center. The theoretical basis for the present intervention was the Health Belief Model which predicts that individuals will make behavior changes if they believe they are at risk for developing a chronic

disease (Coulston et al., 2001). The Older Americans Nutrition Act congregate meal program participants can benefit from nutrition education that addresses the prevention of chronic diseases (Cheong et al., 2003; McCamey et al., 2003; Wellman et al., 2002). The major findings were that at Time 1, participants were highly aware of the relationship of low intake of whole grain foods and chronic disease. Also, after the intervention there were improvements in some, but not all, aspects of recognizing the labeling for whole grain foods; a trend for an increase in knowledge that three or more servings of whole grain foods daily are recommended (from 38% at Time 1 to 52% at Time 2); and a modest, but significant, increase in the total combined intakes of whole grain cereal, whole grain bread, and whole wheat crackers by about 1 serving per week.

It is well established that higher intakes of whole grain foods, such as cereal, bread, and oatmeal, are associated with lower chronic disease risk. For example, in a review by Smith et al.(2003), 17 studies were cited that showed that whole grain foods decreased the risk of heart disease, cancer, and type 2 diabetes. A survey by Market Facts showed that 67% of consumers would eat whole grain products more often if they believed they could help reduce their risk of cancer and heart disease (Market Facts Inc., 1998 as cited by Lang & Jebb, 2003) Similarly, at Time 1, 69% and 76% of congregate meal participants believed that eating more whole grain foods would reduce their risk of cancer and heart disease respectively. The older people in the present study may have been more aware of these diet and disease relationships because of the association between whole grains and fiber. Adequate fiber consumption has been associated with prevention of hyperlipidemia, hypertension, heart disease, and some cancers (Institute of Medicine, 2002). Fiber also promotes gastrointestinal health (Institute of Medicine, 2002) and has received media attention lately focusing on older adults. The 1999 “Shopping for Health” survey found that older adults (54 and over) were more likely than younger shoppers to want

information on fiber (52% vs. 39%) and whole grains (28% vs. 18%) (Prevention Magazine/Food Marketing Institute, 1999).

Despite the scientific evidence that recognizes the many health benefits of adequate whole grain consumption, many consumers cannot successfully identify whole grain foods. It is generally acknowledged that identifying and recognizing the labeling for whole grain foods is challenging for consumers and is potentially a barrier to consumption (Liebman, 1997; Slavin et a al., 2000). Kantor et al. (2001) suggest that inconsistent and unclear labeling standards may be a reason. For example, some foods such as brown rice or whole wheat pasta are more easily identifiable as being whole grain because consumers can only choose between whole grain and the refined/white counterpart. However, confusion arises from processed products with multiple ingredients such as breads, crackers, and other baked goods. These products may be labeled as "multigrain," "nine-grain," or "made with whole grain," and may contain some whole grain ingredients but usually are made with enriched wheat flour without the same amounts of fiber and other health benefits gained from true whole grain food products (Liebman, 1997). Other product labeling terms that may confuse consumers are "stoneground" and "wheat" because these terms do not always identify a whole grain product. The present intervention study supports Liebman's claims about the problems associated with unclear labeling. At Time 1, over 50% of participants answered the true/false questions about ways to identify whole grain foods incorrectly: "all multigrain bread is whole grain," (64%), "all stoneground bread is whole grain," (70%), and "all wheat bread is whole grain" (54%). These finding suggest that more effort should be focused on educating consumers about how to identify whole grains. This education intervention used five messages to help with the labeling confusion: (1) Look for the whole grain logo in large letters on packages, (2) Do not be fooled by "wheat," "multigrain," or

"stoneground" in the name, (3) Look for 100% whole wheat or 100% whole grain in the product name, (4) Look for a whole grain listed as the first ingredient, and (5) Look for the whole grain health claim on food packages. As a result of these messages, at Time 2, there were significant increases in the number of participants who knew that "all 100% whole wheat bread is whole grain" ($P \leq 0.01$) and were able to suggest that a food is whole grain if "the first ingredient is a whole grain" ($P \leq 0.04$). To address the labeling problem, it has been suggested that a consumer-friendly whole grain definition and a universal on-package identifier be developed to help consumers readily identify whole grain foods (Marquart et al., 2003). In 1999 the Food and Drug Administration authorized an on-packagae health claim as another strategy to improve product labeling and consumer identification of whole grains (US Food and Drug Administration, 1999). Additionally, the text of the 2000 Dietary Guidelines includes an educational box that encourages consumers to look for products where a whole-grain ingredient is first on the ingredients list as a way to correctly select whole grains (US Department of Health and Human Services, 2000).

At the present time, the US is the only nation to specifically quantify the number of whole grain servings people should eat per day, and it is only recently that whole grain foods have been separately distinguished from grain foods in general (Lang & Jebb, 2003). Epidemiological data has shown that health benefits can be obtained from one to three servings of whole grain foods per day with no clear dose-response relationship (Jacobs et al., 1998*b*, 1999; Liu et al., 1999, 2000). The Healthy People 2010 report recommends 3 or more servings of whole grains per day (US Department of Health and Human Services, 2000). However, the 2000 Dietary Guidelines which more Americans are familiar with are not specific in their number of servings of whole grains daily. In this study, there was a trend for an increase in the knowledge

that “3 Are Key” from 38% to 52% after the intervention ($P \leq 0.06$). Despite some efforts between various agencies including the Food and Drug Adminstration, US Department of Agriculture, and the Department of Health and Human Services, most consumers are still not meeting the recommendations with an average consumption being <1 serving per day (Adams & Engstrom, 2000). These findings suggest that a more coordinated national plan needs to be developed to get the whole grain message to consumers. The Five a Day Program, a national nutrition education initiative by the National Cancer Institute, was successful in increasing overall intake and awareness of fruits and vegetables and can serve as a model for a similar program which promotes whole grains in the same way (Johnson et al., 2000). Efforts to increase awareness, knowledge, and intake of whole grain foods are just beginning. Focus groups, surveys, as well as behavioral intervention studies will be necessary to help identify messages and campaigns to increase whole grain intakes (Marquart et al., 2003). This whole grain intervention in the elderly was a small scale study in a low-income, low-literacy, rural population, but the conclusions reached show that dietary behavior change related to whole grain foods is possible.

