

POUNDS OFF DIGITALLY (POD): AN EXAMINATION OF THE USE OF
PODCASTING TO PROMOTE WEIGHT LOSS

Gabrielle M. Turner-McGrievy

A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill
in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the
Department of Nutrition.

Chapel Hill
2009

Approved by:

Advisor: Marci K. Campbell

Reader: Deborah F. Tate

Reader: Kimberly P. Truesdale

Reader: Sriram Kalyanaraman

Reader: J. Michael Bowling

© 2009
Gabrielle M. Turner-McGrievy
ALL RIGHTS RESERVED

ABSTRACT

GABRIELLE TURNER-MCGRIEVY: Pounds Off Digitally (POD): An examination of the use of podcasting to promote weight loss
(Under the direction of Marci K. Campbell)

The purpose of this research project was to assess if podcasting could be an effective way to deliver a weight loss intervention. This dissertation followed three aims. Aim 1 consisted of a content analysis of weight loss podcasts (N =13) and surveys with weight loss and physical activity podcast show hosts (N =13) and listeners (N = 22). Podcasts had an average accuracy score of 19.5 (range 15.5 - 22) out of 25. The majority (91%) of listeners reported making at least one healthy change as a result of listening to podcasts. The purpose of Aim 2 was to explore differences in how people process information on weight loss either through reading text on a Web site or listening to the information via podcast. Participants were randomly assigned to view a Healthy Weight Web site (N = 20) or listen to a Healthy Weight podcast (N = 20). Participants completed questionnaire items and had skin conductance (SCL) levels measured. There was no difference in SCL levels between the groups; however, the Web group reported greater ease of navigation and user control and found the intervention to be less novel than the podcast group. Aim 3 consisted of a randomized controlled trial comparing a control podcast to a weight loss podcast based on Social Cognitive Theory (enhanced podcast) for 12 weeks. Enhanced group participants (n=41) had a greater decrease in weight (-2.9 ± 3.5 kg enhanced group vs. -0.3 ± 2.1 control group; $P < 0.001$ between groups) and BMI (-1.0 ± 1.2 kg/m²

enhanced group vs. $-0.1 \pm 0.7 \text{ kg/m}^2$ control group; $P < 0.001$ between groups) than the control group ($n=37$) and had greater weight loss-related knowledge ($P < 0.05$), elaboration ($P < 0.001$), and user control ($P < 0.001$) and less cognitive load ($P < 0.001$). The results of this dissertation project suggest that a well-designed, theory-based podcast may be an effective way to promote healthy weight loss. More research is needed to see if podcasting can be as effective at helping people with health behavior changes as other electronic media, such as the Web.

ACKNOWLEDGEMENTS

I would like to thank my chair, Marci Campbell, who allowed me to use my creativity to explore unanswered questions in the world of Public Health Nutrition. I am also extremely grateful for the support and mentoring I received from my committee members: Deb Tate, Kim Truesdale, Sri Kalyanaraman, and Mike Bowling. I am also thankful to my parents, Phil and Lis, who instilled in me an early love of learning about nutrition and exploring unanswered questions through scientific inquiry.

Finally, I would like to thank my husband, Matt, who provided me with endless support through two graduate degrees. I could not have done this without the laughter and joy he helped bring to this whole process.

TABLE OF CONTENTS

LIST OF TABLES.....x

LIST OF FIGURES.....xi

Chapter

I.	INTRODUCTION.....	1
	A. Overview.....	1
	B. Specific Aims.....	3
II.	CONCEPTUAL FRAMEWORK.....	4
	A. Introduction.....	4
	B. User Control and Cognitive Load.....	4
	C. Perceived Novelty and Impression Formation.....	5
	D. Elaboration Likelihood Model.....	6
	E. Social Cognitive Theory.....	8
	F. Explanation of conceptual model.....	8
III.	LITERATURE REVIEW.....	12
	A. Podcasting background.....	12
	B. Use of the Web for weight loss.....	13
	C. Use of audio cassettes and compact discs in health interventions.....	14
	D. Use of radio and other mass media campaigns in health interventions.....	15

