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THE IMPACT OF GROCERY STORE PODCASTS IN THE DELIVERY OF
NUTRITION EDUCATION TO IMPROVE SHOPPING BEHAVIORS,
PARTICULARLY THE PURCHASE OF OMEGA-3 RICH FOODS

BY

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Abstract of the Dissertation

The Impact of Grocery Store Podcasts in the Delivery of Nutrition Education to Improve Shopping Behaviors, Particularly the Purchase of Omega-3 Rich Foods

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Omega-3 (n-3) fatty acids are important nutrients and are deficient in the American diet. Therefore increasing the intake of n-3s is a public health goal. Research has suggested that because people eat what they buy, point-of-purchase interventions may have the potential to help consumers make healthy food choices. A study of existing literature revealed that these interventions have not used newer technological means, have many limitations, and have failed to assess long-term shopping behavior change. The research presented in this dissertation aims to test use of, and long-term effects of, new technology (i.e., podcasts) as a means of delivering nutrition education at the grocery store to interested consumers while they shop.

A single-group, repeated-measures, mixed-methods study design was employed to determine if listening to a podcast about n-3s while grocery shopping increased shoppers' awareness about, and purchases of, seafood and other foods rich in n-3s. Constructs from

the Theory of Reasoned Action were used to evaluate the effectiveness of the podcasts. A secondary data analysis of participant food purchase data was done to examine the long-term effects of podcast exposure over the six months following the intervention (as compared to the six months prior). As a result of exposure to the podcasts TRA constructs improved, knowledge about n-3s increased and misconceptions were reduced. In addition, both long-term (six months post-intervention) and short-term purchases (day of the intervention) of n-3 rich food item purchases increased. These findings suggest that podcasts may be an effective means to communicate nutrition education messages at the point of purchase, to those who indicate an interest in the subject.

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Chapter 1: Introduction

Omega-3 fatty acids (n-3s) are crucial components of a healthy diet. The three most widely researched types of n-3s are, alpha linolenic acid (ALA), docosahexaenoic acid (DHA), and eicosapentaenoic acid (EPA). These fatty acids are essential because ALA is not synthesized by the human body and, DHA and EPA are inefficiently converted from ALA.^{1,2} Their importance in health is evidenced by the fact that national dietary recommendations state that the general population must consume at least eight ounce servings of seafood, which are primary sources of DHA and EPA, each week.³ The consequence of consuming n-3s has been highlighted by epidemiological researchers who have identified low intake of n-3s as one of the top 10 risk factors related to preventable causes of death in the United States.⁴ Since consumption of seafood is low,³ it is imperative that interventions to educate and inform the general public regarding the importance of n-3 consumption and the possible health benefits associated with these nutrients be developed.

Supermarkets are pivotally positioned between the population at large and the foods they consume, as people cannot eat what they do not buy. Because consumers visit grocery stores more than two times per week and many consumers appreciate nutrition education availability in the store,⁵ grocery stores may be a venue with great potential for influencing behavior change.^{6,7} While food packaging and labeling is gaining in popularity as one way to obtain nutrition education in stores; insufficient omega-3 claims appear on food product packages. Claims often fail to distinguish between the different

n-3 fats (which are linked to widely varied health outcomes), and foods' omega-3 content does not appear on nutrition facts labels. Therefore, with regards to good food sources of n-3s additional education is needed at the point of purchase.

The use of technological devices may be one means of educating consumers in stores while grocery shopping. Research shows that the general public already uses mobile devices to check prices, research products, and read product reviews before and during their time in the store.⁵ The use of mobile devices to download and listen to educational podcasts, either prior to or during shopping, better inform consumers about foods rich in n-3s. However, the use of podcasts in providing nutrition education to the public is sparse in the literature; no research has examined their use at the point-of-purchase. Thus, the investigator developed this project aiming to test the use of a grocery store tour podcast(s) for the delivery of n-3 nutrition education.

The theory of reasoned action (TRA) has been used as the theoretical framework for the work described in this dissertation. The TRA focuses on the theoretical constructs concerned with motivational factors as determinants of behavior change.⁸ TRA asserts that the intentions to perform a behavior greatly influence behavior change, and intentions are influenced by other constructs.⁹ Among these constructs are: perceived behavioral control (i.e., belief's of one's capabilities to perform a behavior),¹⁰ subjective norms (i.e., the perception that those important to the individual think that performing the behavior is important),¹¹ and perceived importance (i.e., the degree of importance one places on performing the behavior)⁸ of the behavior in question.

The research represents a novel approach to nutrition and point-of-purchase education delivery to encourage the purchase of foods containing an essential nutrient that is under-consumed in the American diet. If it is successful, the approach could be applied to increasing the purchase of other nutrient dense foods nutrition educators hope to encourage.

Study Hypotheses

One hypothesis for the formative research presented in this dissertation was:

1. Consumers interested in learning more about n-3s will enjoy listening to a podcast about them and the foods they can find them in, as they shop.

Hypotheses, tested in both the formative research and the primary research study, presented in this dissertation were:

2. Listening to a podcast(s) about n-3s and n-3 rich foods while grocery shopping will increase the immediate purchase of n-3 rich foods, as well as intermediary (TRA) variables that may affect immediate and long-term purchasing behaviors. Intermediary variables include: self-efficacy, perceived importance, social norms, and behavioral intentions.

Study hypotheses associated with the primary study only were:

3. Listening to podcasts about n-3s and n-3 rich foods while grocery shopping will reduce shoppers' misconceptions and increase their knowledge about n-3s': types, food sources and health benefits;

4. Listening to podcasts about n-3s and n-3 rich foods while grocery shopping will result in long-term (6-month post-intervention) increased purchase of n-3 rich foods.

This project will contribute to the scientific literature regarding the use of podcasts to deliver impactful nutrition education interventions at the point of purchase.

Dissertation Format

A non-traditional format has been used for this dissertation. Chapters 1-3 and 7 have been written and referenced separately from the stand alone data chapters. Chapters 4-6 are written in manuscript form ready to submit to peer-reviewed journals. The bibliography has been formatted in accordance American Medical Association's manual of style. Chapter Four is comprised of the findings related to the investigation's pilot (hypotheses 1-2); Chapter Five reports the findings related to hypotheses 2-3; and, Chapter Six documents the findings associated with hypothesis four. Chapter Seven synthesizes the findings from the unique findings presented in Chapters 4-6.

Chapter 2: Literature Review

The literature review for this project examines the potential for success of using various social media to educate the public about omega-3 fatty acids. It opens with information that defines omega-3s (n-3s), followed by a section on their health implications. The review goes on to discuss the importance of the media in communicating health information, particularly with regards to n-3s. Since American diets are n-3 deficient one way to increase consumption is if n-3 rich food purchase at point of purchase locations are encouraged. Nutrition intervention studies at point of purchase sites especially grocery stores or supermarkets and use of technologies in point-of-purchase interventions are discussed next. Lastly this chapter features a review of the Theory of Reasoned Action, from which particular constructs have been chosen to support the work defined within this dissertation.

Omega-3s and Nutrition

Long chain n-3s are essential polyunsaturated fatty acids (PUFAs).¹² PUFAs are characterized by the position of the double bonds in their structure. With regard to n-3s, the double bond is on the third carbon, from the methyl end of the fatty acid.¹² The three types of n-3s that have been most studied in terms of human health are alpha linolenic acid (ALA), eicosapentaenoic acid (EPA) and, docosahexaenoic acid (DHA). ALA is essential to the human body as it is not endogenously synthesized.¹² DHA and EPA are synthesized from ALA but this conversion is inefficient and appears to be minimal in humans.^{1,12} Foods commonly consumed by the US population that are rich in these n-3s

are shown in Table 2.1 and 2.2, which were previously published in an article approved by the American Heart Association Science and Coordinating Committee.¹³

TABLE 2.1 α-Linolenic Acid Content of Selected Vegetable Oils, Nuts, and Seeds¹³	
	<i>α-Linolenic Acid Content, g/tbsp</i>
Olive oil	0.1
Walnuts, English	0.7
Soybean oil	0.9
Canola oil	1.3
Walnut oil	1.4
Flaxseeds	2.2
Flaxseed (linseed) oil	8.5
<i>Adapted from USDA Nutrient Data Laboratory.</i>	

In summary, EPA and DHA are usually found together and derived from marine sources like fatty fish and fish oils;¹² chickens, pigs, and cows fed DHA-rich foods, such as seeds, grass, or feed containing DHA, typically produce eggs and meat with higher levels of DHA;⁵ and DHA is sometimes added into processed foods such as dressings, margarine and spreads, mayonnaise, milk, yogurt, and nutrition bars. ALA is found in a variety of plant sources such as vegetable oils, seeds, nuts, legumes and grains.¹²

TABLE 2.2 Amounts of EPA+DHA in Fish and Fish Oils and the Amount of Fish Consumption¹³

	EPA+DHA Content, g/3-oz Serving Fish (Edible Portion) or g/g Oil	Amount Required to Provide ∞ 1g of EPA+DHA per Day, oz (Fish) or g (Oil)
Tuna		
Light, canned in water, drained	0.26	12
White, canned in water, drained	0.73	4
Fresh	0.24-1.28	2.5-12
Sardines	0.98-1.70	2-3
Salmon		
Chum	0.68	4.5
Sockeye	0.68	4.5
Pink	1.09	2.5
Chinook	1.48	2
Atlantic, farmed	1.09-1.83	1.5-2.5
Atlantic, wild	0.9-1.56	2-3.5
Mackerel	0.34-1.57	2-8.5
Herring		
Pacific	1.81	1.5
Atlantic	1.71	2
Trout, rainbow		
Farmed	0.98	3
Wild	0.84	3.5
Halibut	0.4-1.0	3-7.5
Cod		
Pacific	0.13	23
Atlantic	0.24	12.5
Haddock	0.2	15
Catfish		
Farmed	0.15	20
Wild	0.2	15
Flounder/Sole	0.42	7
Oyster		
Pacific	1.17	2.5
Eastern	0.47	6.5
Farmed	0.37	8
Lobster	0.07-0.41	7.5-42.5
Crab, Alaskan King	0.35	8.5
Shrimp, mixed species	0.27	11
Clam	0.24	12.5
Scallop	0.17	17.5
Cod liver oil*	0.19	5
Standard fish body oil	0.30	3
Omega-3 fatty acid concentrate	0.50	2

Data from the USDA Nutrient Data laboratory. The intakes of fish given above are very rough estimates.

*This intake of cod liver oil would provide approximately the RDA of vitamins A and D.

Other types of n-3s being researched in terms of their relationship to human health include stearidonic acid (SDA) and docosapentanoic acid (DPA). Studies are underway to examine SDA's metabolism into EPA to see if it can serve to be a good source of n-3s.^{12,14} DPA is a highly unsaturated fatty acid (HUFA), similar in structure to the better known n-3s, EPA and DHA.¹² There is currently debate among the scientific community as to whether HUFAs, which contain more than three double bonds, are a good source of n-3 in the diet.¹⁵ Food sources for SDA and DPA are genetically modified soybean oil (SDA); and, various fish, land-based meats, and arctic harp seals (DPA).^{12,14}

N-3s are essential fatty acids; their importance to the health and development of the human body is discussed below.

The Health Benefits of Omega-3s

Early research found that consumption of n-3s, especially EPA and DHA, resulted in lower incidence of coronary heart disease in the Inuit population in Greenland.¹⁶ Later studies have been conducted to examine other potential health benefits of n-3 consumption. The most researched potential health benefits associated with the consumption of EPA, DHA and ALA are coronary heart disease, inflammatory health problems, improved pregnancy outcomes, improved cognitive health, vision, psychiatric disorders, Polycystic Ovary Syndrome (PCOS) and cancer.¹⁷

Omega-3 Consumption and Coronary Heart Disease

A number of review studies have reported that EPA and DHA lower risk for chronic diseases, particularly those related to cardiovascular disease.^{2,13,18,19} Cardiovascular disease (CVD) manifests itself in a number of forms, including atherosclerosis, arrhythmia, myocardial infarction, stroke, heart failure and heart valve problems.²⁰

The benefits of EPA and DHA include: decreased risk of death from heart attacks and stroke, especially non-sudden death from myocardial infarction; improved heartbeat regularity; and improved cardiovascular risk factor profiles with regards to blood pressure, triglyceride levels, resting heart rate, and heart rate variability.^{13,21} In fact, the consumption of two to four grams of EPA and DHA by those with hypertriglyceridemia this can lower triglyceride 20% to 40%.¹⁸ The review performed by the 2010 Dietary Guidelines for Americans Committee (DGAC) found that ALA appears to favorably impact serum lipid levels.³ This may be one mechanism whereby CVD is reduced, however, the DGAC report 2010 stated that “limited but supportive evidence suggests that higher intake of n-3s from plant sources may reduce mortality among persons with existing CVD,”³ i.e. it is useful to tertiary prevention.

Omega-3 Consumption and Inflammation

Omega-3s can exert anti-inflammatory effects by the reduction of pro-inflammatory cytokine expression in many chronic inflammatory conditions.^{22,23} A review by Simopolous that included more than 100 studies suggested that n-3s may be potential therapeutic agents for inflammatory diseases such as arthritis, psoriasis, ulcerative colitis, lupus and asthma.²⁴

Omega-3 Consumption and Pregnancy and Lactation

The brain and certain parts of the eye are rich in DHA.²⁵ Dietary intake of n-3s during pregnancy and lactation contributes to an accumulation of these fatty acids in infants' central nervous systems.²⁵ The DGAC 2010 report states: "Moderate evidence indicates that increased maternal dietary intake of long chain n-3 PUFA, in particular docosahexaenoic acid (DHA) from at least two servings of seafood per week, during pregnancy and lactation is associated with increased DHA levels in breast milk and improved infant health outcomes, such as visual acuity and cognitive development."³ Jointly, the Perinatal Lipid Intake Working Group, Child Health Foundation; Diabetic Pregnancy Study Group; European Association of Perinatal Medicine; European Association of Perinatal Medicine; European Society for Clinical Nutrition and Metabolism; European Society for Pediatric Gastroenterology, Hepatology and Nutrition, Committee on Nutrition; International Federation of Placenta Associations; and the International Society for the Study of Fatty Acids and Lipids, have recommended that pregnant and lactating women consume at least 200 mg per day of DHA.²⁶ The U.S. Food and Drug Administration's (FDA) data for Americans states that pregnant and lactating women should eat up to 12 ounces of fish per week, which may include up to six ounces of albacore tuna.²⁷

Omega-3 Consumption and Child Health Outcomes

Studies regarding n-3 consumption by children younger than two years of age were not identified in the literature. Studies with children over age two have focused on the potential of adequate fish consumption on the improvement of cognitive health. A 2007

review of 69 studies, performed between 1992 and 2006 on the potential effects of EPA and DHA on child health, states that the evidence for the benefits of EPA and DHA supplementation in healthy children older than 2 years of age is generally “promising” in some studies but not yet conclusive.²⁸ The findings from subsequent studies addressing n-3 supplementation for children with attention-deficit-hyperactivity disorder have been inconsistent.²⁹⁻³¹

Omega-3 Consumption and Vision

The retina has the highest level of n-3s in the body, especially DHA.²⁵ Lower levels of retinal n-3s has been shown to be potentially detrimental.^{32,33} Research has shown that the incidence of several vision disorders, including age-related macular degeneration, is strongly associated with lower n-3s blood levels.³³ The ongoing trial, Age-Related Eye Disease Study, has found an association between consuming a diet rich in n-3s and a lower progression of early stage age-related macular degeneration.³²

Omega-3 Consumption and Psychiatric Disorders

A review on the influence of n-3s on psychiatric disorders shows a negative correlation between the risk of depression and adipose tissue DHA concentrations.³⁴ Comparisons of data from several countries show that consuming over 65g of seafood per day reduces the frequency of bipolar disorder (manic-depressive patients), although it seems to have no effect on other psychiatric disorders such as schizophrenia.³⁵ It has been also been reported that DHA may have an impact on the mechanism(s) in the brain that regulates suicidal behavior.^{36,37}

Preliminary evidence suggests a possible association between EPA and DHA and reduced risk of aging-associated cognitive decline,³⁴ but further research is necessary to understand the potential role of these n-3s in old age. Also with regards to the elderly, studies have shown that fish intake reduces the risk of dementia, especially Alzheimer's disease.³⁸

Postpartum depression (PPD) has also been shown to be affected by n-3 intake, e.g. an epidemiological study covering 23 countries showed that countries where more fish is consumed have lower rates of postpartum depression.³⁹ Other investigations have shown that women who have higher levels of n-3s in their breast milk have lower rates of PPD.²⁵ Increased intake of fish oil results in higher levels of DHA in breast milk and increased erythrocyte levels of DHA in the infants.⁴⁰ Preliminary investigations on childhood depression and neurological outcomes in children with phenylketonuria have been encouraging, but further research is necessary.^{41,42}

Omega-3 Consumption and Polycystic Ovarian Syndrome (PCOS)

PCOS is an endocrine disorder often seen in women of reproductive age that results in an increased production of androgenic hormones.⁴³ PCOS is an inflammatory condition. Treatment involves patient consumption of a diet rich in anti-inflammatory foods including n-3s.⁴³ N-3s have been shown to increase insulin sensitivity that reduce inflammatory responses,^{22,44} and therefore may play a role in treatment of PCOS, although further research is required for verification of this finding.