There was a modest increase in the intakes of some whole grain foods. These foods included whole grain cereal, whole grain bread, whole wheat crackers, and popcorn. The lack of a trend for an increase in consumption of the other whole grain foods may reflect the difficulties in identifying these foods, finding them in the grocery store, a lack of knowledge that some of the foods that are most often refined grain (bagels, English muffins, whole wheat flour, etc.) also are marketed in a whole grain form, or that this subgroup of older adults do not typically consume these foods in any form. Other possible barriers to consumption include some, but perhaps not all of the following: unfamiliar taste, lack of preparation time, lack of monetary

resources, unfamiliarity with whole grain foods, and a lack of knowledge of the health benefits of whole grains. However, in this study at Time 1, 85% stated that they liked the taste of whole grain foods, and 60% said they preferred whole grain bread to white bread. Fifty-seven percent did indicate that they believed that whole grain bread was more expensive than white bread. For other food groups, such as fruits and vegetables, similar types of education interventions have shown that intakes can increase (Campbell et al., 1999; Havas et al., 1998). A fruit and vegetable education intervention study conducted in northeast Georgia OANP participants, after analysis of the food frequency questionnaire, showed a significant increase (P=0.03) in total fruit and vegetable items by 2.4 servings per week (Wade, 2003). Another successful intervention designed to increase intakes of fruits, vegetables, and dairy products in the older adult population using a pre- and post-test design, improved fruit, vegetable, and dairy consumption by 1 serving per day (Bernstein et al., 2002). While our results do not reflect statistically significant increases in intake, the trends toward increased consumption of some whole grain foods means that behavior change is a possibility and will continue to be a goal for future whole grain intervention studies in this population.

There are some limitations to this study. This was a convenience sample of mostly Caucasian women. Our findings may not reflect the responses of all OANP participants from different areas with different race, cultural, gender, or age characteristics, but may serve as a model for future interventions and evaluations in low-income, low-literacy older adult populations. Secondly, attendance at the lessons was not mandatory. Although handouts were available for absent participants, they may have missed the key messages that were reinforced at every lesson perhaps negatively influencing their knowledge, intake, and behavior. Thirdly, the dietary intake data from the food frequency questionnaire was self-reported, and may have poor

accuracy because diets vary from day to day and actual amounts eaten may have been difficult for these older participants to reconstruct (Jacobs et al., 1998*b*). Finally, although the prevalence of cognitive disabilities was examined in this study using the Orientation Memory Concentration Test (Katzman, 1983), the information was not used as an exclusion criterion for data analysis. In order to account for differences in cognitive abilities, in this generally low-literacy group, the curriculum was designed using an eighth grade reading level as the mean education level based on a report by Brackett (1999).

The study also had several strengths. Because OANP participants are a group of older adults who are at greater risk for the chronic diseases that whole grains help to prevent, this educational program was designed to help a population that was in need of an intervention. Trained educators delivered all of the lessons. The key messages about whole grains were repeated at each of the five sessions. Each handout had easy whole grain recipes with short preparation times to encourage participants to try whole grains at home. Each lesson ended with a tasting session that featured the whole grain discussed in that day's lesson. All sessions were informal, the participants had the opportunity to ask questions and make comments, and key concepts were repeated during taste testing of whole grain foods.

Future studies should include focus groups and more behavioral interventions in the older adult population to learn about messages and campaigns to encourage whole grain consumption. Studies should focus on helping consumers identify and purchase whole grain food products. Additionally, in future interventions, more emphasis should be placed on the three or four key whole grain foods that consumers are most familiar with and are more likely to purchase. These interventions should also include tips on ways to include different whole grains at each meal. Behavioral interventions should have simple compelling messages, and be easy to implement.

Acknowledgements

This study was funded by the USDA-Food Stamp Nutrition Education Program, Georgia Department of Human Resources, and Northeast Georgia Regional Development Center and Area Agency on Aging.

TABLE 1. Characteristics of Participants

Variable	Total Sample
Age, years	
n	95
mean ± SD	77 ± 7
<80, %	61
≥80, %	39
Gender	
n	95
men, %	12
women, %	82
Ethnicity	
n	95
white, %	75
black, %	25
OMC[a]	
n	95
mean	6.8 ± 6.4
≤8, % (normal or minimal impairment)	68
9-19, % (moderate impairment)	26
≥20, % (severely impaired)	5
BMI[b], (kg/m^2)	
n	76
mean	27.4 ± 5.1
<25, %	29
25-<30, %	38
≥30, %	33
G37. Do you like the taste of whole grain foods (breads, cereal, oatmeal, etc.)?	
n	95
yes, %	85
no, %	15
G38. Do you prefer the taste of white bread to whole grain (wheat) bread?	
n	95
yes, %	39
no, %	61

Variable	Total Sample
G39. Do you think that whole grain bread is more expensive than white bread?	
n	95
yes, %	57
no, %	61
missing, %	9
G40. Would you like to know more about how to include whole grains in your diet?	
n	95
yes, %	84
no, %	16
G41. Would you like a handout with healthy menus to take home?	95
n	92
yes, %	8
no, %	
G42. Do you shop for your own groceries?	
n	95
yes, %	75
no, %	25
G43. If you answered no, then who shops for you?	
n	95
spouse, %	6
other family, %	18
friend, %	1
other, %	2
not applicable, %	73
G44. Do you plan the meals you eat?	
n	95
yes, %	72
no, %	28
G45. Do you cook the meals you eat?	
n	94
yes, %	73
no, %	27
G46. Do you use a microwave at home?	
n	95
yes, %	87
no, %	13

Variable	Total Sample
G47. Do you use a stove at home?	
n	95
yes, %	91
no, %	9
G48. Are you currently smoking cigarettes, pipes or cigars, or using chewing tobacco/snuff?	
n	95
yes, %	7
no, %	93
Do you have or ever had any of the following?	
G49. Diabetes	
n	95
yes, %	31
no, %	69
G50. Cancer	
n	95
yes, %	22
no, %	78
G51. Heart disease or heart attack	
n	95
yes, %	34
no, %	66
G52. High blood cholesterol	
n	93
yes, %	51
no, %	47
missing, %	2
G53. High blood pressure or hypertension	
n	95
yes, %	69
no, %	31
G54. Bowel disorder (constipation, diverticulosis, diverticulitis)	
n	95
yes, %	38
no, %	62

[a]OMC=Orientation memory concentration test, ≤8 Normal cognition, 9-19 Moderate impairment, ≥20 Severe impairment.