E.	Use of other portable electronic media in health-related interventions.....	16
	Personal Digital Assistants (PDAs).....	16
	Text messaging.....	17
F.	Factors associated with successful weight loss.....	18
	Self-monitoring.....	18
	Group and family support.....	18
	Physical activity.....	19
	Low-fat diets.....	20
G.	Consumer use of electronic media for health information.....	20
H.	Measuring physiological and psychosocial responses in media studies.....	22
I.	Summary.....	23
IV.	PODCASTING AS A WAY TO DELIVER AND RECEIVE WEIGHT LOSS INFORMATION: A CONTENT ANALYSIS AND SURVEY.....	24
A.	Abstract.....	24
B.	Introduction.....	25
C.	Methods.....	27
	Content Analysis.....	27
	Interviews with podcast hosts and their listeners.....	29
D.	Results.....	30
	Content Analysis.....	31
	Survey with podcast hosts.....	32
	Survey with podcast listeners.....	33

	E. Discussion.....	33
V.	DELIVERING WEIGHT LOSS INFORMATION VIA PODCAST OR WEB: THE MEDIA EFFECTS ON PSYCHOSOCIAL AND PHYSIOLOGICAL RESPONSES.....	44
	A. Abstract.....	44
	B. Introduction.....	45
	C. Methods.....	49
	Data analysis.....	51
	D. Results.....	52
	E. Discussion.....	54
VI.	POUNDS OFF DIGITALLY (POD) STUDY: A RANDOMIZED PODCASTING WEIGHT LOSS INTERVENTION.....	65
	A. Abstract.....	65
	B. Introduction.....	66
	Podcasting Demographics.....	67
	Theoretical framework: Why podcasting may be an effective way to deliver a weight loss intervention.....	69
	C. Methods.....	70
	Statistical Analyses.....	73
	D. Results.....	74
	E. Discussion.....	76
VII.	SUMMARY AND RECOMMENDATIONS.....	88
	A. Summary of findings.....	88
	B. Theoretical implications.....	90
	C. Recommendations.....	91

Aim 1.....	91
Aim 2.....	92
Aim 3.....	93
D. Future directions and research needs.....	94
APPENDIX A: PODCAST HOST SURVEY.....	98
APPENDIX B: PODCAST LISTENER SURVEY.....	101
APPENDIX C: MEDIA EFFECTS STUDY SURVEY.....	104
APPENDIX D: SCREEN SHOTS OF HEALTHY WEIGHT WEB SITE.....	116
APPENDIX E: SURVEYS USED FOR PODCASTING INTERVENTION.....	119
REFERENCES.....	130

LIST OF TABLES

Table

2.1	Interactivity Scale and examples from podcasting.....	10
4.1	Individual rater and average accuracy scores in the five American Heart Association (AHA) categories (possible range 1-5 per category) and total score (possible range 5-25) of the 13 weight loss podcasts.....	37
4.2:	Survey results with weight loss and fitness podcast hosts including demographic information, podcast details, and listener feedback.....	39
4.3:	Survey results with weight loss and fitness podcast listeners including demographic information, listening behavior, and experience with listening to weight loss or fitness podcasts.....	41
5.1:	Stimulus material components and how each targets the theory constructs.....	59
5.2:	Baseline demographic data for podcast and Web participants.....	61
5.3:	Survey and Skin Conductance Level Results Measured in the Podcast and Web groups after the Intervention.....	63
6.1:	Intervention components and how each targets the theory constructs.....	81
6.2:	Baseline demographic data for control and enhanced podcast group participants.....	83
6.3:	Differences between groups with weight, food group intake, physical activity, and knowledge during study period.....	85

LIST OF FIGURES

Figure

2.1: Conceptual Model.....	11
6.1: Participant recruitment and analysis flow diagram.....	82

CHAPTER I

INTRODUCTION

I.A. Overview

Latest figures reveal that 66.3% of U.S. adults are overweight or obese (Body Mass Index ≥ 25 kg/m²) (Ogden et al., 2006). People who are overweight or obese are at a significantly higher risk of developing many chronic diseases, including some forms of cancer, cardiovascular disease, hypertension, and Type 2 diabetes (Jee, Kim, & Lee, 2005). The main treatments for overweight and obesity include dietary changes, increases in physical activity, and other behavioral modifications (Banning, 2005). Technology-enhanced approaches to weight loss have begun to emerge with the increased development of electronic media. Many researchers are now employing the use of the Internet to deliver interventions (Berkel, Poston, Reeves, & Foreyt, 2005). These interventions, however, often lack portability, restricting where and when interventions can be delivered. Web-based interventions typically also require participants to be literate and able to process information well through reading.