Omega-3 Consumption and Cancer

At the present time there is no clear evidence in humans regarding n-3s and decreased cancer risk, although a review by Hooper et al., found no evidence that n-3s had an effect on incidence of cancer²¹ yet there are some conflicting studies regarding consumption of ALA and a potential that it increases risk for prostate cancer.^{45,46} With regards to advanced forms of prostate cancer, a growing body of literature suggests that n-3s from fish and fish oil may be beneficial.⁴⁷

The numerous potential health benefits of n-3s make it imperative that n-3 rich foods are a regular part of the diets of those aged two and over. The health benefits of n-3s seem promising in its therapeutic use to treat numerous health benefits. Pregnancy, lactation, and CVD are the only health conditions for which dietary recommendations are specifically available, as these are the only conditions for which a preponderance of evidence on which they can be made exists.^{17,18,26}

Omega-3 Consumption Recommendations

For the general public, the daily recommended intake (DRI) for ALA states that 0.6 to 1.2% of dietary calories (approximately 1.1g/day for women and 1.6g/day for men) should come from these fats.³ The American Heart Association (AHA) suggests that 1.5 to three grams per day of ALA should come from sources like tofu and other forms of soybeans; walnuts and flaxseeds and their oils; and, canola oil.¹⁸

The 2010 Dietary Guidelines for Americans, for the first time, included recommendations for EPA and DHA at 250mg/day. This recommendation was translated to a food based

recommendation of two servings (8 oz) per week of a variety of seafood (DGA 2010).

The AHA, on the other hand, makes recommendations for EPA and DHA both in terms of seafood and nutrient consumption as follows:

- Adults should consume fish (particularly fatty fish) at least two times a week; or,
- Patients with documented CHD should consume up to one gram of EPA and DHA (combined) per day; and,

Patients with hypertriglyceridemia, should consume two to four grams of EPA and DHA per day, this can lower triglyceride 20% to 40%.³

For primary prevention of CVD other agencies like, the National Heart Foundation of Australia,⁴⁸ and the United Kingdom Scientific Advisory Committee⁴⁹ all recommend two servings of fish per week, preferably fatty fish, providing about 450 to 500 mg EPA and DHA per day. The National Academies recommend that adolescent males, adult males, and females who will not become pregnant, as well as adult males and females who are at risk of CVD, consume two, three ounce servings of fish per week. The report acknowledged that females who are or may become pregnant or who are breastfeeding, and children up to age 12 may benefit from consuming two, three ounce servings of seafood, especially seafood with higher concentrations of EPA and DHA. In addition, the Dietary Guidelines for Americans report states that pregnant and lactating women should consume at eight and up to 12 ounces of a variety of seafood per week.³

The only market segment for which n-3 minimum dosage is prescribed is individuals with prolonged elevated lipid profiles, for whom n-3s are prescribed in the dose of four

grams per day. To date, Lovaza®, by GlaxoSmithKline, is the only n-3 (fish oil) pharmaceutical that has been approved for this purpose to date; however, the patent on this drug expires in 2015 and generic versions may be made in the first quarter of 2015.⁵⁰ Considerable work is still needed to support specific recommendations for n-3 intake, particularly for EPA and DHA in cases where individuals are allergic to, or choose not to consume, seafood in recommended amounts.

Misinformation about Omega-3s in the Media

Although n-3 dietary recommendations have been made and numerous health benefits have been documented in the scientific literature, tremendous ambiguity is present in the popular media with regard to these fats. In a position paper published by the Academy of Nutrition and Dietetics in 2002, the Academy attributed these types of food/nutrition education issues to the lack of sufficient context for consumers to have a clear understanding of the research and/or associated food recommendations, and the media's tendency to overstate the significance of preliminary findings.⁵¹ Some examples are given below:

Information to the public about n-3s often fails to distinguish between the different n-3s as observed in one popular health-related television show's website describes the different n-3s ALA, DHA and EPA, but incorrectly associates all health benefits with eating foods rich in any of these n-3s rather than distinguishing the benefits of foods specifically containing DHA and EPA.⁵² Sometimes popular media provides incorrect information as is evidenced in a popular press article for vegans that erroneously stated

“...experts say as long as you get adequate ALA, you don’t need to worry about two other types of omega-3s, EPA and DHA, which are found in non-vegan sources”,⁵³ and

A popular health magazine has repeatedly overstated research in articles entitled “Omega-3 fatty acids, the vanishing youth nutrient - why the disappearance of omega-3s from our diet may be responsible for the epidemics of obesity, heart disease, cancer. Oh, and wrinkles, too,”⁵⁴ and, “Foods that Boost your Brain Power – Omega-3 fatty acids.”⁵⁵ Many of the studies performed with regard to n-3s and their potential health benefits are preliminary and the media often overstates these preliminary findings. For example the OMEGA trial gained a lot of media coverage when they proposed that n-3s do not prevent the risk of cardiac events one year after a myocardial infarction.⁵⁶ All popular media outlets covered this story out of context and claimed that there is no point in increasing these nutrients in the diet.⁵⁷ This further fueled confusion and consumer uncertainty. Therefore there is a need for nutrition intervention to reduce ambiguity surrounding n-3 information.

Given the valuable health benefits of omega-3s discussed above, as well as the misinformation regarding what foods to purchase to glean their benefits, this study focused on this area of needed nutrition education to test the use of a new technology to offer it. Thus, the remainder of this literature review shifts its focus to in-store, i.e., point of purchase, interventions, use of technology in nutrition education and finally the theories used to help craft a successful and effective intervention.

Nutrition Intervention at Point of Purchase

Point-of-purchase advertising is a tactic whereby displays are used to catch shoppers' eyes in an attempt to encourage consumer impulse purchasing. Nutrition education interventions have utilized this same technique, i.e., point of purchase nutrition interventions, in an attempt to prompt consumers to make healthier food purchasing choices in stores. Point of purchase interventions have been studied for many decades as potential tools for behavior change.⁶ Researchers have tested the proposition that information provided in supermarkets can increase awareness and knowledge of healthy food choices and provide a catalyst to change shopping behavior,⁵⁸ however grocery store interventions have yielded mixed results.

In a 2001 review of environmental food shopping interventions tested since the 1970s, 10 of which were done in grocery stores, Seymour et al found varied effectiveness of these grocery store interventions. Half of the studies showed no change in sales while the other half showed a modest increase in some of the targeted food item such as, low fat foods, fruits and vegetables etc.⁵⁹ Most point of purchase grocery interventions have used general labeling techniques, print materials and posters; and have targeted specific locations or microenvironments.⁶⁰⁻⁶²

Recent studies have similarly evidenced mixed findings. For example, one intervention that included the use of shelf labels, signage and posters, along with in-person distribution of leaflets to increase the purchase of healthful foods, found that shoppers significantly improved their purchase of fruits and dark green vegetables, but did not find

an increased purchases of other vegetables.⁶³ Conversely, when the effects of two, one-hour audiotapes and in-store public service announcements were tested as means of increasing the purchase fruits and vegetables, Connell, et al found an increase in knowledge and self-reported fruit and vegetable intake.⁶⁴ However, when point of purchase marketing was tested against the influence of “discounts,” in a randomized control trial conducted by researchers in New Zealand discounts had a significantly stronger effect on food purchases than the point-of-purchase marketing.⁶⁵

Still, point of purchase nutrition education may influence the diets of some. Researchers who conducted the healthy foods Hawaii intervention, which included point of purchase use of posters, cooking demonstrations, displays and shelf labels to promote healthy food choices among caregivers, noted that although few participants observed the intervention signage, the overall food quality and knowledge was better among the intervention group, suggesting that those who “had” noticed the intervention messages likely made better choices.⁶⁶

Conflicting results suggest that point of purchase grocery store interventions “may” have promise as one means of changing the dietary habits of large numbers of people. All research studies reviewed thus far have suggested that there is a need for more research on this area that offers easily accessible, attention grabbing nutrition education material as well as a reliable means of assessing long term shopping behavior change.

Technology and Grocery Shopping

Technology is changing the way consumers shop for groceries.⁵ With 91% of US adults as cell phone users, mobile technologies are pervasive. In 2011 PEW researchers found that 35% of cell phone users used smart phones; this number had jumped to 56% by 2013 and was still increasing.⁶⁷ The food and marketing institute found that most grocery shoppers (52%) use some sort of technology in their grocery shopping:

- 23% of shoppers check prices at multiple stores online,
- 31% use mobile technology such as make shopping lists, finding recipes or researching products and
- 32% use online coupons.

One technology that could potentially be used in grocery shopping that has yet to be studied is podcasts.

Podcasts

A podcast is defined by the Merriam-Webster dictionary as “a program (as of music or talk) made available in digital format for automatic download over the Internet.”⁶⁸ Users can listen to podcasts on their computer (e.g., using Windows Media Player), or download to portable MP3/MP4 players and/or smartphones. Podcasts are already being used in medical school curricula and in professional meetings to educate health professionals.^{69,70} According to Pew Internet in 2008, 19% of all internet users reported downloading a podcast and this trend is increasing and, even though recent evidence is not available, it is safe to assume that the number has significantly risen in the last five years as has smartphone use.⁷¹ Evaluation to ensure their reliability in terms of nutrition education is needed. Appendix A has a list of search terms that were used to search for

nutrition education interventions in a grocery store setting utilizing technology such as podcasts. The searched revealed no results. Therefore this study aims to fill this gap by using podcasts as means for nutrition education in grocery stores and monitoring pre and post intervention shopping data using price plus cards.

Extensive research has demonstrated that for any nutrition intervention to be successful it must have a strong reliance on health behavior and health education models and theories.⁷² This project therefore is based on the constructs of the Theory of Reasoned Action (TRA) that provides a conceptual framework for understanding the processes through which behavior change occurs and the factors that influence behavior. The following section will now discuss the theory.

Theory of Reasoned Action

The Theory of Reasoned Action (TRA) has been used to guide many health interventions.^{8,11,72} The TRA has been used in numerous studies, especially in relation to food shopping.^{11,73,74} According to the theory, human behavior is guided by three kinds of beliefs, that is behavioral beliefs (i.e., beliefs about the consequences or attributes of the behavior), normative beliefs (i.e., beliefs of the normal expectations of other people) and control beliefs (i.e., beliefs about the presence of factors that encourage or discourage performance of a behavior).^{75,76} The TRA states that intentions to perform a behavior predict behavior change and some constructs such as, perceived behavioral control (PBC), subjective norms, and perceived importance predict intentions.⁸ These constructs are further described below.

Perceived behavioral control

PBC can be defined as the perceived ease or difficulty of performing a behavior which rises from control beliefs.⁷⁶ If an individual feels that there is a sufficient degree of control over the actual behavior they may be expected to carry out their intentions to perform the behavior when the right opportunity presents itself.⁷⁵ It has further been stated that perceived behavioral control should incorporate self-efficacy as well as controllability items such as control over the behavior and the extent to which performance of the behavior is up to the individual. Also, Ajzen states that although self-efficacy and controllability are two separate components they should and are related to one another.⁷⁵

Self-efficacy - an individual's beliefs that he or she has the capacity to influence the quality of functioning and the events that affect his/her life. Self efficacy is even more important to the adoption of more complex behaviors. It is the most popular concept of SCT that is incorporated into many other health education theories and models.⁷⁷

Controllability

Control over execution of a certain behavior depends on the presence of internal and external factors that may serve to facilitate or interfere with performance of the behavior. Control over the behavior and the extent to which performance of the behavior is up to the individual are most important components of controllability.⁷⁵

Social norms

These are thought to reflect beliefs about the behavioral expectations of important and/or significant others, weighted by the motivation to conform to them.⁸ Intentions to perform behavior are a function of subjective norms coupled with perceived importance of the behavior in question.⁷⁸

Motivation

Perceived importance is the individuals' beliefs about the importance and outcomes of performing a behavior. Therefore strong beliefs about the positive outcomes associated with the desired behavior results in higher degree of importance placed it.⁸

These constructs were employed in the work presented in this dissertation to help develop a podcast(s) that will successfully affect the shopping behaviors with regards to n-3 rich foods.

Summary

N-3s are important nutrients and their contribution to health and development is well documented, as are some dietary recommendations for the general public, pregnant and lactating women and CVD patients. Information present in the media about n-3s is ambiguous. Research-based information must be made available for the public and tested for its viability in terms of prompting consumers to increase their n-3 consumption. The Theory of Reasoned Action can be used as a framework to create and evaluate such communications.

This review was designed to support this project which seeks to examine the potential for success of using podcasts to educate grocery shoppers about omega-3 fatty acids and thereby increase purchase of n-3 rich foods and supplements.

Chapter 3: Methods

The main objective of this study was to examine if consumers who were interested to learn more about omega-3s (n-3s) enjoyed listening to a podcast(s) while grocery shopping. Further, this research sought to examine the effects of the podcast(s) on participants' knowledge, n-3 rich food purchases, and intermediary variables (self-efficacy, perceived importance, subjective norms, and behavioral intentions) that may affect immediate and long-term purchasing behaviors. The research protocol was approved by the Rutgers Office of Research and Sponsored Programs Institutional Review Board (#10-548).

Formative Research

A pilot study was conducted between January and May 2011. Intercept interviews were performed with grocery shoppers in a supermarket located in Woodbridge, New Jersey. The research team comprised of three researchers with graduate level education in nutrition. Prior to participant recruitment members of the research team tested the podcast on an afternoon when store traffic was off-peak. They downloaded the podcast onto mp3 players and impersonated shoppers, listening to the podcast while grocery shopping.

The Pilot Study

A five-minute podcast (Attachment 2) was developed that directed listeners to foods rich in n-3s that could be found among the following sections of the grocery store: pastas,

cereals, dairy foods, nuts, peanut butters, oils, canned meats, and fish (canned, fresh, and frozen). A male narrator recorded the podcast. The content was organized to align with the pilot store's layout and had been recorded so shoppers could pause and restart the podcast as needed. Pauses were strategically placed between food sections and in order for listeners to look for and read labels of certain foods as directed in the podcast.

Study Design

A mixed method, single group, repeated measures study design was employed. All shoppers who entered the store were asked if they intended to purchase more than 10 items, and if they would be interested in learning more about n-3 foods. An incentive of \$10.00 was given to all those who completed the study. Shoppers were asked to listen to the podcast while grocery shopping. Before and after listening to the podcast, shoppers participated in semi-structured interviews (Attachment 3). Pre-intervention, shoppers were also queried regarding their age, gender and their previous use of podcasts. Single questions were used to assess TRA constructs for each shopper and answers were given on a 5-point Likert scale. The constructs assessed were (1) subjective norms regarding n-3 intake (i.e., family, friends, and coworkers perceive importance regarding n-3 intake); (2) self-efficacy (i.e., the confidence they had in their ability to shop for n-3 rich foods) and perceived importance regarding the purchase of n-3 rich foods; and (3) intention to purchase n-3 rich foods at the next shopping trip. The subjective norms question was only administered in the pre-intervention while, self-efficacy and perceived importance questions were administered pre- and post-intervention. Post-intervention, participants were asked if they enjoyed using the podcast, what they liked and disliked about the

podcast and how they thought it might be improved. Purchases of foods rich in n-3s made on the day of the interview were self-reported by the participants but were visually verified by the researcher post-intervention.

Primary Podcast Study

Based on the results of the pilot study (as reported in Chapter 4) new podcasts were created and recorded using superior quality instruments to improve sound quality and volume. The podcast was divided into 10 separate podcasts. The first podcast was an overall introduction about n-3s, their food sources, and their health benefits. One podcast was recorded for each of the eight food sections mentioned above; a new podcast was created for n-3 supplement types, supplement and drug interactions. These podcasts were recorded with a female narrator and background music was added in order to block external distractions. A transcript of these podcasts has been included in Attachment 4.

Participants and Setting

Sample size calculations were conducted based on the premise that 30% of the study population would increase their purchases of n-3 rich foods ($\alpha = 0.05$). It was determined that 340 participants would be required from 20 different stores. Negotiations were made with The Great Atlantic & Pacific Tea Company (A&P) to conduct this study in 20 of their grocery stores in New Jersey.

Study Design

Similar to the pilot this study also employed mixed methods and a single group; repeated measures study design was used. The semi-structured interview script was modified and has been included in Attachment 5. Amendments to the study were made as follows:

1. The allowable participant age range was increased from 18-65 to 18-80 years.
2. Participants who identified themselves as being on a major shopping trip were invited to participate.
3. Participants who were shopping in at least four of the nine food sections were allowed to participate in the study
4. Incentive was increased to \$20.00 for study completion.
5. Participants knowledge regarding n-3s was tested pre- and post-intervention using six questions that were coded dichotomously.
6. Shoppers price plus card numbers were obtained at post-intervention in order to acquire their pre- and post-intervention shopping data

Secondary data analysis was conducted with shopping data acquired from the consumer analytics department at A&P.

Data Analyses

Qualitative data collected from the pilot study were counted and changes participants' wanted to see made were catalogued. These responses helped test the following hypothesis:

1. Consumers interested in learning more about n-3s will enjoy listening to a podcast about them and the foods they can find them in, as they shop.

All quantitative data collected was analyzed using SAS v9.2 (Cary, N.C; 2008).

Descriptive statistics were calculated for gender, age, mp3 player ownership, podcast familiarity and previous use, n-3 rich food purchases made, as well as their intentions to purchase n-3 rich foods during future shopping trips. Paired sample t-tests were conducted to detect pre- and post-intervention differences in the shoppers' self-efficacy and perceived importance. Differences in the number of, misconceptions, and correct responses to each of the six knowledge questions, pre- and post-intervention, were compared using McNemar tests. Pearsons' correlation tested the interplay of the TRA variables. The results of these analyses tested the following hypotheses:

2. Listening to a podcast(s) about n-3s and n-3 rich foods while grocery shopping will increase the immediate purchase of n-3 rich foods, as well as intermediary (TRA) variables that may affect immediate and long-term purchasing behaviors. Intermediary variables include: self-efficacy, perceived importance, social norms, and behavioral intentions.
3. Listening to podcasts about n-3s and n-3 rich foods while grocery shopping will reduce shoppers' misconceptions and increase their knowledge about n-3s': types, food sources and health benefits;

Food purchase records were received as Microsoft Excel 2010 (Microsoft Excel 2010, Microsoft Corporation). Food items assessed were salmon, tuna, shrimp, sardines, walnuts, fish-oil supplements and fortified foods including: peanut butter, oils, butter-spreads, eggs, milk and mayonnaise; all others were removed from the data set. The

number of items of each of the aforementioned foods purchased was counted for each participant, by month, and coded. The coded data was imported into Statistical Analysis Software (version 9.2, 2008, SAS Institute Inc), and matched by identification number to demographic variables that had been previously collected. For each participant the number of months in which each food was purchased was calculated, as was the number of foods purchased pre- and post-intervention. Paired sample t-tests were conducted to detect pre- and post-intervention differences in number of purchases of each of the foods. These analyses tested the following hypothesis.