[b]BMI= Body mass index, <25 Normal, 25-<30 Overweight, ≥30 obese.

TABLE 2. Intake of Whole Grain Foods, Brown Bread and White Bread by Adults in Older Americans Nutrition Program

Variable	Total sample	Time 1	Time 2	P-values[a]
G7. Oatmeal (regular, quick, or instant)				
n	95	84	84	
Mean ± SD, times/week	2.2 ± 2.6	2.3 ± 2.7	2.3 ± 2.6	0.68
< once/week, %	46	45	43	0.76
≥ once/week, %	54	55	57	
G8. Brown rice (regular or quick)				
n	95	84	84	
Mean ± SD, times/week	0.3 ± 0.8	0.3 ± 0.8	0.3 ± 0.7	0.57
< once/week, %	84	82	77	0.44
≥ once/week, %	16	18	23	
G9. Whole grain cereal				
n	95	84	84	
Mean ± SD, times/week	2.2 ± 2.6	2.1 ± 2.5	2.4 ± 2.4	0.40
< once/week, %	44	43	35	0.27
≥ once/week, %	56	57	65	
G10. Whole grain granola bar				
n	95	84	84	
Mean ± SD, times/week	0.4 ± 1.2	0.3 ± 1.0	0.4 ± 1.3	0.67
< once/week, %	85	86	85	0.83
≥ once/week, %	15	14	15	
G11. Whole grain pasta or noodles				
n	95	84	84	
Mean ± SD, times/week	0.4 ± 1.1	0.4 ± 1.0	0.1 ± 0.4	
< once/week, %	78	79	90	0.03*
≥ once/week, %	22	21	10	0.03*
G12. Brown bread				
n	95	84	84	
Mean ± SD, times/week	3.9 ± 3.4	4.1 ± 3.3	4.0 ± 3.3	0.90
< once/week, %	25	21	23	0.85
≥ once/week, %	75	79	77	
G13. White bread				
n	95	84	84	
Mean ± SD, times/week	2.1 ± 2.7	2.2 ± 2.7	1.6 ± 2.6	0.05*

Variable	Total sample	Time 1	Time 2	P-values[a]
< once/week, %	49	48	61	0.09
≥ once/week, %	51	52	39	
G14. Whole grain bread				
n	95	84	84	
Mean ± SD, times/week	2.7 ± 3.4	2.9 ± 2.7	3.3 ± 0.3	0.21
< once/week, %	43	40	33	0.34
≥ once/week, %	57	60	67	
G15. Whole grain bagels				
n	95	84	84	
Mean ± SD, times/week	0.1 ± 0.3	0.1 ± 0.3	0.1 ± 0.3	1.00
< once/week, %	96	96	94	0.47
≥ once/week, %	4	4	6	
G16. Whole grain English muffins				
n	95	84	84	
Mean ± SD, times/week	0.3 ± 0.7	0.3 ± 0.7	0.2 ± 0.5	0.23
< once/week, %	84	82	87	0.39
≥ once/week, %	16	18	13	
G17. Whole wheat crackers				
n	95	84	84	
Mean ± SD, times/week	0.9 ± 2.0	0.8 ± 1.5	1.2 ± 1.8	0.11
< once/week, %	71	69	58	0.15
≥ once/week, %	29	31	42	
G18. Popcorn				
n	95	84	84	
Mean ± SD, times/week	1.0 ± 1.3	1.0 ± 1.4	1.1 ± 1.5	0.18
< once/week, %	53	54	48	0.44
≥ once/week, %	47	46	52	
G19. How often do you cook/bake with whole wheat flour?				
n	95	84	84	
Mean ± SD, times/week	0.1 ± 0.4	0.1 ± 0.4	0.1 ± 0.8	0.91
< once/week, %	94	94	95	0.73
≥ once/week, %	6	6	5	
Summary Scores				
Intake of 11 Whole Grain Foods, servings/week				

Variable	Total sample	Time 1	Time 2	P-values[a]
n	95	84	84	
Mean ± SD	10.4 ± 6.4	10.5 ± 6.2	11.7 ± 6.9	0.22
Intake of 3 Whole Grain Foods with the Largest Increases after the Intervention[b], servings/week				
n	95	84	84	
Mean ± SD	5.8 ± 4.6	5.8 ± 4.4	6.9 ± 4.8	0.05*
Whole Grain, servings/day				
n	95	84	84	
< 1 serving/d, %	27	26	23	0.59
≥ 1 serving/d, %	73	74	77	
< 2 servings/d, %	69	69	61	0.26
≥ 2 servings/d, %	31	31	39	
< 3 servings/d, %	89	90	86	0.34
≥ 3 servings/d, %	11	10	14	

[a] P-values are from Signed Rank test for comparing Time 1 and Time 2 means,(except for "intake of 3 whole grain foods" which was normally distributed) and from Chi-square analyses for comparing Time 1 and Time 2 frequencies.
[b] Mean intakes of the three whole grain foods that increased by 0.3 servings/week or more (whole grain cereal, whole grain bread, and whole wheat crackers).