Obesity has been consistently on the rise over the past three decades (Hedley et al., 2004). This rise has occurred concomitantly with an increase in “screen time”—which is the use of computers, televisions, and video games—by both children and adults (Gordon-Larsen, Nelson, & Popkin, 2004). Since many adults and children are spending increased amounts of time in front of screens or connected to the Internet (Wiecha, Sobol,

Peterson, & Gortmaker, 2001), it may be important to use portable media in weight loss interventions so as not to increase screen time further.

An emerging new portable technology is “podcasting,” which came into existence in 2004. Podcasts are audio files that may be downloaded and transferred to portable audio players (MP3 players). There are hundreds of health-related podcasts available on the Web but very little research has been done on this new technology. Podcasting represents a largely untapped conduit to people with Internet access who are seeking information about weight loss. Examining the role of podcasting in weight loss will advance the field of Public Health Informatics—defined as “the science of applying Information-Age technology to serve the specialized needs of public health” (Friede, Blum, & McDonald, 1995)—and fill gaps in the current knowledge regarding the efficacy of portable technology to promote weight loss. Previous public health weight loss interventions have generally not been effective (Jeffery, 2001; Schmitz & Jeffery, 2000) and it is imperative that we find innovative, inexpensive, and far-reaching ways to deliver weight loss interventions. The Web has been shown to be an effective method of delivering a weight loss intervention but it has mainly been tested in older, well-educated, White women (Tate, Jackvony, & Wing, 2003, 2006; Tate, Wing, & Winnett, 2001). More importantly, many people do not want to participate in face-to-face weight loss interventions as they are seen as time consuming and often inconvenient (*Sherwood et al., 1998*).

The purpose of this research project is to assess the effectiveness of a weight loss intervention that employs the use of an enhanced podcasting as compared to a standard podcast available online.

I.B. Specific Aims

1. The objective of the first aim is to conduct formative research with nutrition and weight loss podcast producers (and listeners) to guide the creation and delivery of the intervention podcasts. We also conduct a content analysis of current weight loss podcasts to assess the content and accuracy of these podcasts.
2. The objective of the second aim is to determine the mechanism by which podcasting may exert an effect. This study will test potential mediators of the intervention and test the differences in how people process information on weight loss either through reading text or listening to the information. It will also measure differences in knowledge pre and post the use of each medium.
3. The objective of the third aim is to determine whether podcasting weight loss information is an effective way to promote weight loss through a 12-week intervention with overweight adults comparing an existing weight loss podcast to an enhanced, theory-based podcast.

CHAPTER II

CONCEPTUAL FRAMEWORK

II.A. Introduction

User (Information) Control Theory (Eveland & Dunwoody, 2001), Cognitive Load Theory (Brunken, Plass, & Leutner, 2003; Paas, Tuovinen, Tabbers, & Van Gerven, 2003), Social Cognitive Theory (SCT) (Bandura, 2004), and the Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1986) will guide the design and theoretical framework of the present study. These theories were chosen because they have been applied to learning about health behavior changes and promoting those changes. The theories discussed below provide a theoretical basis as to why we might see differences between the podcasting groups and why podcasting may be more effective at producing weight loss than other electronic media, such as the Web.

II.B. User/Information Control and Cognitive Load

User or Information Control Theory states that allowing a user to have control over the pace and content of instruction allows for better and more effective learning (Eveland & Dunwoody, 2001). This occurs because users learn in different ways so the more control you can provide learners with their learning experience, the more variety of learning styles you can accommodate. Providing control over learning also allows the learners to feel more motivated to learn (Eveland & Dunwoody, 2001). Cognitive Load Theory states that people have limited cognitive processing abilities and in order for learning to be effective, the cognitive load must be lessened (Paas et al., 2003).

Elements of both User /Information Control Theory and Cognitive Load Theory posit that a freedom in the learning process (Eveland & Dunwoody, 2001) and reduced cognitive burden (Brunken et al., 2003; Paas et al., 2003) produce more effective learning. Podcasting may also allow a user to learn in different environments—such as at a desk, in the car, or while exercising, and this freedom in learning can increase a sense of user control (Ariely, 2000). A greater variety of learning styles can be accommodated if the user is provided with control over their learning environment (Ariely, 2000). This greater sense of control can also increase a user’s motivation to learn (Eveland & Dunwoody, 2001).