4. Listening to podcasts about n-3s and n-3 rich foods while grocery shopping will result in long-term (6-month post-intervention) increased purchase of n-3 rich foods.

Chapter 4: Grocery store podcast about omega-3 fatty acids influences shopping behaviors, a pilot study.

Abstract

Objectives: To determine if listening to a podcast about omega-3 fatty acids (n-3s) while grocery shopping increased shoppers' awareness about, and purchases of, seafood and other foods rich in n-3s. The Theory of Reasoned Action was the study's framework.

Methods: Repeated measures design with a convenience sample (n=56) of grocery shoppers who listened to the podcast while shopping. Pre- and post-intervention semi-structured interviews were conducted.

Results: Shoppers were primarily females (mean age = 41 ± 15.3 years). Their perceived ability to buy [$t(55) = 6.27, p < .0001$] and perceived importance regarding buying [$t(55) = 3.38, p < .01$] n-3 rich foods improved significantly. At least one n-3 rich food (mean = 1.5 ± 0.8) was purchased by 30%, and 79% planned future purchases.

Conclusion and Implications: Podcasts may effectively communicate nutrition information. More research with a larger sample size is needed to evaluate the effects of the podcast on long-term changes in shopping behavior.

This chapter was written according to the author guidelines for submission to the *Journal of Nutrition Education and Behavior* which publishes research related to nutrition education and dietary/physical activity behaviors.

Introduction

Smartphones are changing how people access health information. Approximately 52% of consumers use mobile technologies to get the best deals, to find coupons, or to research products while grocery shopping.⁵ Podcasts that can be downloaded to smartphones offer the potential to provide nutrition education to consumers on demand, for example, while they shop for groceries.⁷⁹ The use of podcasts to assist consumers in making informed choices at the point of purchase has untapped potential.

Point-of-purchase advertising includes the use of displays to encourage consumer impulse purchases.⁸⁰ Point-of-purchase nutrition interventions have used this same technique in an attempt to prompt consumers to make healthier purchases.^{6,59} These interventions have been characteristically simple and direct in terms of the messages they conveyed (e.g., eat more vegetables or drink low-fat milk).⁸¹⁻⁸³ Previous point-of-purchase studies differ from this study in that none have employed podcasts as a method of imparting nutrition information.

Omega-3s (n-3s) are important components of a healthy diet. However, advice on increasing their consumption is inherently complex. The three most researched types of n-3s — alpha linolenic acid (ALA), docosahexaenoic acid (DHA), and eicosapentaenoic acid (EPA) — come from different food sources and offer distinctly different health benefits. Found primarily in plant-based foods, ALA contributes to the tertiary treatment of some types of heart disease.^{18,84} Found primarily in seafood,⁸⁴ DHA and EPA are associated with heart disease prevention,^{18,85} and improved pregnancy outcomes and

normal fetal development,^{25,26} and are used in the treatment of macular degeneration³² and depression.⁸⁶ DHA and EPA also hold promise in the treatment of many inflammatory health conditions^{22,23} and in reducing symptoms associated with attention deficit hyperactivity disorder^{29,31} and Alzheimer's disease.^{24,34} Despite the numerous health benefits associated with DHA and EPA consumption, Americans consume approximately 109 mg daily, less than 45% of the recommended 250 mg.³ They also consume less fish and seafood than is currently recommended (i.e., a 3.5 ounce fatty fish portion at least twice a week).¹⁸

To further compound the complexities associated with making n-3 recommendations, food labels do not list the type or the amount of n-3s that foods contain. The authors believe that popular media communications are often inaccurate as they fail to make the aforementioned differentiations, overstate preliminary research findings, and erroneously recommend increased consumption of ALA-rich foods to glean benefits that have been associated with foods rich in DHA and EPA. Examples of these inaccuracies follow: One popular health-related television show's website describes ALA, DHA and EPA individually, but incorrectly associates all n-3 health benefits with eating foods rich in any of the n-3s.⁵²

A popular press article for vegans erroneously stated that "experts say as long as you get adequate ALA, you don't need to worry about two other types of omega-3s, EPA and DHA, which are found in non-vegan sources."⁵³

A popular health magazine has repeatedly overstated research findings in articles like: "Omega-3 fatty acids, the vanishing youth nutrient — why the disappearance of omega-

3s from our diet may be responsible for the epidemics of obesity, heart disease, cancer. Oh, and wrinkles, too”⁵⁴ and “Foods that Boost your Brain Power – Omega-3 fatty acids.”⁵⁵

A podcast was created to (1) help clarify these misconceptions, (2) stress the importance of increased n-3 intake, and (3) teach which foods are good n-3 food sources. Fatty fish and seafood were most heavily encouraged in this podcast since they are the richest sources of DHA and EPA. They are also foods for which recommendations are made in the Dietary Guidelines for Americans³ and by the American Heart Association.¹⁸

The objective of this pilot study was to assess the effects of this podcast’s use at the point-of-purchase. The Theory of Reasoned Action (TRA) suggests that self-efficacy, perceived importance, and subjective norms predict intention to perform a behavior, which in turn predicts behavior change.⁷² TRA was used as this study’s framework. This study examined participants’ (1) abilities to identify n-3 rich foods (self-efficacy); (2) beliefs that buying n-3 rich foods is important (perceived importance); (3) beliefs regarding the importance that shoppers’ families, friends, and coworkers place on n-3 consumption (subjective norms); (4) intention to make n-3 rich food purchases; and (5) purchases of n-3-rich foods made on the day of the intervention.

Methods

This pilot study was conducted between January and May 2011 (Rutgers Institutional Review Board Protocol #10-548). Intercept interviews were performed with grocery

shoppers in a supermarket located in Woodbridge, New Jersey. Prior to participant recruitment, the research team (three researchers with graduate level education in nutrition) was trained to conduct the interviews described below. Members of the research team downloaded the podcast onto mp3 players and impersonated shoppers, listening to the podcast while grocery shopping on an afternoon when store traffic was off-peak. The five-minute podcast directed listeners to foods rich in n-3s that could be found among the: pastas, cereals, dairy foods, nuts, peanut butters, oils, canned meats, and fish (canned, fresh, and frozen). The content was organized to align with the pilot store's layout. The podcast mentioned the differences between ALA- versus DHA- and/or EPA-rich foods and it stressed the importance and identification of DHA- and EPA- rich foods, especially seafood.

All shoppers who entered the store were asked if they both (1) intended to purchase more than 10 items and (2) would be interested in learning more about n-3 foods. Of all those who entered the store approximately 10% volunteered to participate, in part because the inclusion criteria greatly limited participation. Other reasons stated for not participating included being "in a hurry" and being preoccupied with children.

Before and after listening to the podcast, shoppers participated in semi-structured interviews. Single questions were used to assess TRA constructs for each shopper. The constructs assessed were (1) subjective norms regarding n-3 intake (i.e., family, friends, and coworkers perceive importance regarding n-3 intake) pre-intervention; (2) self-efficacy (i.e., the confidence they had in their ability to shop for n-3 rich foods) and

perceived importance regarding the purchase of n-3 rich foods pre- and post-intervention; and (3) intention to purchase n-3 rich foods at the next shopping trip post-intervention. Purchases of foods rich in n-3s made on the day of the interview were visually verified post-intervention. Pre-intervention, shoppers were also queried regarding their age, gender and their previous use of podcasts and post-intervention, participants were asked what they liked and disliked about the podcast and how it might be improved. Ten dollars were given for study completion.

All quantitative data collected were analyzed using SAS (version 9.1; SAS Institute, Inc., Cary, NC, 2013). Descriptive statistics were calculated for gender, age, mp3 player ownership, podcast familiarity, purchases of foods rich in n-3s made on the day of the interview, and intention to purchase n-3 rich foods during future shopping trips. Paired sample t-tests were conducted to determine if there were differences in the shoppers' self-efficacy and perceived importance before and after podcast use. Pearson's correlation was used to assess relationships among the TRA variables examined. Responses regarding purchases were counted and changes participants wanted to see made to the podcast were catalogued.

Results

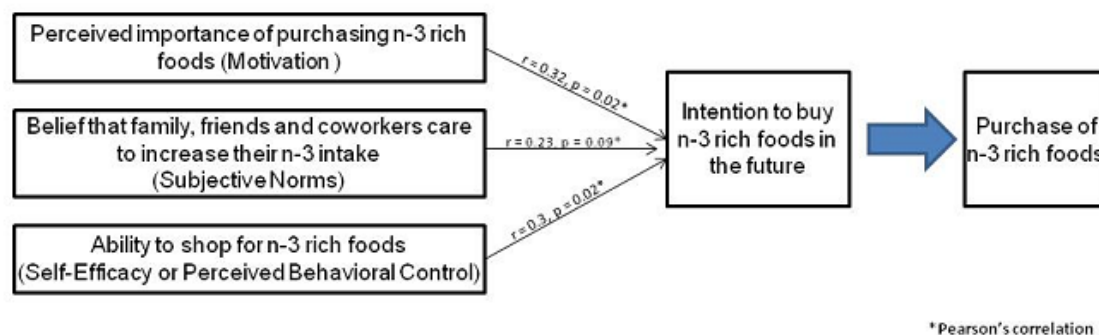
The study sample was comprised of 56 shoppers with a mean age of 41 ± 15 years, most of whom were women (n=44, 79%). The majority owned an mp3 player (n=32, 57%) and more than half had listened to a podcast previously (n=30, 54%). Both participants' self-efficacy to shop for, and perceived importance of, n-3 rich foods improved

significantly as a result of listening to the podcast while shopping (see Table 4.1). These variables demonstrated significant predictive associations with participants' intent to purchase these foods (Figure 4.1).

Table 4.1: Theory of Reasoned Action Constructs Assessed (Pre- and Post-Intervention) in a Point-Of-Purchase Podcast Intervention Aimed at Increasing the Purchase of Foods Rich in Omega-3s (n=56)		
Questions	Pre-test Mean \pm SD	Post-test Mean \pm SD
How confident do you feel in your ability to shop for n-3 rich foods? Likert scale: 1 = least confident; 5 = most confident	3.3 \pm 1.3	4.4 \pm 0.8 ^a
How important do you think it is to buy n-3 rich foods? Likert scale: 1 = least important; 5 = most important	4.2 \pm 1.1	4.6 \pm 0.9 ^b
Do the people you are close to, like your friends, family and co-workers, take care to increase their n-3 intake to improve their diets and their health? Likert scale: 1= not at all; 5 = a lot	3.0 \pm 1.4	Not asked
	Yes Percentage	No Percentage
Do you intend to purchase anything different in the future as a result of listening to the podcast?	79%	21%
Did using the podcast change what you bought today?	29%	71%
^a (t (55) = 6.27, P < .0001); ^b (t (55) = 3.38, P < .01)		

Forty-four shoppers (79%) reported that they intended to increase their purchase of the n-3 rich foods listed in Table 4.2; but only 17 of these 44 shoppers (39%) did so on the day they were interviewed. The number of n-3 food items purchased ranged from 1-4 (mean = 1.6 \pm 0.8 items).

FIGURE 4.1: CONSTRUCTS OF THE THEORY OF REASONED ACTION AS EMPLOYED IN THE PILOT STUDY: GROCERY STORE PODCAST ABOUT OMEGA-3 FATTY ACIDS (N-3) INFLUENCES SHOPPING BEHAVIORS (n=56).



Of the 56 shoppers who agreed to participate, 89% liked the podcast (n=50), particularly its brevity and the clarity of information provided. Some reported that enhanced sound clarity and volume, the addition of background music, and the use of a female narrator would improve the podcast. Also, although the podcast had been recorded so shoppers could pause and restart the podcast as needed, some participants found it “tedious” and “confusing” to use, as they did not shop the aisles in the same order as the store’s layout. One shopper suggested that the podcast be divided into a separate podcast for each aisle to simplify its use.

TABLE 4.2. Foods Bought or Foods Shoppers Said they Would Buy in the Future as a Result of Listening to a Nutrition Education Podcast about Omega-3s While Grocery Shopping (n=56)		
Foods	Participants who intended future purchases	Participants who made purchases on the day of the intervention
	Percentage	Percentage
Seafood		
Tuna, canned	34%	9%
Sardines, canned	18%	4%
Fish, other than tuna/sardines	45%	2%
Fortified Foods		
Fortified eggs	36%	11%
Fortified peanut butter	27%	7%
Fortified butter	25%	5%
Fortified pasta	21%	4%
Fortified cereal	14%	2%

Discussion

The results suggest that podcasts may be a promising medium for providing nutrition education while grocery shopping. An examination of the interplay among the TRA variables (Figure) suggests that for these participants the decision to increase the purchase of foods rich in n-3s, particularly DHA and EPA, is a “reasoned action.”

However, more expansive studies will need to be done to see if this finding holds true.

While increased intention to purchase n-3 rich foods should result in increased purchases, the purchase of n-3 rich foods on the day of the intervention increased only modestly.

The decision to purchase n-3 rich foods on that day may have been negatively affected by participants’ adherence to their grocery lists, prior meal planning, and/or budget constraints. Purchases made on a single day, particularly the day of the intervention, may be an inadequate reflection of “change” so an examination of purchases over time is needed.

Notably, despite the strong emphasis placed on fish in the podcast, only a small number of participants bought fish. Research done in Europe and among pregnant American women has identified some reasons for low fish consumption. These include concerns over (1) the price of seafood, (2) how it smells when it is being cooked, (3) its inability to leave people feeling as satiated as when they eat meat,^{87,88} (4) the risks associated with eating fish⁸⁹ and (5) patients not being advised by their doctor's to eat fish.⁹⁰ Although participants in the U.S. studies were only women and were younger than those in this investigation, their findings may be of value in explaining why consumers' fish purchases are low.

According to Wansink and Sobal, individuals make 200-300 food decisions a day.⁹¹ As such, individuals rely on familiar and habitual behaviors when making food decisions.⁹² It has been postulated that habitual behaviors can become rigid and unresponsive to change despite the understanding of health and nutrition.⁹³ Thus, when encouraged to buy more food items rich in n-3s, shoppers may prefer n-3 fortified versions of foods they habitually purchase (e.g., eggs, milk, pastas, spreads, and peanut butter) over foods they buy less often, like fish. These possibilities suggest there is a strong market for n-3 fortified foods and/or that barriers need to be overcome to increase fish consumption.

We acknowledge that this pilot study has multiple limitations. The insufficient sound clarity and problems associated with matching the podcast's content to the corresponding aisle that some participants experienced may have resulted in their not hearing all that

was said, which may have negatively impacted the results. Notably, due to financial and time constraints a control group was not used. Also, all TRA constructs were assessed using a single question that did not undergo cognitive testing and was not tested for validity or reliability. However, participants answered these questions easily and single item assessment of TRA constructs has been shown to be valid in other investigations.^{10,94} Another limitation is that the participants were not asked if they were pregnant and/or vegetarian. Further, the findings of this study may not be generalizable because this study was done in an affluent community, most participants were familiar with podcasts and the sample population was small. Moreover, some participants' responses may have been overstated as a result of the Hawthorne effect (i.e., the phenomenon of altering behavior because of participating in a study rather than the intervention itself)⁹⁵ or response bias (i.e., respondents answer questions in the way they think the questioner wants them to answer rather than according to their true beliefs).⁹⁶

Implications for Research and Practice

This study suggests that the use of a nutrition education podcast at the point of purchase may positively influence food purchases. Improving the podcast's sound clarity and organizing food information according to shopping aisles in different tracks may improve its usability. Also, adding background music and using a female narrator may make the podcast more appealing. Since this approach to nutrition education looks promising, investigations should be performed in more diverse communities with larger samples. Longer-term behavior changes should be assessed and nutritional outcomes measured. Furthermore, if additional studies confirm that despite encouragement to

purchase/consume fish, consumers choose alternative foods rich in n-3s, perhaps research should be conducted to discover why. Lastly, health associations that recommend eating fish might consider consumer preferences and broaden their recommendations to include n-3 fortified foods.

Chapter 5: A point-of-purchase intervention using podcasts as a means of delivering nutrition education about omega-3s

Abstract

Background: New mobile technologies have untapped potential to communicate nutrition messages at the point of purchase. Omega-3s (n-3s) are important to a healthy diet but tremendous ambiguity prevails regarding n-3 types, health benefits and food sources.

Objective: To determine if listening to podcasts about n-3s while grocery shopping increases shoppers' knowledge, self-efficacy, perceived importance, intention to purchase and actual purchases of foods rich in n-3s. The Theory of Reasoned Action was the study's framework.

Design: A mixed methods, single group, repeated measures study design was employed.

Participants: Intercept interviews were conducted in 20 grocery stores with 340 shoppers who were on a major shopping trip and who were interested in learning more about n-3s.

Intervention: Shoppers were asked to listen to podcasts about n-3 rich foods while grocery shopping. Pre- and post-intervention semi-structured interviews were conducted.