TABLE 3. Attitudes About Whole Grain Foods and Chronic Disease by Adults in Older Americans Nutrition Program

Variable	Total sample	Time 1	Time 2	P-values
G20. Do you think that eating more whole grain foods will help reduce your risk of cancer?				
n	94	83	83	0.16
No, %	2	2	6	
Yes, %	70	69	76	
Don't know, %	28	29	18	
G21. Do you think that eating more whole grain foods will help reduce your risk of heart disease?				
n	95	84	84	0.27
No, %	1	1	5	
Yes, %	75	76	79	
Don't know, %	24	23	17	
G22. Do you think that eating more whole grain foods will help reduce your risk of type 2 diabetes?				
n	95	84	84	0.11
No, %	3	4	11	
Yes, %	64	65	68	
Don't know, %	33	31	21	
G23. Do you think that eating more whole grain foods will help reduce your risk of bowel disorders?				
n	95	84	84	0.83
No, %	3	2	4	
Yes, %	79	82	83	
Don't know, %	18	15	13	
G24. Do you think that if you improved the way that you eat, that you would be a much healthier person?				
n	95	84	84	0.67
No, %	14	13	11	
Yes, %	79	81	86	
Don't know, %	7	6	4	

TABLE 4. Ways to Identify Whole Grain Foods: Suggestions by Participants in Older Americans Nutrition Program

Variable	Total sample (n = 95)	Time 1 (n = 84)	Time 2 (n = 84)	P-values
	%	%	%	
Correct Suggestions				
G25a. Whole grain logo is on package	20	20	32	0.08
G25b. Whole grain health claim is on package	5	5	8	0.35
G25g. 100% whole wheat or 100% whole grain is in the name	19	20	20	1.00
G25h. First ingredient is a whole grain	4	5	14	0.04*
Incorrect Suggestions				
G25c. By brown color- such as brown bread	22	24	18	0.34
G25d. "Wheat" is in the name	3	4	5	0.70
G25e. "Multigrain" is in the name	0	0	1	0.32
G25f. "Stoneground" is in the name	0	0	0	1.00
Other Suggestions				
G25i. Other	19	19	10	0.08
G25j. Don't know	14	14	12	0.65
Correct Suggestions (WGrc) (Maximum= 4)				
n		84	84	
Mean		0.5 ± 0.6	0.8 ± 0.7	0.02*
0, %		55	38	
1, %		40	50	
2, %		5	11	
3, %		0	1	
≥ 1 correct, %		45	62	

Variable	Total sample (n = 95)	Time 1 (n = 84)	Time 2 (n = 84)	P-values
Incorrect suggestions (WGrw) (Maximum= 4)				
n		84	84	
Mean		0.3 ± 0.4	0.2 ± 0.6	0.48
0, %		73	81	
1, %		27	15	
2, %		0	2	
3, %		0	1	
≥ 1 wrong, %		27	19	

TABLE 5. Ways to Identify Whole Grain Foods by Adults in Older Americans Nutrition Program: True, False, and Don't Know

Variable	Total Sample (n = 95)	Time 1 (n = 84)	Time 2 (n = 84)	P-values
G26. A food is whole grain if the whole grain logo is on the package.				
False, %	11	12	8	0.40
True, %[a]	66	65	75	
Don't know, %	23	23	17	
G27. A food is whole grain if a whole grain health claim is on the package.				
False, %	13	13	15	0.90
True, %[a]	62	64	62	
Don't know, %	25	23	23	
G28. Bread is always whole grain if it is brown in color.				
False, %[a]	55	56	48	0.56
True, %	37	36	43	
Don't know, %	8	8	10	
G29. All "wheat" bread is whole grain.				
False, %[a]	47	45	48	0.80
True, %	39	39	40	
Don't know, %	14	15	12	
G30. All "multigrain" bread is whole grain.				
False, %[a]	34	36	40	0.75
True, %	34	33	33	
Don't know, %	33	31	26	
G31. All "stoneground" bread is whole grain.				
False, %[a]	29	31	39	0.46
True, %	35	35	27	
Don't know, %	36	35	33	
G32. All 100% whole wheat bread is whole grain.				
False, %	21	23	6	0.01*
True, %[a]	67	65	82	
Don't know, %	12	12	12	

Variable	Total Sample (n = 95)	Time 1 (n = 84)	Time 2 (n = 84)	P-values
G33. A food is whole grain if the first ingredient is a whole grain, like whole wheat, whole rye, or whole oats.				
False, %	11	10	13	0.61
True, % [a]	71	69	70	
Don't know, %	19	21	17	
G34. White bread is whole grain.				
False, % [a]	78	80	83	0.23
True, %	13	13	6	
Don't know, %	9	7	11	
Whole Grain Knowledge 9 Item Score (Maximum= 9)				
Mean ± SD	5.1 ± 1.8	5.1 ± 1.8	5.5 ± 2.0	0.15 [b]
G35. Do you think that your grocery store has a wide selection of whole grain foods (breads, cereal, oatmeal, pasta, etc.)?				
No, %	3	4	5	0.83
Yes, %	84	85	86	
Don't know, %	13	12	10	
G36. How many whole grain servings should people eat each day?				
1 serving, %	17	18	19	0.19
2 servings, %	21	20	14	
3 servings or more, %*	38	38	52	
Don't know	24	24	14	
G36c. How many whole grain servings should people eat each day?				
Incorrect, % (1, 2, or DK)	62	62	48	0.06
Correct, % (3 or more)	38	38	52	

*$P \leq 0.05$, ** $P \leq 0.01$.