Kristof and Satran (1995) have developed an interactivity scale with seven levels of increasing interactivity that correspond with increases in user control. The first level is control over the pace of learning and ends with control over simulation (Kristof & Satran, 1995). Table 2.1 outlines these seven levels of increasing interactivity and gives examples of how these levels can be found in podcasting. Research has also shown that when a user feels a sense of information control, this can lead to a greater perceived satisfaction with the media (Zhang & von Dran, 2000). The unique qualities of podcasting, which allow the user to be mobile and access the information anytime or anyplace, may provide an increase in freedom without increasing cognitive load.

II.C. Perceived Novelty and Impression Formation

Perceived novelty may also point to podcasting as an effective way to deliver health information. Advertising research has found that a product that is perceived as novel will have better sales than a less novel product (Mukherjee & Hoyer, 2001). Novel products are perceived as having more value as well (Mukherjee & Hoyer, 2001). A

medium that is perceived as novel will also often be perceived as delivering a more meaningful message than a less novel medium (Carpenter, Glazer, & Nakamoto, 1994).

Different types of media can lead to varying impressions formed by the user. Visual and auditory inputs are processed differently and are often processed separately when presented at the same time (Penney & Butt, 1986). This phenomenon is detailed in the separate stream hypothesis, which theorizes that differences in the characteristics of auditory and visual streams account for the differing effects in these modalities (Penney & Butt, 1986). The way information is presented also has an effect on impression formation. For example, greater involvement in the topic and the greater interactivity of the medium leads to greater impression formation (Sundar, Kalyanaraman, & Brown, 2003). Impression formation can occur about the person perceived as delivering the information—such as a physician who has written an article on a Web site (Kalyanaraman & Sundar, 2008) Impression formation, however, can be formed about the technology the learner is using (Kalyanaraman & Sundar, 2008). For example, because podcasting involves listening to a human voice, it may form a different impression on a user than a Web site with similar content.

II.D. Elaboration Likelihood Model

The Elaboration Likelihood Model (ELM) states that the more someone is able to process and elaborate on information, the more likely they are to adopt changes in attitudes and behaviors (Petty & Cacioppo, 1986). Elaboration refers to how much someone processes and thinks about an idea or argument. ELM is a theory to explain how people are persuaded and suggests this happens through two different routes: the central and peripheral routes. Arguments processed through the central route are enduring and

predictive of behavior change whereas arguments through the peripheral route are not long-lasting and don't predict behavior change (Petty & Cacioppo, 1986).

Research has shown that there is an increase in elaboration, and therefore learning, with Web-based interventions versus print interventions, but there is also an increase in selective scanning. This scanning decreases overall learning as compared to other media because users tend to skip over important messages (Eveland & Dunwoody, 2002). Podcasting does not allow selective scanning since it is an audio medium, not written. Podcasting may promote increased elaboration if designed with the constructs of ELM. Therefore, podcasting may be a more effective way to deliver certain types of health messages than the Web or print. In order to increase elaboration, a weight loss podcast would need to be designed to increase the listener's motivation and ability to lose weight. The message would also need to be perceived as being personally relevant. These aspects would help to increase the likelihood that the message would be processed via the central route (Petty & Cacioppo, 1986).

Constructs from User Control Theory, Cognitive Load Theory, and the Elaboration Likelihood Model suggest that elements of podcasting may be more effective than other media—such as print or Web—in promoting freedom in learning (Eveland & Dunwoody, 2001), decreasing cognitive load (Eveland & Dunwoody, 2001), and increasing elaboration (Eveland & Dunwoody, 2002). User Control Theory states that an increase in freedom of learning adds to the control a user feels and therefore increases learning (Eveland & Dunwoody, 2001) whereas Cognitive Load Theory states that the more cognitive burden a user feels when learning, the less able they will be to retain what they learn (Brunken et al., 2003; Paas et al., 2003). Learning through the Web can

increase cognitive load and therefore some theorists have suggested that the increase in freedom to navigate (over print) is negated by an increase in cognitive load (Eveland & Dunwoody, 2001). Podcasting would provide freedom—since podcasts can be listened to anytime and anyplace—without increasing cognitive load, thereby leading to greater learning versus Web.