Statistical Analysis: Descriptive statistics, t-tests, McNemar tests, and correlations were used to analyze the data where appropriate. Qualitative responses are presented to help illustrate quantitative results.

This chapter was written according to the author guidelines for submission to the *Journal of The Academy of Nutrition and Dietetics* which publishes research related to food, nutrition, and dietetics.

Results: Most participants were female and/or white. Nearly half (47%) bought at least one n-3 rich food item as a result of listening to the podcasts (mean = 1.3 ± 0.8 foods). Participants' ability to shop for n-3 rich foods increased significantly ($t[339] = 26.8$, $P < 0.0001$) as did their perceptions of the importance of buying n-3 rich foods ($t[339] = 9.9$, $P < 0.0001$). Increases in perceived importance were significantly correlated with intention to purchase n-3 rich foods in the future ($r = 0.12$, $P < 0.03$). Most of the shoppers (87%) expressed their intention to buy n-3 rich foods in the future.

Conclusions: The podcasts were a successful means of delivering nutrition education messages about n-3s at the point of purchase. The relationship between participants' increased intention to purchase n-3 rich foods and actual purchasing behavior will require prospective assessment.

Introduction

Most Americans (56%) have smartphones and more than half of them have used their phones to access health information.⁶⁷ Consumers presently use their smartphones while grocery shopping to get coupons, find the best deals, and research products.⁵ The ubiquitous nature of mobile technologies, like podcasts, offers a novel avenue of delivering nutrition information to consumers.⁷⁹

Point-of-purchase interventions typically use displays and package labels to help influence decision making while shopping.⁹⁷ Those interventions have focused on food-specific messages such as “eat more vegetables”⁸¹ and “drink low-fat milk”⁹⁸ and have shown modest results in altering consumers' shopping behaviors.⁶⁵ Those studies differ

from this investigation as they have not included podcasts as a means of point-of-purchase nutrition education, nor have they addressed nutrition education regarding specific nutrients. Information regarding omega-3s (n-3) by its nature is nutrient-based.

Omega-3s (n-3s) are important nutrients. Messages about n-3 consumption are complicated because they are not found in only one specific food or class of foods. Further, there are different types of n-3s and in some cases a specific food, like peanut butter, can be fortified with different types depending on the brand and/or variety. The three most researched types of n-3s are alpha linolenic acid (ALA), docosahexaenoic acid (DHA), and eicosapentaenoic acid (EPA). Plant sources, like walnuts and flaxseeds, contain ALA, which has been associated with the tertiary treatment of heart disease.^{2,18,99} Those found primarily in seafood (particularly fatty fish) are DHA and EPA,⁸⁴ and have been linked with the treatment of heart disease,^{17,18,99} hypertriglyceridemia,^{13,21} macular degeneration,^{32,33} depression,^{34,41,86} asthma,²² and arthritis.^{23,24} DHA has also been associated with improved gestational length, and fetal retina and brain development.^{19,25,28,90,100} Despite the numerous health benefits associated with DHA and EPA, Americans consume only approximately 45% of the daily recommended 250 mg.³ They also consume less fish and seafood than recommended (i.e., a 3.5-ounce portion of fatty fish at least twice a week).¹⁸

Although n-3 dietary recommendations have been proclaimed and numerous health benefits have been documented, the popular media presents tremendous ambiguity with regard to these fatty acids. The Academy of Nutrition and Dietetics has attributed such

issues to the lack of sufficient context for consumers to have a clear understanding of the research and/or associated food recommendations, and to the media's tendency to overstate the significance of preliminary findings.⁵¹ Examples of media miscommunications and exaggerations regarding n-3s have been previously reported.¹⁰¹

A series of podcasts were created to help resolve these issues with regards to purchasing food items rich in n-3. The podcasts were designed to be used at the point of purchase to (1) provide clear and current information regarding n-3s, (2) stress the importance of increased n-3 intake, and (3) teach which foods are good n-3 food sources. This study's objective was to evaluate the effects of using these podcasts. The Theory of Reasoned Action (TRA) was used as this study's framework. According to the theory, the intention to perform a behavior predicts behavior change and constructs such as, perceived behavioral control (including self-efficacy and controllability items),⁷⁵ social norms, and perceived importance predict intentions.⁸ These constructs were used to guide the evaluation of the podcasts' success.

Methods

Participants

A major retail grocery chain agreed to allow this study to be conducted in their New Jersey stores. Three hundred and forty (340) individuals (17 per store from 20 stores) were required to prove an increase n-3 food purchases among at least 30% of study participants with a 95% confidence. Between September 2012 and March 2013, trained researchers (nine health professionals with a background in public health and/or

nutrition) conducted intercept interviews with shoppers according to a protocol approved by the Rutgers University Institutional Review Board (protocol # 10-548). As shoppers entered the store they were approached and asked if they were on a major shopping trip and if they would be interested in learning more about foods rich in n-3s. If so, they were given a checklist of nine food categories (pasta, cereal, canned fish, oils, peanut butter, nut, dairy, fresh fish or frozen fish, and supplement) and asked to indicate if they planned to shop in aisles containing these items. Those who marked four or more of these aisles were invited for study participation. To recruit the needed number of participants, each site was visited on two weekdays and one weekend day with the exception of one site that was visited 12 times. This store was located in a wealthy locale and was used as a convenience store rather than a primary grocery store.

The Podcasts

A 10-part series of instructional podcasts was developed in accordance with findings from a pilot study.¹⁰¹ The first podcast provided an overview of n-3s and their health benefits, and the other nine were designed to be used in each of the aforementioned food category aisles to illustrate foods rich in n-3s and to advise purchases. In addition, a female voice narrated, and background music was included to help block out external distractions. Both fortified and natural n-3 sources were highlighted in these podcasts, with the strongest emphasis placed on the purchase of foods rich in EPA and DHA, particularly fatty fish. The podcasts described which specific fish were highest in n-3s and which should be limited during pregnancy. The podcasts discouraged shoppers from incurring additional costs to purchase foods fortified with ALA rather than with EPA and

DHA, based on the far greater number of health benefits derived from these fats and their lower consumption levels among the U.S. population. Factors to consider when making supplement choices were explained, as were potential drug-interaction concerns for those with certain health conditions. Shoppers were encouraged to speak to their doctors before beginning supplement regimens. The following foods unrelated to n-3s were encouraged: (1) olive oil- even though it does not contain any n-3s, it is still a very healthy oil (monounsaturated fat source) and (2) ALA-fortified pastas may not be worth the extra cost, as ALA intake is typically adequate, but may still be a good purchase if high in fiber. These talking points were added to address misconceptions noted in the study's pilot.

Measures

A semi-structured interview was administered at pre-test to collect demographic data, health histories regarding health conditions that n-3s may help treat, and information regarding the participants' familiarity with the use of the podcasts. Shoppers' knowledge of n-3s, where they accessed information about n-3s and if they had been advised by a health professional regarding n-3s was also queried. The TRA constructs assessed were shoppers' perception of: (1) the importance of buying n-3 rich foods (perceived importance); (2) their ability to shop for n-3 rich foods (self-efficacy dimension of perceived behavioral control); and (3) their beliefs regarding the importance their family, friends and coworkers associated with n-3 intake (social norms). Note that only the self-efficacy portion of perceived behavioral control was assessed. However, since the myriad of factors that individuals' perceived as influencing their controllability with

regards to the purchase of n-3 rich foods were unknown and would have warranted another study in itself, this dimension of the construct was not assessed. Constructs were assessed using a single question for each and measured using a 5-point Likert scale.^{9,102} Shoppers' knowledge of n-3s was tested pre- and post-intervention using six questions.

Shoppers were taught how to use the MP3 players provided and then asked to listen to the corresponding title when they shopped for foods for which there was a podcast.

Researchers routinely walked around the store and checked with the shoppers to see if they needed help with the equipment and to make sure they were listening to the podcasts. When shoppers returned their MP3 players, they were asked open-ended questions about how much they liked the podcast, what they would like to see improved, and what they had learned. The TRA questions asked in the pre-test were re-administered. Shoppers were also asked what n-3 rich foods they had purchased as a result of the podcasts as well as about their intentions to purchase n-3 rich foods in the future. Food purchases were visually verified by the researchers.

Data Analysis

This study employed a mixed-methods study design. All quantitative data collected was analyzed using the Statistical Analysis System (version 9.2, 2011, SAS Institute Inc.).

Descriptive statistics were calculated for gender, age, MP3 player ownership, podcast familiarity and previous use, n-3 rich food purchases made, as well as intentions to purchase n-3 rich foods in the future. A single-group, repeated-measures (pre-intervention/post-intervention) study design was employed, so paired sample t-tests were

conducted to detect pre- and post-intervention differences in the shoppers' self-efficacy and perceived importance. Differences in the number of misconceptions and correct responses to the knowledge questions, pre- and post-intervention, were coded dichotomously and compared using McNemar tests.¹⁰³ Qualitative responses were not analyzed, but were catalogued to help illustrate the quantitative responses.

Results

Three-hundred and forty shoppers with a mean age of 49 ± 13 years completed the study. About two-thirds of the participants were women (73%) and slightly more than half were white (52%). Approximately 33% had a high school education, 21% had “some college,” and 42% had completed a Bachelor's or a graduate degree. More than half owned an MP3 player (53%), and most of them knew what a podcast was (75%) and had previously downloaded one (64%). Fifty-two shoppers worked in a health related field; only eight made recommendations pertinent to n-3s as part of their work. Nearly all shoppers (92%) either had a personal history of n-3 treatment-related health conditions and/or a family history with one of these conditions. The prevalence of specific health conditions and the number of participants who were advised about n-3s by a health professional are shown in Table 5.1.

Table 5.1: Prevalence of health conditions associated with omega-3 consumption among shoppers who listened to podcasts about increasing omega-3 purchases while grocery shopping (n=340).

Health Condition	Self		Family History	
	Diagnosed with the condition (n)	Advised about omega-3s by physician (n)	Family history of the condition (n)	Advised about omega-3s by physician (n)
Coronary heart disease	38	16	147	48
Hypertriglyceridemia	50	27	93	30
Asthma	43	12	92	18
Arthritis	63	19	116	31
Psoriasis	14	2	17	6
Depression	29	9	42	10
Alzheimer's	2	2	49	15
ADHD	5	1	31	9
Macular degeneration	3	0	31	6
Vision problems	158	38	163	37

Most of those surveyed had heard or read about n-3s prior to the intervention (82%).

Their primary information sources were television (41%) and/or magazines (16%). In response to an open-ended question regarding what people had heard about n-3s, most (82%) gave only a single response, with the most frequent responses being that “*they are found in fish*” (44%) and that “*they are good for you*” (28%). Misconceptions were stated by 25 shoppers, the most common misconception being that olive oil is rich in n-3s. Only four shoppers stated misconceptions post-intervention. McNemar test results show that this was a significant reduction ($P=0.001$). One shopper said that:

“I thought olive oil had omega [3]s, but it doesn't.”

McNemar test results also revealed significant differences in the number of people who answered the knowledge questions correctly pre- to post-intervention (Table 5.2).

Table 5.2: Responses to knowledge questions regarding omega-3s, before and after listening to podcasts about increasing omega-3 purchases while grocery shopping (n=340).			
Questions	Responded Correctly Pre-intervention (n)	Responded Correctly Post-intervention (n)	McNemar Test Significance Level
Which omega-3 is different from the others?	14	222	<0.0001
What do you think are the specific health benefits of omega-3s?	179	310	<0.0001
Which oils are naturally rich sources of omega-3s?	164	246	<0.0001
Do fish and walnuts offer the same health benefits?	47	125	<0.0001
What type(s) of fortified products claim that they are high in omega-3s?	67	273	<0.0001
What type(s) of fortified products may not be worth the extra money?	6	161	<0.0001

Some shoppers reported post-intervention they were now intrigued and would seek to learn more about n-3s to make informed decisions. Some comments were:

“I already look for Omega 3's. Now I know to look for foods only with EPA and DHA and research more. Pregnant women should have no more than 6 oz of albacore tuna, when I was pregnant I had more and now I am worried, no wonder my son drives me crazy!”

“Some [information] was surprising; I thought I knew what omega-3s were. If the label says omega-3s it does not mean it has the right kind. I liked that it told you when it wasn't worth extra money. [The podcasts were] straight-forward.”

Despite 223 people having suffered from at least one health conditions that n-3s may help treat, just about one third of them (n=83) had been advised to consume more. Some expressed frustrations that their doctors had not done so.

“My doctor should be telling me all this”

“I think my mother-in-law is on blood thinners.....I should tell her to stop taking fish oil that I bought her...why didn't her doctor warn her about things [foods and supplements] to avoid when taking her medication?”

Of the 50 shoppers who were 65 years or older, most (n=46) had been diagnosed with or had a family history of one of the health conditions queried, and only nine had reported that they were advised about n-3s by their physicians. While 84 women of child-bearing age (<45 years) participated in this study, only 12 had received any advice by a health professional regarding the consumption of n-3s to support the birth of healthy babies. Although no study participants were pregnant, eight reported they were trying to get pregnant and not one of them had received any advice by doctors regarding n-3 intake.

The podcasts were well received by the study participants. Most said they liked the series (86%), which was evidenced by responses such as:

“I really liked the information... clever way to present nutrition advice.”

“Very informative, I heard the whole thing [and] I wanted more.”

One senior said:

“This was a great experience... it was nice to have someone keep me company [and] advising me on product selection.”

Many participants found the podcasts easy to use (79%); as the following comments illustrate:

“The information was very well laid out and it was easy to listen to the podcast and shop.”

“It was nice to see the foods and hear about them at the same time.”

Almost all of the shoppers (96%) said the information was clearly presented and easy to understand.

“Very informative, gave me a good idea of what was good and what is not so good”

“Her [the narrator’s] voice was very clear. Important information that I needed to know... I am glad I agreed to participate.”

As a result of listening to the podcasts, 159 shoppers (47%) bought at least one n-3 rich food item (listed in Table 3).

“Interesting to see there are many n-3 fortified foods. I bought milk and peanut butter with DHA.”

“Fish is a jackpot! I always knew that but now I am sure fish is great for you.”

The average number of n-3 rich foods bought was 1.3 ± 0.8 items. A large percentage of the shoppers (87%) expressed their intention to buy the n-3 rich foods listed in Table 5.3 in the future.

“I must buy and eat fish two times a week... like salmon and tuna.”

“I will start buying more and different [kinds of] fish.”

Table 5.3: Planned purchases and actual foods purchased by participants in a study to evaluate the impact of listening to podcasts about increasing omega-3 purchases while grocery shopping (n=340)		
Foods	Purchased n-3 rich foods on the intervention day (n)	Planned future n-3 rich foods purchases (n)
DHA, EPA or ALA Rich Foods		
Walnuts	27	54
Tuna, canned	23	29
Salmon	16	20
Sardines	12	5
All Fish, (not including those stated above)	35	136
Foods Fortified with DHA, EPA or ALA		
Butter/margarine	25	31
Peanut butter	18	49
Pasta	17	22
Eggs	16	27
Milk	14	30
Mayonnaise	9	5
Fish Oil Supplements	0	34

While none of the shoppers bought any fish oil supplements on the day of the intervention, 10% (n = 34) said they planned to buy supplements in the future.

“I don't eat fish, so I should take supplements which I will start [doing] soon.”

Changes in all the TRA constructs assessed pre- and post-intervention improved significantly. Mean scores of shoppers' ability to shop for n-3 rich foods increased from 3.1 ± 1.3 to 4.3 ± 0.8 ($t[339] = 26.8, P < 0.0001$). Similarly, the mean scores of the shoppers' perceived importance of buying n-3 rich foods increased from 4.1 ± 0.7 to 4.7 ± 0.7 ($t[339] = 9.9, P < 0.0001$). Increases in perceived importance were significantly

correlated with intention to purchase n-3 rich foods in the future ($r = 0.12$, $P < 0.03$), while the changes in self-efficacy to purchase these foods were not.

Discussion

Podcasts as a point-of-purchase intervention were successful in communicating nutrition-education messages, reducing misconceptions, and even prompting shoppers to learn more about the topic in this study. Our study confirms previous findings that these interventions employ a socio-ecological approach to help improve food purchasing decisions and therefore may be ideal for educating consumers to improve health outcomes.⁶² These podcasts served their purpose in educating customers not only while they shopped but acquiring knowledge may have continued even outside the grocery store as many shoppers reported their intrigue and interest in learning more about n-3s.

In the pilot study for this investigation, the TRA constructs affected intentions to purchase n-3 rich foods, as the theory would suggest.¹⁰¹ In this investigation, the significant improvements among the TRA constructs would also seem to suggest that purchasing n-3 rich foods is a “reasoned action.” Yet, while shoppers’ self-efficacy to buy n-3 rich foods and their perceived importance regarding n-3s increased significantly, only the latter correlated with intention to purchase n-3 rich foods in the future. Reasons that may have contributed to the failure of the theory to predict intentions may be that the purchase of n-3 rich foods is not in fact a “reasoned action”. Another explanation might be that all the constructs of the theory were not impacted by this intervention and therefore were not assessed. For example, perceptions of the importance of purchasing n-

3 rich foods held by participants' family and friends would not have changed during the single shopping trip when this intervention was performed. Therefore the intervention would not have changed social norms. In addition, only one dimension of perceived behavioral control (i.e., the self-efficacy dimension) was assessed. As previously stated, it was impossible to predict what other controllability factors may impact shoppers' intentions to purchase n-3 rich foods. Content to affect controllability was not included in the podcast and hence not measured. Future studies should assess various factors that affect shopper's perceived control and interventions should be designed to address these issues.