[a] Indicates correct answer.
[b] Student's t-test

TABLE 6. Changes in Knowledge, Attitudes, and Behaviors Related to Whole Grain Foods After the Intervention

Variable	Time 2 (n = 84)
GB60. Have you increased your overall consumption of whole grain foods (breads, cereal, oatmeal, pasta, etc.)	
No, %	51
Yes, %	48
Don't know, %	1
GB61. Can you think of some diseases or conditions that might be decreased by a diet high in whole grain foods?	
No, %	31
Yes, %	57
Don't know, %	12
GB62. Tried a whole grain food that you didn't like before, but now like?	
No, %	62
Yes, %	38
Don't know, %	0
GB63. Eat more whole grain foods because you think they are good for you?	
No, %	24
Yes, %	76
Don't know, %	0
GB64. Feel more strongly than before that eating whole grain foods will reduce the risk of disease?	
No, %	25
Yes, %	75
Don't know, %	0
GB65. Tried to follow a healthier diet?	
No, %	19
Yes, %	81
Don't know, %	0
GB66. Made a recipe from one of the lessons?	
No, %	77
Yes, %	23
Don't know, %	0

Variable	Time 2 (n = 84)
GB67. What was your overall level of satisfaction with this whole grain nutrition education program?	
Poor, %	0
Fair, %	7
Good, %	46
Very Good, %	32
Excellent, %	13
GB68. How many sessions of the whole grain nutrition education program did the participant attend?	
0 lessons, %	7
1 lesson, %	8
2 lessons, %	13
3 lessons, %	11
4 lessons, %	15
5 lessons, %	13
Missing attendance records, %	32

TABLE 7. Correlations of Whole Grain Intake with Smoking, Diseases, Knowledge, and Attitudes

	Time 1 Intake of Whole Grains (Servings/Week)[a]	Time 2 Intake of Whole Grains (Servings/Week) [b]	Change in Intake of Whole Grains (Servings/Week)
Smoking			
G48. Are you currently smoking cigarettes, pipes, or cigars, or using chewing tobacco/snuff?	-0.24	-0.10	0.13[c]
Diseases (self-report, past or current)			
G49. Diabetes	0.31**	-0.10*	0.05[c]
G50. Cancer	-0.30**	-0.24*	-0.06[c]
G51. Heart disease or heart attack	-0.01	0.09	0.11[c]
G52. High blood cholesterol	0.08	0.16	0.21[c]
G53. High blood pressure or hypertension	-0.04	-0.16	-0.21[c]
G54. Bowel disorder (constipation, diverticulosis, diverticulitis)	-0.05	-0.18	-0.21[c]
Taste			
G37. Do you like the taste of whole grain foods?	0.25*	0.21	0.03[c]
G38. Do you prefer the taste of white bread to whole grain (wheat) bread?	-0.29**	-0.28**	-0.11[c]
Knowledge			
Wgk. Knowledge of whole grain labeling	0.29**	0.07	-0.07[e]
36c. Know that 3 or more servings of whole grains recommended daily	0.26*	0.23*	0.07[e]
Attitudes			
Do you think that eating more whole grain foods will help reduce your risk of:			
G20. Cancer	0.38***	0.33**	0.09[e]
G21. Heart disease	0.30**	0.23*	0.01 [e]
G22. Type 2 diabetes	0.18	0.43****	0.21 [e]
G23. Bowel disorders	0.12	0.12	0.28* [e]
G24. Do you think that if you improved the way that you eat, that you would be a much healthier person?	0.14	0.16	0.14 [e]
Gb64x. Feel more strongly than before that eating whole grain foods	NA	NA	0.31**

will reduce the risk of disease?			

N = 82-84; NA is not applicable; * $P \leq 0.05$; ** $P \leq 0.01$, *** $P \leq 0.001$; **** $P \leq 0.0001$

[a]Correlations of Time 1 whole grain intake with Time 1 diseases, taste, knowledge and attitudes.
[b]Correlations of Time 2 whole grain intake with Time 1 smoking, diseases and Time 2 taste, knowledge, and attitudes.
[c]Partial correlations of changes in whole grain intake with Time 1 smoking or diseases (controlled for Time 1 whole grain intake).
[d]Question was asked only at Time 2.
[e]Partial correlations of changes in whole grain intake with changes in knowledge or attitudes (controlled for Time 1 knowledge or attitudes).

CHAPTER 4

CONCLUSIONS

The goals of this educational intervention and evaluation were to (1) determine knowledge, attitudes, and intakes of whole grain foods and (2) determine the effects of a nutrition education intervention on improving the knowledge, attitudes, and intake of whole grain foods. It was hypothesized that knowledge, attitudes, and intakes of whole grain foods would be low initially, but would improve after the intervention. At Time 1 (pre-test), Older Adults Nutrition Act Program (OANP) participants were highly aware of the relationship of low intake of whole grain foods and chronic disease risk, but had low knowledge about how to identify whole grain foods using the food label and how many servings of whole grain foods are recommended daily. After the intervention there were some improvements in recognition of whole grain food labels; a trend for an increase in knowledge that three or more servings of whole grain foods are recommended daily (from 38% at Time 1 to 52% at Time 2); and a modest but significant, increase in the total combined intakes of whole grain cereal, whole grain bread, and whole wheat crackers by about 1 serving per week. Therefore, the findings support the hypotheses in this sense: prior to the nutrition education intervention, although participants were aware of the relationship between whole grains and chronic disease risk, their attitudes and intakes of whole grain foods were low. After the educational their attitudes and intakes of whole grain foods improved.

The results of this whole grain nutrition education intervention show that a subgroup of older adults who are considered to be low-income and high nutritional risk, are nonetheless capable of dietary behavior changes that promote healthy aging. Because this study found only

modest increases in whole grain intake (about 1 serving per week), more effort should be made to increase whole grain consumption. In this particular study, the nutrition educators used appropriate whole grain food products as visual aids at the lessons. These aids included whole grain bread bags (to show participants how to look for 100% whole wheat on the label), whole grain cereal boxes (to show the whole grain health claim and 100% whole wheat on the box), oatmeal boxes (to show the whole grains and heart disease health claim), and whole wheat cracker boxes (to show the 100% whole grain label). These displays reinforced the message to look for 100% whole grain boldly displayed on the front of the package as a way to clearly identify whole grain products. Also, participants were instructed to check for a whole grain (whole-wheat flour, whole ground corn, whole rye, whole oats, etc.) as the first ingredient on the food label. These two messages led to significant changes in knowledge at Time 2 as more participants knew that "all 100% whole wheat bread is whole grain" ($P \leq 0.01$) and were able to suggest that a food is whole grain if "the first ingredient is a whole grain" ($P \leq 0.04$). At Time 2, many participants (43%) still answered "true" to the statement that bread is always whole grain if it is brown in color. Additionally, 40%, 33%, and 27% answered incorrectly that all "wheat", "multigrain", and "stoneground" breads were whole grain, respectively. These results indicate that there is still confusion concerning how to recognize whole grains. Therefore, future interventions should continue to strongly emphasize identification of whole grain food products.