II.E. Social Cognitive Theory

Social Cognitive Theory (SCT) states that there are several factors that work together to create behavior change including environmental and personal factors. Self-efficacy is a key construct in SCT. If a person has confidence in their ability to make a behavior change (self-efficacy), then they are more likely to be able to make that change (Glanz & Rimer, 2005). Some of the SCT constructs that can be used to improve self-efficacy include behavioral capability, knowledge of how to make a behavior change (Glanz & Rimer, 2005); expectations, what the individual anticipates the outcome to be of a behavior change (Glanz & Rimer, 2005); and expectancies, the value a participant places on making the behavior change (Glanz, Rimer, & Lewis, 2002).

II.F. Explanation of conceptual model

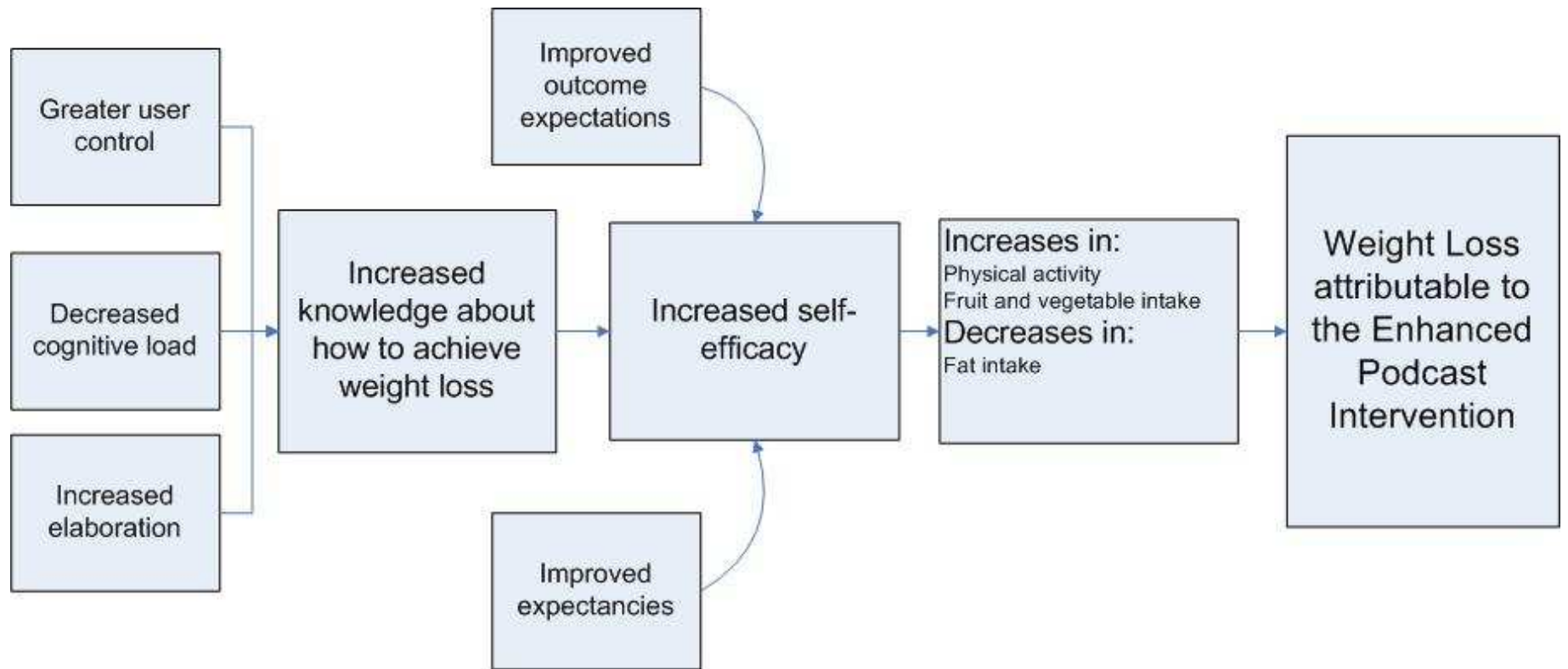
The Web has been used effectively to deliver an SCT-based weight loss intervention (Winett, Tate, Anderson, Wojcik, & Winett, 2005). Concepts from SCT, such as outcome expectations, expectancies, and self-efficacy can all be used to increase weight loss and deliver health information. In the present study, constructs from User Control Theory, ELM, and SCT helped to guide the development of the conceptual model and support the use of podcasting over other delivery methods, such as the print or Web. The design of the enhanced podcasts will aim to decrease cognitive load by