Notably, even though most participants reported intentions to buy n-3 rich foods in the future, only relatively few purchases were made on the day of the intervention. Reasons may include participants' adherence to their grocery lists, prior meal planning, and/or budget constraints. The relationship between increased intentions to purchase n-3 rich foods and people's actual purchasing behaviors will require prospective assessment.

Notably, despite the emphasis placed on fish consumption in the podcasts, few participants bought fish the day of the intervention. While low purchase levels on the day of the intervention could be explained by the aforementioned factors, it is particularly important for researchers to examine these purchasing trends over time. Studies have shown low levels of fish consumption in the U.S.A.⁴ Research done in Europe and among pregnant American women may explain why increasing fish consumption remains a difficult "sell" for nutrition educators. Concerns include (1) the high price of seafood,

(2) how it smells when it is being cooked, (3) its inability to leave people feeling as satiated as when they eat meat,^{87,88} (4) the perceived risks associated with eating fish,⁸⁹ and (5) not being advised by their doctor to eat fish.⁹⁰ Although participants in the U.S. studies cited above were younger women with different ethnic backgrounds than those in the current investigation, these findings may still be of value in explaining low fish purchases.

It has also been postulated that habitual behaviors can become rigid and unresponsive to change despite the understanding of health and nutrition.^{91,93} Thus, when encouraged to buy more foods rich in n-3s, shoppers may have preferred n-3 fortified versions of foods they habitually purchase (e.g., eggs, milk, pastas, spreads, and peanut butter) over foods they buy less often, like fish. Perhaps, there is a stronger market for foods that are fortified with n-3s and/or that particular barriers need to be overcome to increase the purchase of fish.

Another factor contributing to low fish consumption may be the failure by health professionals to provide information regarding foods that help prevent and treat health conditions. It has been reported that doctors continue to be the primary source of information for individuals who are concerned about specific health conditions.⁶⁷ Most shoppers in this study had and/or had a family history of at least one n-3 treatment-related health condition and in spite of that, many were not even aware of what n-3s were. It is crucial that dietitians who work alongside physicians encourage them to talk to patients about foods they should eat as well as potentially harmful interactions of drugs and

supplements. Moreover, it may be prudent for doctors to refer their patients to dietitians who are especially trained to provide specific dietary recommendations.

Seniors seem to be particularly interested in n-3s and health. The initial research protocol mandated that the study population would only include adults aged 65 and younger because this study employed a novel technology and adults aged 65 and older (seniors) have been shown to be less likely to adopt new technologies.¹⁰⁴ However, during participant recruitment researchers found that seniors seemed particularly willing to participate, stating that they were enticed by the prospect of learning more about n-3s. The project protocol was amended when the study was just underway (i.e., still collecting data at the first site) to increase the allowable participant age to increase from 65 to 80. These data supports others' findings that seniors are active information seekers;^{105,106} their interest levels may be high due to both their need for information about n-3 consumption as well as their higher incidence of n-3 related conditions like arthritis, macular degeneration, Alzheimer's, and heart disease.^{33,107,108} To serve this audience, where a thirst for knowledge outweighs the lack of familiarity with technological delivery systems, nutritionists may need to provide instruction on the use of newer technologies.

An ancillary finding was that the podcasts not only served an informational function but perhaps also a social one. It has been reported that shopping is not just about buying necessities, but it is an important means of socialization.¹⁰⁹ Seniors expressed enjoyment in having a virtual companion with whom to shop; nutritionists may want to consider

virtual companionship as a means of increasing “teachable moments” to promote healthful behavior change among seniors.

This study had some limitations. Due to financial and time constraints, a control group was not used. Also shoppers were not asked if they were vegetarian which may have negatively affected fish purchases. Moreover, some participants’ responses may have been overstated as a result of the Hawthorne effect (i.e., the phenomenon of altering behavior because of participating in a study rather than the intervention itself)⁹⁵ or response bias (i.e., respondents answer questions in the way they think the questioner wants them to answer rather than according to their true beliefs).⁹⁶ Also, all TRA constructs were assessed using a single question that was not tested for validity or reliability and did not undergo cognitive testing. However, use of single-item assessment of TRA constructs has been shown to be valid in other investigations.^{10,94} While the large sample size and numerous locations were this study’s strengths, the results may not be generalizable, and future examinations in varied locations and more diverse audiences may need to be conducted to see if they also produce similar results.

Conclusions

This investigation presents a novel approach to nutrition education and should serve as a catalyst for much needed additional work. If future studies confirm that despite encouragement to purchase/consume fish consumers choose alternative foods rich in n-3s, perhaps the Academy of Nutrition and Dietetics and other health associations that recommend eating fish might consider consumer preferences and broaden their

recommendations to include n-3 fortified foods. Additional research studies should be conducted to identify barriers to fish purchase and/or consumption and to optimize messages to overcome these barriers to increase consumption. Finally, longer-term behavior changes need to be assessed in future investigations. This study shows that dietitians may want to create additional podcasts as point-of-purchase interventions, as they appear to be a promising means of improving grocery-shopping behaviors. This recommendation is also supported by the following statement made by Susannah Fox, associate director at the Pew Research Center's Internet & American Life Project, *“that’s where health care happens – in the grocery store aisle, making a decision, wondering what to eat for dinner tonight, looking up choices on a smartphone.”*¹⁰

**Chapter 6: A point-of-purchase intervention using grocery store tour podcasts
about omega-3s increases long-term purchases of omega-3 rich food items**

Abstract

Background: Podcasts developed to be used at the point-of-purchase may be valuable means for public health nutritionists to help consumers make healthy dietary choices. However, podcasts have yet to be assessed for this purpose.

Objective: To assess the impacts associated with a point-of-purchase intervention using grocery store tour podcasts about n-3 rich food items.

Design: This investigation was a repeated-measures secondary data analysis of the food purchase records obtained from a convenience sample of shoppers' loyalty cards.

Participants: Shoppers (n = 251) who had listened to podcasts regarding n-3 rich foods while grocery shopping. Most shoppers were white, women, and/or had at least a high school education.

Statistical Analysis: Descriptive statistics were performed on demographic characteristics. Paired t-tests were performed to assess if food purchases increased from the six months pre-intervention through the six months post- podcast exposure. Correlations were used to detect relationships between shopping changes and with participants' gender, race, and education level.

This chapter was written according to the author guidelines for submission to the *Journal of The Academy of Nutrition and Dietetics* which publishes research related to food, nutrition, and dietetics.

Results: More than half of the shoppers (59%) increased their purchases of n-3 rich foods; mean purchases increased significantly from 0.2 ± 0.7 pre-intervention to 3.6 ± 5.1 post-intervention ($t[172] = -6.9, P < 0.001$).

Conclusions: Grocery store podcasts appear to be an effective means of nutrition education that nutritionists can use to assist their clients in making healthier purchases. Longer term studies should be done to assess if lasting change results from these types of interventions.

Introduction

People eat what they buy.^{111,112} Therefore, grocery stores interventions may be a valuable tool for public health nutritionists who aim to help consumers make healthier dietary choices.¹¹³ However, grocery store point-of-purchase interventions have shown mixed results, and podcasts have never been tested as a means of delivering point of purchase nutrition education. This investigation was designed to evaluate the long-term effects of a point-of-purchase podcast intervention about omega-3s (n-3s) by reviewing participants' food purchases throughout a one year period (six months pre-intervention through six months post-intervention). This investigation was part of a larger study designed to assess the impacts associated with use of this innovative means for providing consumer education at the point of purchase.

The intervention was comprised of listening to a 10-part series of educational podcasts about n-3 rich foods, their types and their health benefits and their food sources, while

shopping. The podcasts were intended to be virtual grocery shopping companions that is, they were designed to be listened to on an MP3 player; a common component of most smartphones which many people already use to research products and search for coupons and/or sale promotions.⁵

The opening podcast introduced n-3s and their health benefits. Nine other podcasts were designed to be used while shopping for food items from each of the following categories: pasta, cereal, canned fish, oils, peanut butter, nuts, dairy, fresh fish or frozen fish, and/or supplements. These podcasts had been created to help reduce the ambiguity present in the media regarding the different types and food sources of these fatty acids.¹⁰¹ The podcasts discouraged shoppers from incurring additional costs to purchase foods fortified with ALA (alpha linolenic acid) rather than DHA (docosahexaenoic acid), and EPA (eicosapentaenoic acid), based on the far greater number of health benefits derived from these fatty acids.^{3,17,99,114} Since research has established that the consumption of DHA and EPA rich foods (i.e., seafood, especially fatty fish) is low among Americans,³ the podcasts emphasized the purchase of fatty fish, but included advice regarding which types of fish should be limited during pregnancy.

Previous investigations; done as part of the larger study of which this work was a part included:

- a pilot study (n=56) to examine the feasibility of using podcasts as a means of delivering nutrition education regarding n-3s while grocery shopping,¹⁰¹ and

- an investigation designed to evaluate the effects of the podcasts' use on most of the constructs of the Theory of Reasoned Action (TRA), i.e., shoppers' (1) perceptions of the importance of buying n-3 rich foods; (2) ability to shop for n-3 rich foods; (3) beliefs regarding the importance their family, friends and co-workers associated with n-3 intake; (4) purchase of n-3 rich foods on the day of the intervention; and (5) intentions to purchase n-3 rich foods in the future; had been conducted.¹¹⁵

The TRA has been used as the framework for numerous studies, including those concerning food shopping.^{11,73,74} The work described in this manuscript built upon the previous studies, as it examined the final portion of the TRA, i.e., behavior change, as the main objective of this investigation was to examine the effects of the n-3 grocery store podcasts on participants' long-term n-3 rich food purchases.¹⁰¹

The sample size for the latter of the two investigations listed above included 340 shoppers recruited from 20 New Jersey stores that belonged to the Great Atlantic & Pacific Tea Company (A&P) retail grocery chain. Shoppers had both listened to the podcasts while shopping on the day of the intervention, and had been provided with a website's address where the podcasts could be accessed.¹¹⁶ This investigation was done with a sub-sample of those 340 shoppers and who agreed to provide their grocery store loyalty card numbers, which enabled the researchers to examine their n-3 rich food item purchases over time.

Methods

This investigation was a secondary data analysis of the food purchase records from the 251 study participants who had listened to the podcasts regarding n-3 rich foods while grocery shopping, and who had supplied researchers with their shopper loyalty cards. The participants were never told that their shopper loyalty cards would be used to track or evaluate their purchases. Shopping data were obtained from the consumer analytics department at A&P, using the participants' loyalty card numbers. Data collected previously had been de-identified, so use of the loyalty card numbers to obtain shopping data constituted the use of data from individuals, collected anonymously. Food purchase records for each of the individuals was obtained for six months prior to and six months after the date from which they participated in the intervention. This project protocol was approved by Rutgers University Institutional Review Board (protocol #10-548).

Data Analysis

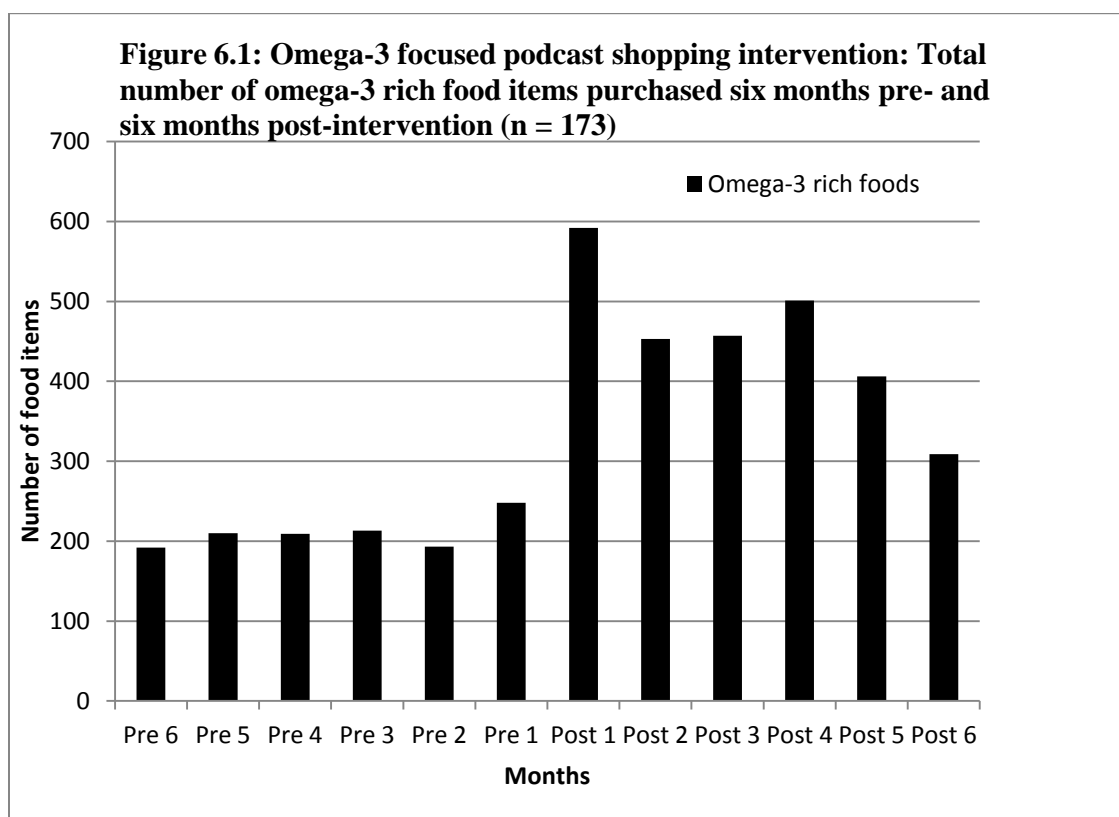
Food purchase records were received as Microsoft Excel 2010 (Microsoft Excel 2010, Microsoft Corporation) worksheets. The dataset was stripped of all items purchased except for the food items that had been encouraged in the podcast. These were: salmon, tuna, shrimp, sardines, all other seafood, walnuts, fish-oil supplements and fortified foods including: peanut butter, eggs, milk and mayonnaise. The number of each of the aforementioned food items purchased was counted for each participant and coded, by participant, by month. Purchases made on the day of the intervention were excluded so as to reduce error that might have been generated from the Hawthorne effect (i.e., the phenomenon of altering behavior because of participating in a research study rather than

the intervention itself).⁹⁵ The coded data was imported into *Statistical Analysis Software* (version 9.2, 2008, SAS Institute Inc), and matched by identification number to the demographic variables that had been previously collected. Data that had been sorted by participant identification number, was re-sorted for aggregated analyses of foods purchased per month (i.e., the data was transposed wide to long). Seafood and fortified foods were analyzed both by food type and food category (i.e., salmon purchases were examined as “salmon” and “seafood”). Charts were created to illustrate the quantity of purchases of the food items and food categories. A Pearson’s correlation was used to assess the relationship between intentions to purchase n-3 rich foods on the day of the intervention with the actual long-term n-3 rich food purchases. Paired sample *t*-tests were conducted to detect pre- and post-intervention differences in number of food purchases. One-way analysis of variance was used to examine any differences that might be attributable to the race, gender and education levels of the investigation’s participants.