This study found significant increases in the combined mean intakes of whole grain cereal, whole grain bread, and whole wheat crackers by about 1 serving/week after the intervention ($P \leq 0.05$). This finding may suggest that key whole grain food items are most popular, common, and easily accessible to consumers. Other studies have reported that bread and breakfast cereals are the most popular sources of whole grains based on convenience, taste, and

availability (Jacobs et al., 1998*a*; Liu et al., 1999; Richardson, 2000). Future studies may find improved intakes of whole grains by focusing on the foods that consumers like and can be easily incorporated into meals. For example, interventions may focus on specific foods for breakfast (whole grain toast, breakfast cereal, or oatmeal), lunch (sandwich made with whole grain bread), and dinner (brown rice). Also, healthy whole grain snacking should be promoted with foods such as popcorn, whole wheat crackers, or baked tortilla chips.

This intervention also included whole grain recipes in the handouts and product tastings at each session. At Time 2, 23% said that they had tried a recipe from the lessons and 38% said that they had tried a whole grain food that they did not like before, but now like. Participants seemed to enjoy the product tastings and were able to identify whole grain products to try at home that suited their particular tastes. Other important ideas that can be incorporated into future interventions include: repetition of the "3 are Key" message, emphasis on the health benefits of whole grain intake, and checklists for goal-setting may improve program outcomes.

In conclusion, there is much room for improvement of whole grain food consumption to meet the three servings per day goal not only in the older adult population but in all populations. It is apparent that consumers are interested in learning about whole grains but may not be familiar with proper identification techniques or their relationship to reduced chronic disease risk. The suggestions given in this section may be helpful for future interventions to assist in increasing knowledge, reducing barriers, improving attitudes, and increasing the intakes of whole grain foods in this population.

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APPENDICES

APPENDIX A

WHOLE GRAINS AND YOUR HEALTH CONSENT FORM

FORM WG

WHOLE GRAINS AND YOUR HEALTH CONSENT FORM

I, _____, agree to participate in the study titled "WHOLE GRAINS AND YOUR HEALTH" conducted by Dr. Mary Ann Johnson in the Department of Foods and Nutrition at the University of Georgia. I understand that I do not have to take part if I do not want to. I can stop taking part without giving any reason and without penalty. I can ask to have all information concerning me removed from the research records, returned to me, or destroyed. My decision to participate will not affect the services that I receive at the Senior Center.

The benefits of this study are to help me improve my eating habits (by increasing my awareness and intake of whole grain foods) and physical activity habits. This study will also help the investigators learn more about good ways to help older adults improve their eating and increase their physical activity. This study will be conducted at my local Senior Center. If I volunteer to take part in this study, I will be asked to do the following things:

1. Attend two sessions for collecting information about my health, fitness, food intake, and nutrition habits. Each session will last up to 40 minutes.

2. Attend up to 5 nutrition and health programs and take part in a physical activity program to improve my strength and balance. Each session will last about 30 to 60 minutes each.

3. Someone from the study may contact me to clarify my information.

The instructor will provide food to taste. Mild to no risk is expected by tasting food. However, I will not taste foods that I should not eat because of swallowing difficulties, allergic reactions, dietary restrictions, or other food-related problems.

No risk is expected, but I may experience some discomfort or stress when the researchers ask me questions about my food intake, nutrition status, and health. The leaders will advise me to stop exercising if I experience any discomfort or chest pains. No information concerning myself or provided by myself during this study will be shared with others without my written permission, unless law requires it. I may choose not to answer any question or questions that may make me uncomfortable. I will be assigned an identifying number and this number will be used on all of the questionnaires I fill out. Data will be stored in locked file cabinets under the supervision of Dr. Mary Ann Johnson at the University of Georgia; only the staff involved in the study will have access to these data and only for the purpose of data analyses and interpretation of results. The data will be destroyed by January 1, 2012.

If I have any further questions about the study, now or during the course of the project I can call Ms. Marilyn Wright (706-542-4838) or Dr. Mary Ann Johnson (706-542-2292).

I will sign two copies of this form. I understand that I am agreeing by my signature on this form to take part in this project. I will receive a signed copy of this consent form for my records.

_____ _____ _____

Signature of Participant Participant's Printed Name Date

_____

Participant Address and Phone

_____ _____Mary Ann Johnson___ _____

Signature of Investigator Printed Name of Investigator Date

_____ _____ _____

Signature of Staff who Printed Name of Staff Date

Read Questionnaire to

Participant

Questions or problems regarding your rights as a participant please call or write: Chris A. Joseph, Ph.D.; Human Subjects Office, The University of Georgia; 606A Boyd Graduate Studies Research Center; Athens, GA 30602-7411; Telephone 706-542-3199;

E-Mail Address IRB@uga.edu.

UGA project number: H2003-10980-0; DHR project number: 030607 09/16/03 maj-je

APPENDIX B

ORIENTATION-MEMORY-CONCENTRATION TEST

ORIENTATION-MEMORY-CONCENTRATION TEST **ID: _____**

Read all questions to the participant. Tell them that some of the questions may be easy and some may be hard -- just do the best you can.