presenting an easy-to-follow format that will repeat each episode. This will also aid in User Control since participants will be able to pause the podcast after certain sections and start it again later. We theorize that elaboration will be targeted because the messages will be personally relevant to the participants and the goal setting exercise and weekly journaling will help increase a sense of accountability. In this model (see Figure 2.1), it is hypothesized that the enhanced podcasts will be more effective than the existing podcasts for weight loss delivery because they will be designed with theory and therefore will lead to a greater increase in knowledge, behavioral capability, outcome expectations, and expectancies. These factors help to increase self-efficacy. The changes in these constructs will lead to behavior changes, such as an increase in self-monitoring and a decrease in fat intake, which will therefore result in a significant weight loss in both podcasting groups with a greater loss being seen in the enhanced podcasting group.

Table 2.1: Interactivity Scale and examples from podcasting

Seven levels of increasing interactivity	Podcasting example
(based on (Kristof & Satran, 1995))	
control over the pace of learning	being able to listen to the podcast content all at once or at different times
control over sequence	being able to skip ahead to other content
control over media	being able to start and stop the podcast
control over variables	listening to a podcast on different devices
control over transaction	subscribing to a podcast or downloading the file directly
control over objects	reordering playlists
control over simulation	being able to listen to the podcast in different places such as a car or at home

Figure 2.1: Conceptual Model



CHAPTER III

LITERATURE REVIEW

III.A. Podcasting background

Podcasting has seen an amazing growth in the past two years. In September 2004, a search on Google for “podcasts” yielded 24 hits (Wikipedia, 2005). Just two years later, a search on Google conducted by our research team yielded 146 million hits. In 2008, Podcast Alley (a podcast directory) had 43,000 podcast shows available for download, up from 26,000 just two years earlier (Madden, 2008). A 2008 survey conducted by the United Kingdom’s RAJAR (Radio Joint Audience Research Limited) found that 6 million people in England have reported downloading a podcast—up from 4.3 million just 12 months earlier. RAJAR also found that 3.7 million users report listening to a podcast each week (up from 1.87 million from the previous year)(RAJAR 2008). Of the 317 podcast users surveyed by RAJAR, only 3.1% reported being currently subscribed to a health-related podcast; the majority reported favoring comedy-related content (RAJAR 2008).

In the United States, podcast use and MP3 ownership has also been on the rise (Madden, 2008). A 2008 Pew Internet and American Life survey examined several traits of podcast listeners and found that the percentage of internet users who have downloaded a podcast increased from 7% in 2006 to 19% in 2008 (Madden, 2008). In the U.S., technology is the most popular category (Madden, 2008). A 2005 Pew survey found that both men and women equally download podcasts (Pew, 2005). This has changed in

recent years however, with 22% of men and 16% of women reporting having ever downloaded a podcast in 2008 (Madden, 2008). Of adults 18-29, 27% have reported downloading a podcast, 20% of those aged 30-49 have downloaded a podcast, and 23% of those 50 and older have downloaded one. The 2005 Pew survey on podcasting also found that minorities (African-Americans and Latinos) are more likely to own MP3 players than Whites (16% and 9%, respectively) (Pew, 2005). This demographic pattern differs somewhat compared to other technology use (U.S. Census Bureau, 2000) and has implications for reaching both younger and older adults, men and women, Latinos, and African Americans.

III.B. Use of the Web for weight loss

The World Wide Web has been widely used in health interventions (Berkel et al., 2005). While the Web does not necessarily have the portability of other technologies, which would make it comparable to podcasting, it is similar to podcasting in that it requires an Internet connection and can allow for the delivery of regularly updated health information. Additionally, the Web has been widely used in weight loss interventions. This may serve as a predictor of the viability of using podcasting for weight loss interventions and the Web will serve as one of the control conditions in the present research study.