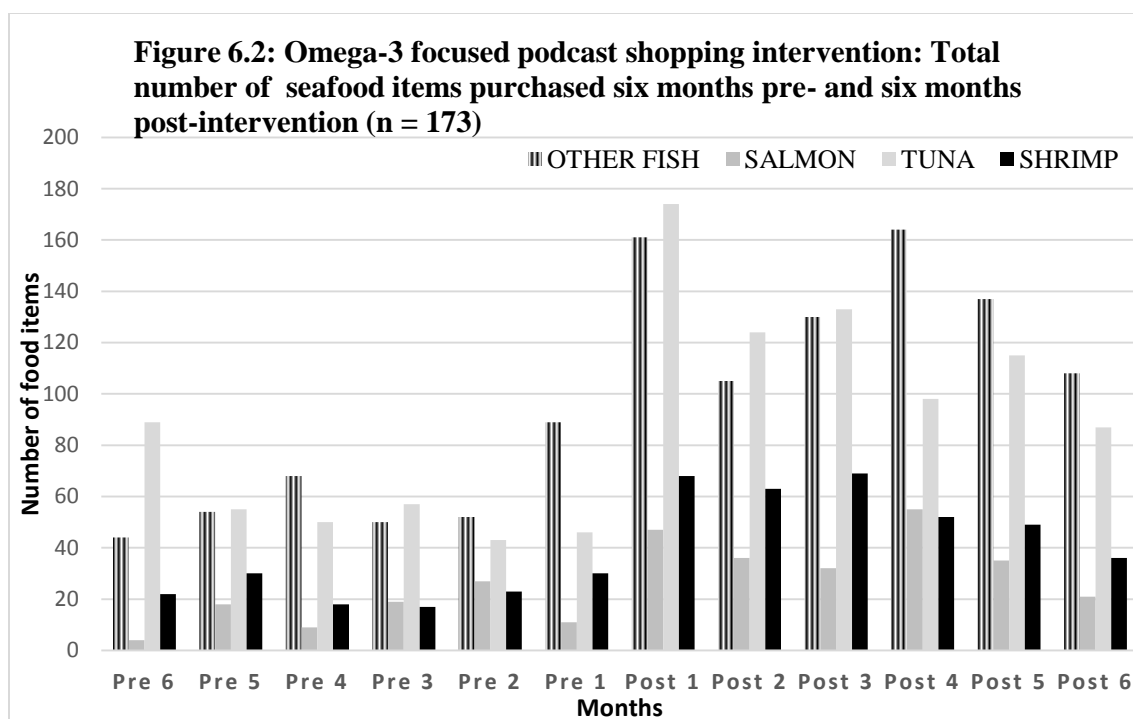
Results

Purchase data for the foods purchased during each of the 12 months analyzed (six months pre-podcast and six months post-podcast, by shopper) were obtained from 251 shoppers, however, only the data from those with complete data sets (n=173) were included in the analyses. This subsample of shoppers was mostly female (76%) and/or white (58%). More than a third of the shoppers were black (35%); a small percent of the study sample (7%) represented other races and ethnicities, including those who identified themselves as Hispanics. Most shoppers (95%) had at least a high school degree, with 28% and 13%

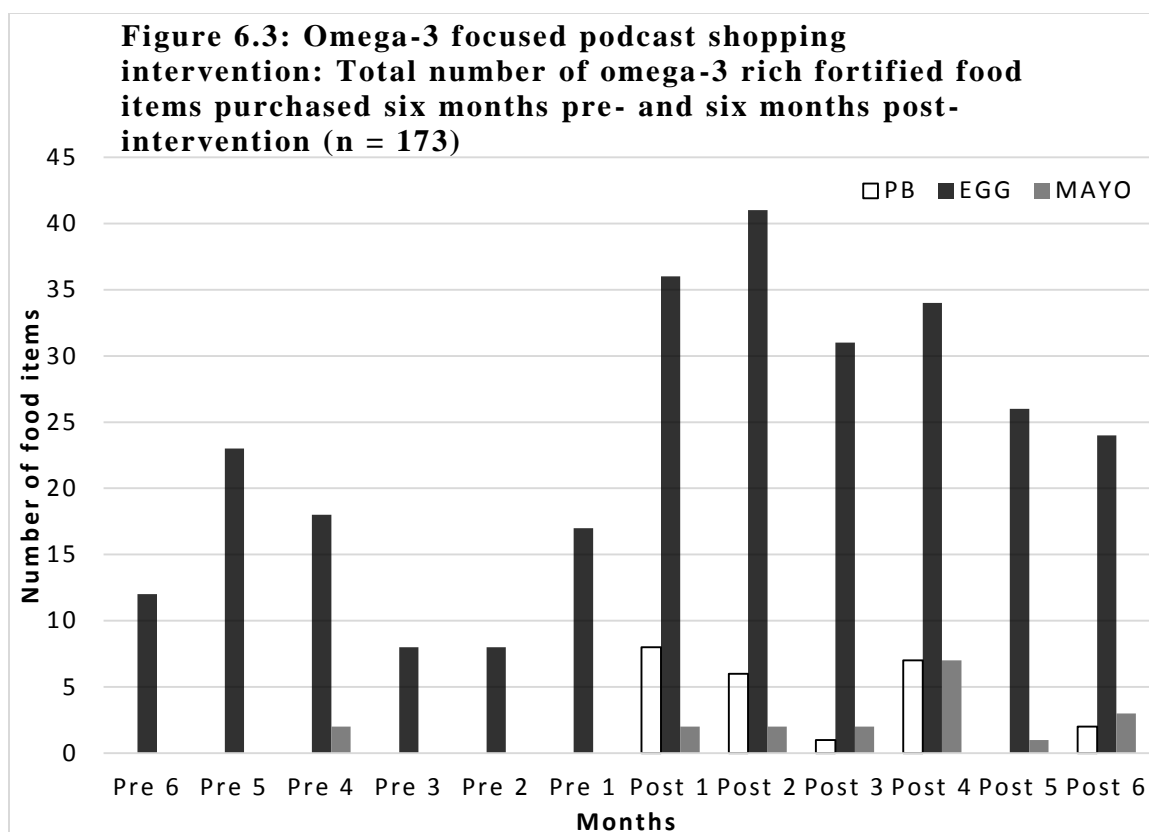
having obtained bachelors' and graduate degrees, respectively. Shoppers ranged in age from 18-80 years, with the mean age being 50.4 ± 13.8 years.



There was a clear increase in the purchase of n-3 rich food items bought during the period of the investigation (Figure 6.1) with 102 shoppers (59%) purchasing more n-3 rich foods pre- to post-intervention. Sixty-six (38%) of the shoppers had purchased no n-3 rich foods during the six months prior to the intervention; twenty-five of these shoppers made n-3 food purchases post-intervention. Thirty-four people had not purchased fish in the six months prior to listening to the podcasts but had done so afterwards; and, 30 shoppers had not purchased fortified foods prior to listening to the podcasts and did afterwards.



Overall, mean purchase of n-3 rich foods increased significantly from 0.2 ± 0.7 pre-intervention to 3.6 ± 5.1 post-intervention ($t [172] = -6.9, P < 0.001$). All food purchases examined, both individually (Table 6.1) and when categorized as “seafood” and “fortified foods” (Table 6.2), showed significant post-intervention increases with the exceptions of, walnuts, sardines, and n-3 fortified milk. The number of months in which omega-3 purchases were made also increased significantly (Tables 6.1 and 6.2).



The total number of “seafood” and “fortified foods” purchases were charted (Figure 6.2 and 6.3). The chart illustrates data showing that the number of n-3 rich foods purchased prior to the podcast intervention was relatively low and showed little variance according to the month. A spike in the purchase of n-3 rich foods is evident during the first month post-intervention. As such, analyses were repeated excluding this month. Results remained significant (Tables 6.1).

Table 6.1: Omega-3 focused podcast shopping intervention: Mean number of months in which omega-3-rich food foods were purchased and mean number of items purchased pre- and post-intervention (n=173).

Food Items	No. of months that item was purchased (Mean \pm SD)			No. of items purchased (Mean \pm SD)		
	6 Months Pre-Intervention	6 Months Post-Intervention	Post-Intervention (excluding month 1 ^a)	6 Months Pre-Intervention	6 Months Post-Intervention	Post-Intervention (excluding month 1 ^a)
Salmon	0.3 \pm 0.7	1.3 \pm 1.7***	0.5 \pm 1.0***	0.4 \pm 1.6	1.1 \pm 3.6**	1.1 \pm 3.6**
Tuna	0.6 \pm 1.2	1.1 \pm 1.5***	1.1 \pm 1.5***	2.3 \pm 5.5	4.5 \pm 7.5***	4.5 \pm 7.5***
Shrimp	0.5 \pm 1.0	1.1 \pm 1.4***	0.9 \pm 1.4**	0.8 \pm 1.7	2.0 \pm 3.4***	1.6 \pm 2.9**
Sardines	0.1 \pm 0.4	0.2 \pm 0.4	0.1 \pm 0.3	0.4 \pm 1.9	0.5 \pm 1.3	0.5 \pm 1.3
Fish (other)	0.9 \pm 1.5	1.8 \pm 2.0***	1.4 \pm 1.7***	2.3 \pm 5.5	4.8 \pm 7.5***	3.9 \pm 6.5**
Walnuts	0.2 \pm 0.1	0.5 \pm 0.3*	0.1 \pm 0.3*	0.1 \pm 0.5	0.1 \pm 0.6	0.1 \pm 0.6
Fortified peanut butter	0.0 \pm 0.0	0.1 \pm 0.3*	0.1 \pm 0.3**	0.0 \pm 0.0	0.1 \pm 0.6*	0.1 \pm 0.7**
Fortified eggs	0.3 \pm 0.7	0.7 \pm 0.3***	0.7 \pm 1.3***	0.5 \pm 2.0	1.1 \pm 2.8***	1.0 \pm 2.5*
Fortified milk	0.02 \pm 0.1	0.1 \pm 0.7	0.1 \pm 0.7*	0.02 \pm 0.2	0.2 \pm 1.2	0.1 \pm 0.9
Fortified mayonnaise	0.04 \pm 0.1	0.1 \pm 0.4*	0.1 \pm 0.4*	0.01 \pm 0.2	0.02 \pm 0.4*	0.01 \pm 0.4 *

^a = The first month post-intervention when sales spiked ; * = Paired t-test $P < 0.05$, ** = Paired t-test $P < 0.01$, *** = Paired t-test $P < 0.0001$

While *t*-tests revealed that changes in the purchase of fortified foods was higher in women than men ($t [172] = 2.68, P < 0.001$), no differences were found with regards to any other demographic variables (i.e., shoppers' gender, race or education levels). No significant relationship was found between responses regarding intentions to purchase n-3 rich foods that had been stated on the day of the intervention and the increase in the number of n-3 rich foods purchased.

Table 6.2: Omega-3 focused podcast shopping intervention: Mean number of months in which omega-3-rich foods, by category, were purchased and mean number of items purchased six months pre- and six months post- intervention (n=173).				
Food Items (grouped)	Mean number of months item was purchased		Mean number of items purchased	
	Pre Mean \pm SD	Post Mean \pm SD	Pre Mean \pm SD	Post Mean \pm SD
Seafood (fish and shell-fish)	2.0 \pm 3.0	3.9 \pm 4.5***	5.3 \pm 10.6	10.6 \pm 15.8***
Fortified foods (peanut butter, milk, eggs, mayonnaise and spreads)	0.4 \pm 0.9	0.9 \pm 1.7***	0.6 \pm 2.0	1.4 \pm 3.3***
*Paired t-test $P < 0.01$; **Paired t-test $P < 0.001$; ***Paired t-test $P < 0.0001$				

Discussion

This investigation was designed to further a study into the use of podcasts as grocery shopping tours. Specifically, it assessed the impact of the podcasts' use on food purchases, using objective food purchase data collected via customer loyalty cards. The strength of this intervention was evident whether the data was analyzed in terms of the number of items purchased per month, or in terms of the number of months in which at least one purchase was made. Further, only one demographic variable, gender, appeared to affect shoppers' responses, i.e., women bought more fortified items than men. This difference may be explained by marketing studies that reveal that because women are the

primary grocery shoppers for most households, therefore the marketing of fortified foods is primarily targeted towards them.¹¹⁷⁻¹¹⁹

The podcasts' success is further evidenced upon examination of sales data regarding less popular food items. For example, none of the 173 shoppers in this investigation had ever purchased n-3 fortified peanut butter and only one shopper had purchased n-3 fortified mayonnaise prior to study participation; however, post-intervention 10 shoppers bought n-3 fortified peanut butter and eight purchased the mayonnaise. In spite of the significant increases in most of the foods that were recommended, purchases of walnuts sardines and fortified milk were not affected. Deterrents for purchase of fortified may have been the relatively "high" price of the fortified milk because it is generally organic milk that is fortified with DHA¹²⁰ and is usually more expensive than non-organic milk. In the case of sardines it is the authors' presumption that sardines are "acquired" tastes that are difficult to acquire. Additionally, it has been documented in previous studies that nuts are foods that many people buy in bulk.¹²¹ So while, the purchase of walnuts may have increased it may not have been evident in the purchase data in this grocery store as it was not a whole-sale store.

Perhaps of greater importance to nutritionists are the increases in seafood purchases. It is well established that seafood consumption in U.S. is low.³ Not surprisingly, numerous barriers to fish consumption have been identified.⁸⁷⁻⁹⁰ Because of these considerations, nutritionists are challenged to get their clients to consume these foods. Perhaps podcasts will be able to significantly assist them in their efforts to get people to eat more fish.

While, the investigators make no claims that this study resulted in increased seafood “consumption,” we believe that improved consumption is likely among those who purchased more, since people eat what they buy.^{111,112}

Despite the podcasts’ success, we would be remiss not to recognize that part of its success may have been attributable to the inclusion criteria that study participants be individuals interested in learning more about n-3s. In other words, we would not expect such a strong degree of success if the podcasts were used by “everyone.” Further, when the podcast is recommended for use, we do not expect that everyone will be interested in using it.

Adult learning theory states that adults only learn if they have an internal motivation to do so.¹²² It is highly unlikely that an adult who is not interested in learning about n-3 rich foods will download a podcast on this topic. Further, other models, e.g., the Transtheoretical Model’s Stage of Change,⁷² suggest that different messaging should be used for people in relation to their interest in the health topic being addressed. The podcast grocery store tours appear to be effective for assisting those interested in learning more about n-3s. However, if this means of nutrition education were to be used with those who do not have an interest in this topic, different, more tailored messaging would be useful (e.g., focusing more on individuals’ susceptibility to health conditions that n-3s may help treat).¹²³ Even then, the expectation that the degree of change evidenced in this study would be repeated would not be appropriate. That said, many dietitians work with clients who have recently experienced health challenges that facilitate teachable

moments, but their time with these clients is limited. It is likely that the use of the podcasts would assist the dietitians in providing practical, supplemental, and effective nutrition education.

This investigation was not without limitations. First, purchases for six months post-intervention were reviewed and this may have inflated the ultimate impact of the podcasts as purchases did decrease over-time. Additional studies need to be done over a longer purchasing period. Also this investigation did not review foods purchased in other stores. Yet, it is likely that this store was a primary shopping source for the participants as all those included had store loyalty cards and had indicated that they were on a major shopping trip when they were recruited. While, one limitation is that each participant had a varied time period for purchase data this may be in fact the investigation's strength in that, purchases data may not have been affected by the "time of the year" and/or "store promotions". Additionally, this investigation did not include a control group because no gold standard was identified for comparison by the authors in their review of previous point-of-purchase research studies; further, including a control group was beyond the limits of available resources. Also participants' were not asked if they were vegetarians.

Despite these limitations, this intervention and study design overcame some of the issues that have been identified with other point-of-purchase interventions. For example, previous studies' participants' intervention exposure varied widely, both in terms of the number of intervention components to which they were exposed, as well as the amount of time the investigators knew they had been exposed to the intervention.^{59,65,124} In this

investigation those assessed had been observed to being actively engaged in this single-component intervention. Further, issues have been noted regarding how the intervention effects were assessed. Assessment issues have included: (1) the evaluation of aggregate rather than individual level sales data, a method that fails to match intervention exposure to individuals' purchasing practices;^{98,124} (2) heavy reliance on self-reported data, which typically results in inflated estimates of the effects of the intervention due to the Hawthorne effect and/or response bias;^{58,59,64,125} and/or (3) only a sub-set of the foods that the intervention was designed to modify being assessed.^{58,65} These issues were overcome by assessing the purchase of all foods recommended in the podcast, and assessing data in a manner suggested by Glanz and Yaroch who proposed that obtaining individualized sales figures via "loyalty cards" would be a more vigorous method to assess changes in food purchasing.¹²⁶ This investigation therefore insured that (1) the intensity of the intervention was comparable among participants, and (2) only the sales data of those in the intervention were assessed.

With regards to findings related to the theory underlying this work, (the TRA), our previous investigations have found that the significant improvements among the TRA constructs suggested that purchasing n-3 rich foods was in fact a "reasoned action."¹⁰¹ Yet, in this current investigation the increased n-3 rich food item purchases did not significantly correlate to intention on the day of the intervention. These findings are, unfortunately similar to the results of previous food shopping studies where it has been found that the components of TRA may not always predict intention and have also acknowledged the inconsistencies in the link between intention and behavior.^{15,18,35}

Others have attributed poor correlations between stated intentions and opposing behaviors to developments and changes in consumer characteristics (for e.g., major life events like pregnancy or death in the family) and product attributes (e.g., product recalls or lack of sales or promotions).^{74,127} If intention to improve food intake does not predict the long-term change, perhaps nutrition researchers should identify other theories or models to better explain these changes and serve as the basis for behavior change interventions.

Summary

This investigation suggests that podcasts may be an effective method of delivering nutrition education to those who are interested to healthy food shopping behaviors. The fact that increased purchases occurred across many foods suggests that there is not “one” food that is more likely to be purchased than another, so nutritionists promotion of a variety of foods not only supports better diets, but perhaps also better adherence to recommendations among consumers. Further, there appears to be a market for n-3 fortified food items, and fish. An increased demand for n-3 rich foods may also encourage the food industry to improve product selection and also fortify their products with DHA and EPA to help increase the levels of these fatty acids in the American diet.

Based on the findings in this investigation, public health nutritionists would be well advised to develop other podcasts that can be used as grocery shopping companions to encourage purchase of specific nutrients and/or food groups that are lacking in the

population at large. Further studies need to be conducted to assess if these means of delivering nutrition education are effective among different populations. Nutrition education podcasts may very likely help improve the legacy of point-of-purchase nutrition interventions, enabling shoppers to make positive changes to their diets and ultimately their health.

Chapter 7: Conclusion

This research sought to examine the effectiveness of using omega-3 (n-3) grocery store tour podcasts to administer nutrition education at the point-of-purchase. The objectives of this research were to test the use of podcasts while people did their regular grocery shopping in terms of: (1) their thoughts about the podcasts; (2) how the constructs from the Theory of Reasoned Action (TRA) predicted n-3 rich food purchasing behaviors and behavioral antecedents; and, (3) changes in study participants' knowledge about n-3s. Purchases were measured on the day of the intervention as well as for a period of six months afterwards. Ultimately, this study aimed to further the development of novel and innovative means for communicating health information through nutrition education.

Research Overview

Given that point-of-purchase interventions may be effective in helping consumers make healthy choices and that n-3 related nutrition information in the media is often unreliable and ambiguous; a point-of-purchase nutrition podcasting intervention was developed to provide reliable information to help individuals improve their ability to shop for n-3 rich food items, and to help clarify misconceptions regarding n-3s. These podcasts were developed for use by those individuals who are interested in learning more about n-3 rich foods. First, a pilot study was conducted to assess if podcasts can reasonably be used while grocery shopping. Based on the results of the pilot, the single podcast originally created was modified into a 10-part series of podcasts and tested with a larger, more diverse sample, using a variety of pertinent measures. Finally, a secondary data

analysis was performed on food purchase data obtained with regards to purchases made by those who participated in the study, for the full six month before and six months after the participants' podcasts exposure. Results discussed in the previous chapters provide information regarding how these aims were reached. A summary of how the findings in these chapters applied to each of the hypotheses presented in Chapter 1 is shown below.