	Response	# of Errors	Max. Errors	Weight Factor	Total
1) What is the year now?			**1**	**4**	
2) What month is it now?			**1**	**3**	
Please repeat this phrase after me: **JOHN BROWN, 42 MARKET STREET, CHICAGO** *No score for this -- it is a memory phrase for Item # 6. Allow the person up to three trials for learning (repeating) the phrase. If the subject has not learned the phrase after three trials, record the value of "0" as the total score for Item #6, and proceed to Item #3.*					
3) Without looking at your watch or a clock, tell me about what time is it? *Note: score is correct if within one hour of actual time.*			**1**	**3**	
4) Count backwards from 20 to 1. *20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1*			**2**	**2**	
5) Say the months of the year in reverse order. *DEC, NOV, OCT, SEPT, AUG, JULY, JUNE, MAY, APR, MAR, FEB, JAN*			**2**	**2**	
6) Please repeat the name and address I asked you to remember. *Count the number of items (5) in memory phrase recalled incorrectly. An answer of either Market or Market Street is acceptable.* John / Brown / 42 / Market Street / Chicago			**5**	**2**	
(10-11) **TOTAL SCORE**					

Interpretation of corrected scores:

≤ 8	Normal or minimal impairment
9-19	Moderate impairment
≥ 20	Severe impairment

Source: Katzman, R., Brown, T., Fuld, P., Peck, A., Schechter, R., Schimmel, H. Validation of a short orientation-memory-concentration test of cognitive impairment. *American Journal of Psychiatry* 140: 734-739, 1983.

APPENDIX C

PRE-TEST: WHOLE GRAIN INTAKE

PRE-TEST: Whole Grain Intake

Administer this questionnaire before doing any nutrition and health education activities

Name (ID): 1-4	**2. County:** 5-7	**3. Date (M/D/Y):** 8-13	***Line 1***
4. Age: 14-16	**5. Male(0) Female(1)** 17	**6. White(1) Black(2) Hispanic(3) Other(4)** 18	

How often do you eat these foods?	Less than 1 per wk	1 per wk	2 per wk	3 per wk	4 per wk	5 per wk	6+ per wk	1 per day	2 per day	Missing/ Don't Know	
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	***Line 2***
7. Oatmeal (regular, quick, or instant)	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	7
8. Brown Rice (regular or quick)	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	8
9. Whole grain cereal (ask what kind/brand to confirm whole grain)	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	9
10. Whole grain granola bar	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	10
11. Whole grain pasta or noodles	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	11
12. Brown bread	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	12
13. White bread	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	13
14. Whole grain bread (ask what kind/brand to confirm whole grain)	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	14
15. Whole grain bagels	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	15
16. Whole grain English muffins	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	16
17. Whole wheat crackers	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	17
18. Popcorn	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	18
19. How often do you cook/bake with whole-wheat flour?	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	19

Please answer "yes" or "no" to these next questions.	**0**	**1**	**8**	**9**	
20. Do you think that eating more whole grain foods will help reduce your risk of <u>cancer</u>?	No	Yes	Don't know	Missing	20
21. Do you think that eating more whole grain foods will help reduce your risk of <u>heart disease</u>?	No	Yes	Don't know	Missing	21
22. Do you think that eating more whole grain foods will help reduce your risk of <u>type 2 diabetes</u>?	No	Yes	Don't know	Missing	22
23. Do you think that eating more whole grain foods will help reduce your risk of <u>bowel disorders</u> (constipation, diverticulosis, diverticulitis)?	No	Yes	Don't know	Missing	23
24. Do you think if you improved the way you eat, that you would be a much healthier person?	No	Yes	Don't know	Missing	24
How many different ways can you tell if foods are whole grain, for example, if bread is whole grain? (Note to interviewer: do not prompt answers; check any of these answers if given by participant, or write in other answers or mark don't know if appropriate.)	No	Yes	Don't know	Missing	

25a. _____ Whole grain logo is on package 25b. _____ Whole grain health claim is on package 25c. _____ By brown color – such as brown bread 25d. _____"Wheat" is in the name 25e. _____ "Multigrain is in the name 25f. _____ "Stoneground" is in the name 25g. _____ 100% Whole wheat or 100% whole grain is in the name 25h. _____ First ingredient is a whole grain (e.g., whole wheat flour, whole rye flour, oatmeal, etc.) 25i. _____ Other _____ 25j. _____ Don't know					25 26 27 28 29 30 31 32 33 34

Please circle "true" or "false" or "Don't Know" to these next questions	**Circle 0 1 2**	**Line 2**
26. A food is whole grain if the whole grain logo is on the package.	F T DK	35
27. A food is whole grain if a whole grain health claim is on the package.	F T DK	36
28. Bread is always whole grain if it is brown in color.	F T DK	37
29. All "wheat" bread is whole grain.	F T DK	38
30. All "multigrain" bread is whole grain.	F T DK	39
31. All " stoneground" bread is whole grain.	F T DK	40
32. All 100% whole-wheat bread is whole grain.	F T DK	41
33. A food is whole grain if the first ingredient is a whole grain, like whole wheat, whole rye or whole oats.	F T DK	42
34. White bread is whole grain.	F T DK	43

35. Do you think that your grocery store has a wide selection of whole grain foods (breads, cereal, oatmeal, pasta, etc.)?	No	Yes	Don't know	Missing	44
36. How many whole grain servings should people eat each day? **How many whole grain servings should people eat each day?** ***Circle one: 1 2 3 or more***			Don't know	Missing	45

PRE-TEST ONLY

	0	**1**	
37. Do you like the taste of whole grain foods (breads, cereal, pasta, oatmeal, etc.)?	No	Yes	46
38. Do you prefer the taste of white bread to whole grain (wheat) bread?	No	Yes	47
39. Do you think that whole grain bread is more expensive than white bread?	No	Yes	48
40. Would you like to know more about how to include whole grains in your diet?	No	Yes	49
41. Would you like a handout with healthy menus to take home?	No	Yes	50
42. Do you shop for your own groceries?	No	Yes	51
43. <u>If you answered no, then who shops for you?</u> **8=not applicable; 1=spouse, 2=other family, 3=friend, 4=other, describe:_____**			52
44. Do you plan the meals you eat?	No	Yes	53
45. Do you cook the meals you eat?	No	Yes	54
46. Do you use a microwave at home?	No	Yes	55