In a review of Web-based, health-related interventions, 16 of the 17 studies found greater improvements in knowledge and behavior in the Web groups as compared to non-Web-based interventions (Wantland, Portillo, Holzemer, Slaughter, & McGhee, 2004). The Internet is also an efficient way to teach behavior modification principles, like self-monitoring and stimulus control, to overweight participants seeking help with weight loss

(Berkel et al., 2005). Internet interventions for weight loss may be made even stronger when designed using a behavioral theory, such as Social Cognitive Theory (SCT) (Winett et al., 2005). In one 6-month intervention, investigators compared a weight loss Web site intervention based on SCT with an education-only weight loss site and found the group receiving the SCT-based site lost significantly more weight (4.1 ± 4.5 kg versus 1.7 ± 2.7 kg, $P<0.05$) (Tate et al., 2001). Similar results were found in a longer-term study (one year) that compared an SCT-based site to the same site with e-mail counseling added. The SCT plus e-mail group lost significantly more weight than the Internet-only group (4.4 ± 6.2 versus 2.0 ± 5.7 kg, $P<0.05$) demonstrating that adding an interactive, human presence to a Web-based intervention may improve results (Tate et al., 2003, 2006).

III.C. Use of audio cassettes and compact discs (CDs) in health interventions

Many studies have delivered health interventions through CD-ROMs, which must be played on a computer and contain both audio and video (Bosco & Ward, 2005; Piette, 2002). There are a few studies, however, that have used portable audio media, such as CDs or audio cassettes, to deliver an intervention. These studies have found that CDs or cassettes are effective in many areas of health behavior, including improving communication between teens and parents about sex (O'Donnell et al., 2005), helping patients learn breathing techniques to reduce hypertension (Schein et al., 2001), reducing anxiety in patients who are about to undergo surgery (Diaz & Larsen, 2005), and improving coping skills among patients undergoing treatment for depression (Blenkiron, 2001). Overall, audio has been found to be an effective way to deliver health information.

III.D. Use of radio and other mass media campaigns in health interventions

Since there has been very little research on the use of podcasting in health interventions, radio may be the closest equivalent. Radio is rarely used alone, however, in health behavior research. Most studies that use radio are examining public health campaigns which employ a mass media approach—using several different methods including radio, television, bulletin boards, and newspapers simultaneously to reach a larger audience—and therefore it is difficult to assess the effectiveness of radio alone. Mass media campaigns have been implemented in a variety of public health interventions from increasing vaccinations (Holzman, Harwell, Johnson, Goldbaum, & Helgerson, 2005) to improving knowledge of diabetes services among Medicare patients (Schade & McCombs, 2005).

Physical activity campaigns have widely employed the use of mass media interventions that included a radio campaign. In a study examining walking rates in Missouri, researchers used a mass media campaign to increase the levels of moderate physical activity. The Walk Missouri campaign used billboards, radio, newspapers, and posters to promote walking. The campaign improved walking rates and positive beliefs about the benefits of walking (Wray, Jupka, & Ludwig-Bell, 2005). Researchers found similar results in a West Virginia program called Wheeling Walks. Using the transtheoretical model, the researchers designed a program that promoted 30 minutes of daily walking; they found an increase in walking rates and improved stage change at the end of the intervention (Reger et al., 2002).

III.E. Use of other portable electronic media in health-related interventions

While podcasting has an audio element similar to that of radio, it also has a portable element, similar to that of Personal Digital Assistants (PDAs) and mobile phones with text messaging. Because these devices are portable, information can be delivered to a person regardless of where they are. In addition, these devices are often used in interventions to record information as it happens.

Personal Digital Assistants (PDAs).

One of the primary ways technology has been able to enhance weight loss interventions is through improved self-monitoring (O'Neil, 2001). For example, participants can use their PDAs to record a behavior or event as it happens versus retrospectively. An example of this is the recording of a symptom, such as mood or pain. Research that has compared the use of paper and PDA diaries have found fewer missing variables and more compliance with the PDA diaries and more data entered retrospectively with the paper diaries (Gaertner, Elsner, Pollmann-Dahmen, Radbruch, & Sabatowski, 2004; Stone, Shiffman, Schwartz, Broderick, & Hufford, 2003).

PDAs have also been used in the field of nutrition and physical activity, mainly as real time recording devices for behavior. PDAs have been used to record dietary intake (Wang, Kogashiwa, Ohta, & Kira, 2002) and to measure real-time body temperature, activity, and circadian rhythms (Varkevisser & Kerkhof, 2003). PDAs have been used less often as change agents (prompting participants to act or behave in a certain way). Researchers at the Massachusetts Institute of Technology designed a PDA program that will prompt participants to make better diet choices at the point of purchase through

barcode scanning technology (Intille, Kukla, Farzanfar, & Bakr, 2003). No research on the effectiveness of this device, however, has been published.

Text messaging.