Hypothesis 1

Consumers interested in learning more about n-3s will enjoy listening to a podcast about them and the foods they can find them in, as they shop.

Results of the pilot study revealed that those shoppers who volunteered for study participation were interested to learn more about n-3s and enjoyed listening to a podcast about n-3s. An important finding of the pilot study was that although the content of the podcast aligned with the pilot store's layout and the podcast had been recorded so shoppers could pause and restart the podcast as needed; some participants found it "tedious" and "confusing" to use. They reported that they did not shop the aisles in the same order as the store's layout. It was suggested that the podcast be divided into a separate podcast for each aisle to simplify its use.

The other three most common recommended changes to enhance the podcast were:

1. Use of a female narrator as the voice of the podcast;
2. The addition of background music to help block out external distractions; and
3. Enhancement of sound clarity and volume.

Based on the results of this pilot study, separate podcasts were recorded for each of the food types and/or categories presented so that shoppers could customize their grocery store tour experience to accommodate their shopping plans or routines. Those who design similar podcasts in the future would be well advised to do the same.

Hypothesis 2

Listening to a podcast(s) about n-3s and n-3 rich foods while grocery shopping will, increase the immediate purchase of n-3 rich foods, as well as intermediary (TRA) variables, that may affect immediate and long-term purchasing behaviors. Intermediary variables include: self-efficacy, perceived importance, social norms, and behavioral intentions.

In the pilot study, listening to the podcast resulted in an increased number of immediate purchases of n-3 rich foods. The perceived importance of purchasing n-3 rich foods and self-efficacy of purchasing n-3 rich foods also improved significantly post podcast exposure. The constructs of self-efficacy and perceived importance correlated with intentions to purchase n-3 rich foods in the future. The following (larger) study also produced similar findings. Immediate purchases increased, as did the behavioral antecedents: self-efficacy and perceived importance. In this case however, only perceived importance correlated with behavioral intentions. The only TRA variable whose change was not measured in this study was social norms. The people included in this intervention did not know each other and because the study was conducted on the day of the intervention changes in subjective norms could not have transpired, so they

were not assessed. Perhaps, future research may want to examine use of podcasts as a means of supplementing nutrition education classes where individuals learn together over a period of time. This would allow for measures regarding how changes in social norms occur over time and how those changes affect behavioral intentions and ultimately purchasing behaviors.

Hypothesis 3

Listening to podcasts about n-3s and n-3 rich foods while grocery shopping will reduce shoppers' misconceptions and increase their knowledge about n-3s': types, food sources and health benefits

As described previously, nutrition information about n-3s is inherently complex due to the fact that the different n-3s come from different food sources and produce specific health benefits. In spite of the complex nature of the information presented in the podcasts, participants' knowledge about n-3s significantly increased. Also, a significant reduction in the number of misconceptions regarding n-3s was also observed post-podcast exposure. It appears that these podcasts accomplished their aim to effectively convey these complicated nutrition messages. Future studies will have to assess if this holds true for other nutrients and food groups.

Hypothesis 4

Listening to podcasts about n-3s and n-3 rich foods while grocery shopping will result in long-term (6-month post-intervention) increased purchases of n-3 rich foods.

Long-term purchases of n-3 rich foods increased among those who were exposed to the podcast. When a review of the purchases made were limited to those made on the day of the intervention it appeared that participants were choosing to consume more n-3s by relying on habitual food purchases (i.e., buying fortified versions of foods they normally purchased, like milk, eggs, peanut butter and mayonnaise). However, over time this was not the case. Fish purchase increases post-intervention were impressive, (i.e., the most greatly increased purchases among this study population). This increase was seen among a population who self-identified as individuals interested in learning more about n-3s and was therefore a captive audience, thus these results may not be generalizable to others.

Future Research

This research shows that podcasts may be an effective means of communicating nutrition and health messages at the point of purchase. More interventions need to be designed to assess if these results can be reproduced in varied settings with diverse audiences. It may also be prudent to develop other podcasts for nutrient dense food groups that are deficient in the American diet. Technology is ever changing and so is access to health information. Perhaps health professionals should ensure they heed the need of the hour and keep up with the times, to create nutrition education means that are not only effective but also user friendly and appealing. If we can change what people buy we may in fact change what they eat.

APPENDIX

Attachment 1: List of Search Terms

1. Podcast nutrition
2. Podcast health
3. Podcast health education
4. Podcast nutrition education
5. Podcast nutrition education intervention
6. Podcast point of purchase
7. Podcast point of purchase intervention
8. Omega-3 podcast
9. N-3 podcast
10. DHA EPA podcast
11. Podcast grocery shopping
12. Nutrition education podcast grocery shopping
13. Health education podcast grocery shopping

Attachment 2: Pilot Podcast Script

Hi, my name is Scott and I am going to guide you on a tour of the grocery store to help you include more Omega 3 Fatty Acids in your diet by shopping for foods that are naturally rich in omega-3s or have been fortified with omega-3s. But first, what is all the fuss about omega-3s? Omega-3s are healthy fats. Our body doesn't make enough which is why we need to include them in our diets. These fats help our body develop and stay healthy. There are three main kinds of omega-3s. We will talk about each one of them as we get to the particular food sources. The next stop on our tour is the Pasta aisle. *En route to the aisle, feel free to pause the podcast. When you arrive please restart the podcast by pressing play.*

Barilla pasta is just one example of grains they are usually fortified with omega-3s. They are usually fortified with omega-3s ALA. ALA has been researched to protect against cardio vascular diseases. See if you can find other products fortified with Omega-3s. **[Pause]** *You may pause the podcast at this time to browse through the aisles to find the products that are fortified with omega-3s.*

Cereal is another grain food that is fortified with Omega-3s Cascadian Farm is one example; see if you can find others. Other fortified foods, includes oil, peanut butter, mayonnaise. Hellman's Best and Smart Balance are examples of brands that fortified their products with omega-3s. *You may pause the podcast at this time to browse through the aisles for other products that are fortified with omega-3s.* The next stop of our tour is

canned meats. **[Pause]** Please proceed to the canned meat section. *En route to the aisle, feel free to pause the podcast. When you arrive please restart the podcast by pressing play.*

Canned fish such as sardines, anchovies and white albacore tuna, are rich sources of the omega-3s EPA and DHA. EPA and DHA are best known for their benefits to heart health. In fact, scientists now think that EPA and DHA may help in treatment of ADHD and depression as well as improved pregnancy outcomes and help child development. Canned fish is another cost effective and a convenient way to increase omega-3s in your diet. The next stop on our tour is the Nut section. **[Pause]** Please proceed to the nut section. *En route to the aisle, feel free to pause the podcast. When you arrive please restart the podcast by pressing play.*

Nuts like Walnuts, Almonds and Flaxseeds are rich sources of the Omega-3s ALA but be careful not to overdo it. These nuts are high in fats and calories. The next stop on our tour is the Dairy aisle. **[Pause]** Please proceed to the dairy aisle. *En route to the aisle, feel free to pause the podcast. When you arrive please restart the podcast by pressing play.*

As you may have noticed, more foods are now being fortified with Omega-3s these especially include milk, yogurt, soy milk and certain spreads such as I Can't Believe It's Not Butter and Smart Balance. Smart Balance and Organic Valley are example of products fortified with omega-3s look at the label for specific omega-3s information. Consuming omega-3s fortified dairy products throughout your day will help increase the

omega-3s in your diet as well as calcium. Dairy products are not the only foods that are fortified with omega-3s. Eggs are another food that are fortified with omega-3s. Look at the egg cartons and see if you can identify which have omega-3s. **[Pause]** *You may pause the podcast at this time to browse through the aisles to find the products that are fortified with omega-3s.* Eggland's Best and Organic Valley are examples of eggs that may be a good source of omega-3s including omega-3s fortified eggs are cost effective option to include more omega-3s in your diet. The next stop on our tour is the Fish counter. **[Pause]** Please proceed to the nearest fish counter. *En route to the aisle, feel free to pause the podcast. When you arrive please restart the podcast by pressing play.*

Fatty fish like salmon, mackerel, sea bass, blue-fin tuna and trout are rich sources of the omega-3s EPA and DHA. These fatty acids are best known for the benefit to heart health. The 2005 Dietary Guidelines for Americans recommends two, four ounce servings of fish per week. Our tour is now complete. I hope you had a fun time with me in learning about omega-3s. Please go to the customer service desk to return the equipment and receive your compensation.

Attachment 3: Pilot Study Interview Script

Pre-Podcast Survey

Age: _____

Gender: _____

Do you shop using an EBT card or WIC vouchers? Yes No

Sometimes

Do you own an MP3 player (ipod)? Yes No

Do you know what a podcast is? Yes No

(If the answer is no, the interviewer will state that “A podcast is similar to a radio broadcast; however, a podcast can be downloaded from the internet and listened to at your leisure.” Then skip the next 2 questions.)

Have you ever listened to a podcast before today? Yes No

Have you ever downloaded a podcast before today? Yes No

On a scale from 1 to 5, where 1 means “not confident” and 5 means “very confident,” how confident do you feel in your ability to adequately shop for omega-3 rich foods?

On a scale from 1 to 5, where 1 means “not important” and 5 means “very important,” how important do you think it is to buy ample omega-3 rich foods during your major shopping trips?

On a scale from 1 to 5, where 1 means “very little” and 5 means “a lot,” do the people you are close to, like your friends, family, co-workers, take care to increase their intake of omega-3 rich foods to improve their diets and their health?

Post-Podcast Survey

On a scale of 1-5, where a 1 is the lowest ranking and 5 being the highest ranking, how much did you enjoy using the podcast?

On a scale of 1-5 with 1 being very difficult and 5 being very easy, how convenient was it to use the podcast as a shopping companion?

On a scale of 1-5 with 1 being very difficult and 5 being very easy, how clearly do you feel the information on the podcast was presented?

On a scale from 1 to 5, where 1 means “not confident” and 5 means “very confident,” how confident do you feel in your ability to adequately shop for omega-3 rich foods?

On a scale from 1 to 5, where 1 means “not important” and 5 means “very important,” how important do you think it is to buy ample omega-3 rich foods during your major shopping trips?

What did you like most about the podcast?

What did you like least about the podcast?

What would you like to see changed?

Did using the podcast change what you bought, and if so how?

Do you plan to purchase anything different in the future as a result of listening to the podcast, and if so, what?

Would you like the address where you can download other podcasts? Yes No

Attachment 4: Transcript of the Podcast Series

Introduction

Hi my name is Dr. Debra Palmer from Rutgers University and I'm going to take you on a grocery store tour to help you shop for omega-3 rich foods. But first, what is all this fuss about omega-3s? Omega-3s are fats, but they're "healthy" fats. Your body cannot make enough of them, so you need to eat foods rich in omega-3s throughout your entire life!

Research shows that we are just not eating enough omega-3 rich foods! But when you're trying to eat more omega-3s it's important to know that not all omega-3s are the same, as some newscasts and magazines would lead you to believe! Different omega-3s are found in different kinds of foods, and they behave differently in your body. The omega-3s you need to know about are ALA, DHA and EPA, so this is what I will call them throughout the remainder of the podcast. There is very strong evidence that the omega-3s DHA and EPA have beneficial effects for pregnant and nursing moms as well as babies and young children. They also alleviate health problems that you may experience at any age like attention deficit disorders, asthma, vision problems, heart disease, and arthritis. ALA, on the other hand, is heart healthy and foods that contain ALA help maintain good health for reasons other than just their omega-3 content. But ALA is abundant in our diets so we really don't need to load up on ALA rich-foods or supplements. Please feel free to pause the podcast at any time, and then select the appropriate track as you arrive in the corresponding aisle to learn more about which products are highest in omega-3s.

Pastas

The pasta aisle. Look carefully in this aisle and you will find that a good number of pastas are now fortified with omega-3s. The omega-3s they are fortified with are ALA. Now ALA does help protect you against heart disease, but are these pastas really worth the extra money? Maybe, or maybe not; it's up to you. Although ALA is important, you probably already get plenty of it in your regular diet. For example, one source of ALA is soybean oil, which most vegetable oils are made from. Soybean oil is also a component in many processed foods, so unless you are eating very few processed foods, you are on a very low fat diet, or you don't use much vegetable oil, it is likely that you are already consuming plenty of ALA to reap its health benefits. Although people may tell you that your body can convert ALA to the more needed DHA and EPA, this is only true when your body is extremely DHA and EPA deficient...like if you're starving. Hopefully this is not something you need to worry about. On the other hand, although you may not want to pay the extra price for these pastas based on their omega-3 content, many of them are also made with whole grains and are therefore high in fiber, and that is a very good reason to spend a little extra money. Compare nutrition labels to see how much fiber is in different brands of pastas and weigh this against the cost to make a smart decision.

Cereals

The cereal aisle. A fair number of breakfast cereals, like Total Cereal Plus Omega-3s and Kashi GoLean Honey Almond Flax are fortified with heart-healthy ALA, mostly in the form of flax or flaxseed oil. Flax seeds are an excellent source of ALA. While ALA is a heart-healthy fat, you probably already get enough of this nutrient in your diet unless you

refrain from eating other processed foods. You may recall from the podcast introduction that DHA and EPA are the omega-3s that have the most health benefits, and they're the ones most people don't get enough of. So when you read an article or see someone on television who tells you, you will get a host of benefits from eating more omega-3s, and the list of foods that they name includes plant-based foods like flaxseeds, know that they are wrong! These omega-3 rich foods do NOT reflect the same host of health benefits as their DHA and EPA-rich cousins. So again, when a food claim indicates the food is rich in omega-3s, and you see that this omega-3 content originates from a plant, it is not equal to the omega-3s you get from other sources. Still, cereals with added flaxseed are naturally high in ALA, tend to be healthy for reasons other than their omega-3 content. Flaxseeds, for instance, are rich in protein, fiber and anti-oxidants (which are cancer fighters), so many of the cereals that contain them are healthy choices. Whether or not you select cereals rich in omega-3s, check the ingredient list and the Nutrition Facts Label to find those you like that perhaps contain flax or flax seeds, and that are highest in fiber and lowest in sugar.

Peanut Butters

The peanut butter and jelly aisle. Take a look at the peanut butter section of this aisle. You will find that some peanut butters are now fortified with omega-3s in an attempt to make them more heart healthy. But remember, not all omega-3s are the same or provide the same health benefits. Look at the ingredient list carefully to see which omega-3s have been added to the peanut butter. Some have been fortified with ALA so you will see flax, soybean oil or canola oil on their ingredient lists. Others have been fortified with

the healthier DHA and EPA. If they are it will both say so on the front label, and the ingredient list will indicate that the peanut butter contains seafood or seafood oil. If you have a shellfish allergy, don't worry. These seafood oils do not contain any allergens that will harm you. While ALA is heart healthy, the typical American diet which includes oils, salad dressings and other processed foods has enough ALA in it. On the other hand we do not get enough DHA and EPA in our diets, so we actually have to work on getting more. If you or your children do not like fish, or do not eat fish for other reasons, then DHA and EPA fortified products, like peanut butter, may be the way to go. Two tablespoons of this peanut butter provides 32 mg of DHA and EPA. Keep this in mind while you try to consume an average of 200 mg per day.

Nuts

The nut aisle. The only nuts that are really rich in omega-3s are walnuts, which are an excellent source of heart healthy ALA. One ounce of walnuts provides you with almost twice as much ALA as you need each day. Walnuts are extremely healthy. They help increase your HDL, which is your good cholesterol, and contain other important nutrients that help support heart, bone and brain health. Even though walnuts are VERY healthy, they are also high in fat and calories so limit the number you eat to about 14 halves or one small handful per day.

Oil

The salad dressings and oil aisle. Let's start with the cooking oils and sprays. If you're looking to cooking oils and sprays to boost your omega-3 intake, all you will be able to

do is increase your ALA. Vegetable oils that list soybean or canola oil as their first ingredient contain about as much ALA as you need for an entire day in one tablespoon, but you are probably already getting that from other foods. If you are looking for the healthiest oil, you might want to use olive oil. The reason it is a good oil is that it is monounsaturated so it helps reduce your unhealthy cholesterol levels, but don't look to it to increase your omega-3 intake, because it contains no omega-3s. Now let's move to the mayonnaise. If you look carefully you will probably see several say that they are now fortified with omega-3s, but the only omega-3 they are fortified with are, again, ALA so you may want to think twice about spending extra money to buy these products since ALA is naturally found in so many other foods.

Canned Meat and Fish

The canned meat aisle. Canned and packaged fish such as tuna, sardines, anchovies, salmon and mackerel are great ways to get more DHA and EPA into your diet. Scientists are convinced that DHA and EPA play a major role in heart disease prevention, fetal brain development, reduced risk for premature deliveries and overall infant health. There is also a lot of research going on that suggests that these fats may help in the treatment of depression and ADHD, they may reduce suffering from inflammatory conditions like asthma and arthritis, and they may reduce the onset of polycystic ovarian syndrome or PCOS. Eating canned fish is a low cost, convenient way to include omega-3 rich seafood in your diet. Chunk light tuna, for example, is low in mercury and a great addition to salads and sandwiches. But if you are pregnant beware, women who are pregnant or breastfeeding should not eat more than 6 ounces of tuna that is albacore tuna per week.

As an added benefit if you use canned salmon with the bones in it in dishes like salmon patties and salmon dips, you will also get more calcium into your diet, which is another nutrient of concern for many people.

The Dairy Aisle

As you may have noticed more and more foods are being fortified with omega-3s. In the dairy aisle, these include milk, soymilk and certain spreads like “I Can’t Believe It’s Not Butter” and “Smart Balance.” Let’s start by looking at the milks. Different brands of milk fortify their products with different omega-3s by using different techniques.