47. Do you use a stove at home?	No	Yes	56
48. Are you currently smoking cigarettes, pipes or cigars, or using chewing tobacco/snuff?	No	Yes	57
Do you have or have you ever had any of the following?	0	1	
49. Diabetes	No	Yes	58
50. Cancer	No	Yes	59
51. Heart disease or heart attack	No	Yes	60
52. High blood cholesterol	No	Yes	61
53. High blood pressure or hypertension	No	Yes	62
54. Bowel disorder (constipation, diverticulosis, diverticulitis)	No	Yes	63
STAFF			
55. Has this individual participated in the fruit and vegetable evaluation?	No	Yes	64
56. If yes, what is their id number? _____	No	Yes	65-68

APPENDIX D

POST-TEST: WHOLE GRAIN INTAKE

POST-TEST: Whole Grain Intake

Administer this questionnaire after doing any nutrition and health education activities

Name (ID): 1-4	**2. County:** 5-7	**3. Date (M/D/Y):** 8-13	***Line 1***
4. Age: 14-16	**5. Male(0) Female(1)** 17	**6. White(1) Black(2) Hispanic(3) Other(4)** 18	

How often do you eat these foods?	Less than 1 per wk	1 per wk	2 per wk	3 per wk	4 per wk	5 per wk	6+ per wk	1 per day	2 per day	Missing /Don't Know	
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	***Line 2***
7. Oatmeal (regular, quick, or instant)	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	7
8. Brown Rice (regular or quick)	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	8
9. Whole grain cereal (ask what kind/ brand to confirm whole grain)	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	9
10. Whole grain granola bar	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	10
11. Whole grain pasta or noodles	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	11
12. Brown bread	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	12
13. White bread	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	13
14. Whole grain bread (ask what kind/brand to confirm whole grain)	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	14
15. Whole grain bagels	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	15
16. Whole grain English muffins	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	16
17. Whole wheat crackers	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	17
18. Popcorn	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	18
19. How often do you cook/bake with whole-wheat flour?	<1/wk	1/wk	2/wk	3/wk	4/wk	5/wk	6/wk	1/dy	2/dy	M/DK	19

Please answer "yes" or "no" to these next questions.	**0**	**1**	**8**	**9**	
20. Do you think that eating more whole grain foods will help reduce your risk of <u>cancer</u>?	No	Yes	Don't know	Missing	20
21. Do you think that eating more whole grain foods will help reduce your risk of <u>heart disease</u>?	No	Yes	Don't know	Missing	21
22. Do you think that eating more whole grain foods will help reduce your risk of <u>type 2 diabetes</u>?	No	Yes	Don't know	Missing	22
23. Do you think that eating more whole grain foods will help reduce your risk of <u>bowel disorders</u> (constipation, diverticulosis, diverticulitis)?	No	Yes	Don't know	Missing	23
24. Do you think if you improved the way you eat, that you would be a much healthier person?	No	Yes	Don't know	Missing	24

How many different ways can you tell if foods are whole grain, for example, if bread is whole grain? (Note to interviewer: do not prompt answers; check any of these answers if given by participant, or write in other answers or mark don't know if appropriate.)	No	Yes	Don't know	Missing	
25a. _____ Whole grain logo is on package					25
25b. _____ Whole grain health claim is on package					26
25c. _____ By brown color – such as brown bread					27
25d. _____ "Wheat" is in the name					28
25e. _____ "Multigrain" is in the name					29
25f. _____ "Stoneground" is in the name					30
25g. _____ 100% whole wheat or 100% whole grain is in the name					31
25h. _____ First ingredient is a whole grain (e.g., whole-wheat flour, whole rye flour, oatmeal, etc.)					32
25i. _____ Other					33
_____					34
25j. _____ Don't know					

Please circle "true" or "false" or "Don't Know" to these next questions	Circle 0 1 2	Line 2
26. A food is whole grain if the whole grain logo is on the package.	F T DK	35
27. A food is whole grain if a whole grain health claim is on the package.	F T DK	36
28. Bread is always whole grain if it is brown in color.	F T DK	37
29. All "wheat" bread is whole grain.	F T DK	38
30. All "multigrain" bread is whole grain.	F T DK	39
31. All " stoneground" bread is whole grain.	F T DK	40
32. All 100% whole-wheat bread is whole grain.	F T DK	41
33. A food is whole grain if the first ingredient is a whole grain, like whole wheat, whole rye or whole oats.	F T DK	42
34. White bread is whole grain.	F T DK	43

	No	Yes	Don't know	Missing	
35. Do you think that your grocery store has a wide selection of whole grain foods (breads, cereal, oatmeal, pasta, etc.)?					44
36. How many whole grain servings should people eat each day? **How many whole grain servings should people eat each day?** ***Circle one: 1 2 3 or more***			Don't know	Missing	45

OPEN-ENDED BEHAVIOR AND KNOWLEDGE QUESTIONS RELATED TO WHOLE GRAIN INTAKE

Line 3

	No	Yes	Don't know	Missing	
60. Have you increased your overall consumption of whole grain foods (breads, cereal, pasta, oatmeal, etc.)? **Please list foods: Total # per week:_____**					46
61. Can you think of some diseases or conditions that might be decreased by a diet high in whole grain foods? List:					47

(Questions 62-66) Because of the information that you learned in the lessons, have you or do you:
(*Record additional responses below.)*

62. Tried a whole grain food that you didn't like before, but now like?	No	Yes	Don't know	Missing	48
63. Eat more whole grain foods because you think they are good for you?	No	Yes	Don't know	Missing	49
64. Feel more strongly than before that eating whole grain foods will reduce the risk of disease?	No	Yes	Don't know	Missing	50
65. Tried to follow a healthier diet?	No	Yes	Don't know	Missing	51
66. Made a recipe from one of the lessons?	No	Yes	Don't know	Missing	52
POST-TEST ONLY ***Line 4***					
67. What was your overall level of satisfaction with this whole grain nutrition education program? Circle one: *1-Poor, 2-Fair, 3-Good, 4-Very Good, 5-Excellent*					53
68. How many sessions of the whole grain nutrition education program did the participant attend? *Staff should document with attendance records.*					54