Organic Valley and Horizon are two of the brands that fortify some of their milks with omega-3s. Organic valley adds DHA and EPA in a form they call sustainable fish oil, and one cup provides one fourth of the recommended average amount you need each day. Horizon adds oil from algae and one cup provides one seventh the daily recommendation. Soy milk is also fortified with DHA and EPA and, to date, it too is fortified with one seventh of the DHA and EPA that is optimal for you to get each day.

Moving on to the eggs. Look at packages carefully to see if the eggs have been fortified with ALA or DHA and EPA. Choose those that say “DHA omega-3s” on the package to get the most bang for your buck. If a brand boasts that it is very high in omega-3s, that is, more than 150 mg, then in all probability it is high in ALA, rather than DHA. When this is the case the eggs are probably not worth the extra money. If the package does not specify what kind of omega-3s the eggs are fortified with, the only way to find out is to log onto the company’s website and look. So next time you buy omega-3 fortified eggs be sure to do your homework to see if they are really worth the extra money.

Finally, let's take a look at the omega-3 fortified spreads. Again, these spreads can be fortified with any of the omega-3s, so look at the package to find those rich in DHA and EPA. If they are fortified with DHA and EPA, it's likely they contain about 32 mg or 1/7th of the 200 mgs that we recommend you consume each day.

If you or your children do not like to eat fish, of all the omega-3 fortified products fortified milks and eggs are probably the best things you can buy. If you consume at least two servings per week of omega-3 rich fish and seafood regularly, you may still want to buy these fortified products for a little extra insurance that you will be able to reach your omega-3 goals.

Fish

The Fish Counter or Frozen Food Section. This is the longest part of the podcast, but I'm hoping it's well worth your time. Here at the fish counter, or the fish section of the freezer, you've just hit the omega-3 jackpot! This is the place you want to be for omega-3s! Fish and other seafood are rich sources of DHA and EPA. You may remember that DHA and EPA provide many health benefits. They help lower triglycerides and they assist in heart disease prevention, optimal brain development in children, and the delivery of healthy babies. New research suggests that these omega-3s may even help in the treatment of macular degeneration, depression, ADHD, Alzheimer's, and inflammatory conditions like asthma, arthritis and polycystic ovarian syndrome or PCOS.

Fatty fish and many other seafood are the most DHA and EPA naturally rich foods there are. Further, they are VERY low in calories compared to other foods you might eat as entrees or appetizers. But which of the fish are the "fatty" fish? The most common ones

are salmon, tuna, mackerel, herring and trout, but other fresh water fish and shellfish (like shrimp) also have some omega-3s in them, so if you eat enough of them they may really help boost your omega-3 intake too. Fish and other seafood are also rich sources of protein and iron which is very important for health and well being. The USDA, The American Heart Association and many other health organizations, recommend that we eat a variety of seafood at least twice a week.

Seafood can be expensive, but if you buy it when it's on sale or in frozen bulk packs you can get some great prices. Remember, you can always buy fresh fish and freeze what you don't need for later. Money spent on these foods is money VERY well spent if you want to increase the DHA and the EPA in your diet!

But perhaps you're confused about buying fish or how to cook it. For example, you may wonder if you should buy wild caught or farm-raised salmon. Some studies show that farm-raised salmon are lower in omega-3s because of their feed, but other studies show just the opposite. Either way, fish have more omega-3s than any other food. If you don't know how to cook it, just look up a recipe online! Fish is VERY easy to grill, poach or bake, and you can do it when you're in a hurry, as it takes less time to cook than meat or poultry!

You may also have environmental concerns about the sustainability of fish. Hopefully this isn't too big a concern. As time goes on industry and government are getting more and more stringent and improving farming practices to provide consumers with more healthy, environmentally sustainable fish.

Another thing you may worry about is contamination. You may have heard that fish contain mercury and other chemicals that may harm you. Research has shown that while

small amounts of these things do exist to varying degrees, the benefits of eating fish and seafood far, far outweigh these dangers. The only group that needs to worry about this is pregnant women, and even they have only a few restrictions. If you are pregnant and/or breastfeeding stay away from shark, sword fish, king mackerel and tile fish. Also do not consume more than 6 ounces per week of albacore tuna. These fish do have higher mercury contents which might be harmful to you and your baby.

But what about sushi? According to the USDA website, one fish-containing sushi roll (or 6 pieces) is equal to a half serving of fish. If you are looking for omega-3 rich sushi, look for the rolls that contain salmon or tuna. But is sushi dangerous? While sushi is usually safe to eat when freshly made, raw fish are more likely to contain parasites or bacteria than foods made from cooked fish, so once again, eating sushi is probably not a good idea for women who are pregnant. As an aside, if you eat fish you catch, just to be safe, check your local wildlife website before you do. If you want to make sure you get enough DHA and EPA in your diet, fish your way to health!

The Pharmacy or the Supplement Aisle

Omega-3 supplements may be good for your health, especially if you do not consume at least two servings of omega-3 rich fish or seafood every week. DHA and EPA supplements are most beneficial both because they provide the most extensive health benefits, and because Americans fail to consume enough of them. Since ALA is abundant in the American diet supplementation is not typically needed. Taking DHA and EPA supplements may be a very good idea, but there is a LOT to know about them so if

there is a pharmacy area near-by you may want to pull up a seat there, as this part of the podcast is rather long.

ALA supplements are generally offered in the form of flaxseed oil or flax. Buy the flax or flaxseed as a supplement or a food, grind it and add it to products like cereals and yogurts for a little extra crunch and cancer-fighting fiber, but again, don't bother to buy them to increase your omega-3s. They will do very little for you on that front.

DHA and EPA supplements may very well be worth their cost. The most potent supplements are only available at the pharmacy counter and are prescribed by doctors for people with high triglycerides. Some prescription prenatal vitamins are also prescribed for pregnant women. If you fall into either of these categories and your doctor has NOT prescribed these supplements, talk about the possibility of taking them at your next visit.

For the rest of us, DHA and EPA can be purchased across the counter as capsules or cod liver oil. Fish oil capsules provide both DHA and EPA; omega-3s extracted from algae provides DHA only. Cod liver oil contains a little less, yet adequate, levels of DHA and EPA, and it offers the added bonus of vitamin D which is also often insufficient among Americans, particularly people of color, who absorb less vitamin D from the sun and who also tend to be lactose intolerant more often, which means they may get less vitamin D from vitamin D-rich dairy products.

When you are trying to figure out the amount of omega-3s you want to look for in a supplement, know that with regards to standardized fish oils most recommend taking 2 capsules, twice daily. So, to get the recommended

- 3,000 to 4,000 milligrams per day; the label should say each capsule contains 750-1,000 mg; and
- Since only one capsule of DHA derived from algae is recommended per day, each capsule should contain 200 mg.

Make sure you take these supplements as recommended on the bottles, as with omega-3 supplements it IS DEFINITELY possible to get too much of a good thing! Taking supplements in doses that are too large can increase your risk of bleeding or bruising.

As you peruse the vitamin aisle, you may notice that many multi vitamins are now available with added DHA and EPA. These supplements contain only small amounts of omega-3s and are not worth any extra cost; if they cost the same as others go ahead and buy them.

If you are seriously interested in omega-3 supplements you are MUCH better off going with a fish oil supplement to get the recommended amounts.

Omega-3 supplements can be a VERY good idea, but some people do experience some “down-sides”. For example, fish oil supplements can cause some intestinal upset, like loose stools, flatulence and indigestion. These effects can be minimized by taking supplements with meals. You can also start with a low dose of these supplements and gradually increasing them to reduce these side effects.

Some people also experience a fishy aftertaste or some unpleasant belching (referred to as the fishy hic-ups). These problems can be minimized by taking fish oil pills at night. This way any unpleasant reactions will take place during sleep and be less noticeable.

Some people try to reduce these reactions by freezing the supplements, but experts think this is not a good idea.

If you experience this problem or are worried about it, the best idea is probably to purchase odorless supplements. They really work and usually cost the same as other fish oil supplements.

Another problem with fish oil capsules can be their size. Some people dislike swallowing large capsules, and many fish oil capsules are rather large. Fortunately, companies have recently started making smaller, more concentrated forms of fish oil capsules. Look for these.

Despite the many benefits associated with taking DHA and EPA supplements, if you fall into any of the following categories you should NOT take them:

- You bruise easily or have a bleeding disorder;
- You have low blood pressure; OR
- You regularly take:
 - Blood thinning drugs, like aspirin, Coumadin, or heparin
 - Anti-platelet drugs, like Plavix
 - Blood pressure lowering drugs, like Reserpine
 - Cholesterol-lowering medications, like Lipitor, Mevacor, or Zocor
 - Nonsteroidal anti-inflammatory drugs (NSAIDs), like the ibuprofen found in Motrin and Advil; or naproxen found in Aleve
- Cyclosporine or another drug for psoriasis

- Or even the herbal supplements, ginkgo biloba, garlic, or saw palmetto.

Women who are Pregnant or Breast Feeding and infants should avoid supplements containing EPA because it may interfere with DHA absorption, which serves very important functions during early development, including development of the eyes, brain and reproductive organs. So Women who are Pregnant or Breast Feeding and infants taking omega-3 supplements should take supplements made from algae, rather than fish or cod liver oil. If you think omega-3 supplements are a good idea this is a lot to take in, but the good news with the many choices available today is that you are very likely to be able to find a supplement to suit your needs.

Attachment 5: Semi-Structured Interview Form

1. Do you purchase foods or supplements that contain omega-3s on purpose?
☐ Yes ☐ No
 2. Do you own an MP3 player (ipod), or a smart phone that you can download music onto?
☐ Yes ☐ No
 3. Do you know what a podcast is?
☐ Yes ☐ No
 (If the answer is no, the interviewer will state that “A podcast is similar to a radio broadcast; however, a podcast can be downloaded from the internet and listened to at your leisure.” Then skip the next 2 questions.)
 4. Have you ever listened to a podcast before today?
☐ Yes ☐ No
 5. Have you ever downloaded a podcast before today?
☐ Yes ☐ No
 6. Do you work in a health-related field? ☐ Yes ☐ No
 7. Do you, or have you, worked in a position in which you advise people to consume more omega-3s?
☐ Yes ☐ No If yes, what profession? _____
 8. Have you ever been advised to consume omega-3s by a doctor or health professional?
☐ Yes ☐ No If Yes, why? Specify health condition if applicable.
 9. What was the advice?
- On a scale from 1 to 5, where 1 means “not important” and 5 means “very important,” please answer the following questions:
10. How important is it to buy healthy foods?
 1 2 3 4 5
 11. How important do you think it is to learn about the health benefits of omega-3s?
 1 2 3 4 5
 12. How important do you think it is to learn about omega-3s rich foods?
 1 2 3 4 5
 13. How important do you think it is to buy lots of omega-3 rich foods?
 1 2 3 4 5

14. On a scale from 1 to 5, where 1 means “not confident” and 5 means “very confident,” how confident do you feel in your ability to shop for omega-3 rich foods?
- 1 2 3 4 5**
15. On a scale from 1 to 5, where 1 means “very little” and 5 means “a lot,” do the people you are close to, like your friends, family, co-workers, try to increase their intake of omega-3 rich foods to improve their diets and their health?
- 1 2 3 4 5**
16. Which of the following omega-3s are different from the others?
- ☐ ALA ☐ EPA ☐ DHA
17. What do you think are specific health benefits of omega-3s? Ask as an open-ended question; check responses given and write-in anything additionally said:
- ☐ Prevent heart disease ☐ Birth of healthy babies ☐ Lower triglycerides’
- May help treat:
- ☐ Asthma, ☐ Arthritis, ☐ Depression, ☐
- PCOS
- ☐ ADHD ☐ Vision Problems ☐ Alzheimer’s ☐
- Cancer
- ☐ Macular degeneration
18. Which of the following oils are naturally rich sources of omega-3s?
- ☐ Olive oil ☐ Coconut oil ☐ Fish oil
19. If you want to get the health benefits omega-3s have to offer, will you get these same benefits from eating fish as you get from eating walnuts?
- ☐ Yes ☐ No If no:
- What is the difference?
 - Do their health benefits differ? If so, how?
20. What type(s) of fortified products claim that they are high in omega-3s? Fortified products are those that have omega-3s added to them.
21. Name a few omega-3 fortified food products that may not be worth the extra money?

Now I will ask you a few questions to get to know you better:

22. Age: _____
23. Gender: ☐ Male ☐ Female
- If Female, are you pregnant? ☐ Yes ☐ No ☐ Don’t Know ☐ Trying to get pregnant
24. What is your ethnicity?
- ☐ Hispanic or Latino
- ☐ Non-Hispanic or non-Latino

25. How would you describe your race? You can choose more than one answer.

- ☐ Black or African American ☐ American Indian or Alaskan Native ☐ Asian
☐ White ☐ Native Hawaiian or other Pacific Islander
☐ Other: _____

26. Do you have an EBT card? ☐ Yes ☐ No

27. What is the highest level of education you have completed?

- ☐ < High School ☐ High School ☐ 2-year Post-High School
Program
☐ Bachelor's Degree ☐ Graduate Degree

28. Do you have children?

- ☐ Yes ☐ No If yes, what is the age of your youngest child? _____

Have you or a blood relative ever been told by a doctor that you have any of the following health conditions: Please fill in **Y=Yes**, **N=No**, **DK=Don't Know**
For the purposes of this survey, think of your blood relatives as ONLY your grandparents, parents, siblings and/or children.

	Condition	Self	Blood relative
1.	Coronary heart disease Heart disease, heart attack, blocked arteries		
2.	High Triglycerides Triglycerides (type of fat in blood) higher than 200		
3.	Obesity BMI > 30		
4.	Cancer		
If yes, please specify type(s):			
5.	Asthma Lungs swell and narrow, leading to wheezing, shortness of breath, chest tightness and coughing		
6.	Arthritis Inflamed joints causing joint pain, swelling stiffness and limited movement.		
7.	Lupus The body's immune system attacks its own tissues and organs		
8.	Multiple sclerosis (MS) Slow damage to the white fatty substance that surrounds nerve fibers, thereby damaging sites in the brain and spinal cord		
9.	Psoriasis Skin disease – red, itchy scaly patches		
10.	Depression a mood disorder in which feelings of sadness, loss, anger, or frustration interfere with everyday life for weeks or longer.		
11.	Alzheimer's Dementia starting in 40s/50s; impaired memory then impaired speech & thought		
12.	Attention deficit hyperactivity disorder (ADHD) Childhood mental disorder showing markedly low attention and very high levels of activity		
13.	Macular Degeneration Loss of central vision due to damage to retina – usually age related		
14.	Other vision problems Poor eyesight, blurred vision, halos, blind spots, floaters		
15.	Polycystic ovarian syndrome (PCOS) Cysts in ovaries leading hormone imbalance that can cause irregular periods and infertility in women ages 12-45.		

Post-Podcast Survey

1. What did you like most about the podcast?
2. What did you like least about the podcast?
3. How could it be made better?
4. What new thing(s) did you learn?
5. What information provided in the podcast was relevant to you?
6. Did using the podcast change what omega-3 rich foods you bought, and if so how?
7. How often do you normally buy this item/these items and how much do you normally buy? Please list each item you mention in 6.
8. Do you plan to buy foods/products different in the future as a result of listening to the podcast, and if so, what?
9. On a scale of 1-5, where a 1 is the “dislike a lot” and 5 being “like a lot”, how much did you like using the podcast?
1 2 3 4 5
10. On a scale of 1-5 with 1 being very difficult and 5 being very easy, how convenient was it to use the podcast as a shopping companion?
1 2 3 4 5
11. On a scale of 1-5 with 1 being not clear and 5 being very clear, how clearly do you feel the information on the podcast was presented?
1 2 3 4 5
 On a scale from 1 to 5, where 1 means “not important” and 5 means “very important,” please answer the following questions:
12. How important is it to buy healthy foods?
1 2 3 4 5
13. How important do you think it is to learn about the health benefits of omega-3s?
1 2 3 4 5
14. How important do you think it is to learn about omega-3s rich foods?
1 2 3 4 5
15. How important do you think it is to buy lots of omega-3 rich foods?
1 2 3 4 5
16. On a scale from 1 to 5, where 1 means “not confident” and 5 means “very confident,” how confident do you feel in your ability to shop for omega-3 rich foods?
1 2 3 4 5
17. Would you like the address where you can download this or other podcasts?
☐ Yes ☐ No
18. Do you receive WIC benefits? ☐ Yes ☐ No
 If yes, would you like WIC to help you download this or other podcasts? ☐ Yes ☐ No

19. Which of the following omega-3s are different from the others?

- ☐ ALA ☐ EPA ☐ DHA

20. What do you think are specific health benefits of omega-3s? Ask as an open-ended question; check responses given and write-in anything additionally said:

- ☐ Prevent heart disease ☐ Birth of healthy babies ☐ Lower triglycerides'

May help treat:

- ☐ Asthma, ☐ Arthritis, ☐ Depression, ☐ PCOS
☐ ADHD ☐ Vision Problems ☐ Alzheimer's ☐ Cancer
☐ Macular degeneration

Only ask if participant went to oil aisle:

21. Which of the following oils are naturally rich sources of omega-3s?

- ☐ Olive oil ☐ Coconut oil ☐ Fish oil

Only ask if participant went to nut aisle:

22. If you want to get the health benefits omega-3s have to offer, will you get these same benefits from eating fish as you get from eating walnuts?

- ☐ Yes ☐ No If no:

- What is the difference?

- Do their health benefits differ? If so, how?

Only ask if participant went to pasta, cereal, peanut butter or oil aisle:

23. What type(s) of fortified products claim that they are high in omega-3s? (Prompt definition for fortified products as those that have omega-3s added to them.)

24. Name a few omega-3 fortified food products that may not be worth the extra money?

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