More so than PDAs, mobile phones have been used to deliver messages about health behaviors to participants. Through text messaging, researchers have sent participants messages on a variety of topics including smoking cessation (Rodgers et al., 2005), diabetes management (Ferrer-Roca, Cardenas, Diaz-Cardama, & Pulido, 2004), and asthma treatment (Neville, Greene, McLeod, Tracy, & Surie, 2002). One research study examined the use of text messaging on smoking cessation by randomly assigning smokers with cell phones to a text messaging group or control. At six weeks, more participants in the text messaging group had quit smoking than the control. At six months however, it was difficult to tell a difference due to high drop out rates in both groups (Rodgers et al., 2005). A similar study found success at increasing quit rates among college students. This pilot study assessed the efficacy of using text messages to increase quit rates among college students and found that 22% had quit at the end of the six-week intervention (there was no control group) (Obermayer, Riley, Asif, & Jean-Mary, 2004). Even interventions delivered over landline phones have shown greater weight loss effects than paper-based interventions (Tufano & Karras, 2005).

Text messaging has also been used for people with diabetes. A feasibility study examined the use of sending blood glucose readings via text messages. The participants would then receive feedback. While the study did not measure changes in glucose management, it did find that the service was acceptable to participants, even older participants who were less familiar with the technology (Ferrer-Roca et al., 2004).

Another feasibility study examined the use of text messaging in adolescents with Type 1 diabetes. The “Sweet Talk” program, based on social cognitive theory, the health belief model, and goal setting, encouraged participants to monitor glucose levels. No outcome measures, however, were reported (Franklin, Waller, Pagliari, & Greene, 2003).

III.F. Factors associated with successful weight loss

There are several factors that have been shown to help promote weight loss and weight maintenance. In a review of studies that demonstrated successful weight loss maintenance, researchers found a low-fat diet, self-monitoring of weight and dietary intake, and physical activity to all be associated with maintenance of weight loss (Wing & Hill, 2001). Social support has also been shown to be effective in helping people lose weight (Elfhag & Rossner, 2005). In the present study, all of these factors will be incorporated into the Web and podcasting interventions.

Self-monitoring.

Research has shown that frequent self-weighing has been associated with greater weight loss than without self-weighing (Linde, Jeffery, French, Pronk, & Boyle, 2005). One research study examined the effect of self-weighing on preventing weight regain after a loss and also found that self-weighing decreased weight regain (Wing, Tate, Gorin, Raynor, & Fava, 2006). Self-monitoring of dietary intake is also associated with improved weight loss. In a study examining the behaviors of those who successfully lost weight and maintained that loss, participants reported tracking calories and fat each day as well as regular weighing (Kruger, Blanck, & Gillespie, 2006).

Group and family support.

Social support from friends, family, or as group support has been shown to improve weight loss and weight maintenance (Elfhag & Rossner, 2005; Turner-McGrievy, Barnard, & Scialli, 2007). In a study examining the effect of joining a weight loss group with friends or alone, researchers found that those participants who joined with friends had higher rates of completion of the program and were more successful at maintaining their weight loss than those who joined alone (Wing & Jeffery, 1999). In a study of women who were attempting to maintain weight loss, researchers found that those who relied on the support of friends and family were more successful at maintaining their weight loss than those who did not rely on social support (Kayman, Bruvold, & Stern, 1990).

Physical activity.

Physical activity promotes weight loss through several ways. Exercise creates an energy deficit and promotes muscle mass, which can increase basal metabolism (Rippe & Hess, 1998). In a study that examined behaviors of successful weight loss maintainers, researchers found that those who were successful reported exercising 30 minutes or greater each day and incorporating physical activity, such as taking the stairs at work, into their daily routine (Kruger et al., 2006). Research has shown that, in order to successfully maintain weight loss, people must exercise vigorously for 30 minutes per day or exercise moderately for 80 minutes per day (Schoeller, Shay, & Kushner, 1997). In order to lose weight through physical activity, it is estimated that a deficit of 1500-2000 kilocalories/week must be created through exercise (Rippe & Hess, 1998).

Low-fat diets.

Low-fat diets have been shown to produce significant weight loss (Brehm et al., 2005; Mueller-Cunningham, Quintana, & Kasim-Karakas, 2003). Low-fat diets work by creating a calorie deficit that is not fully detected by the dieter. Therefore, low-fat diets reduce calories without an increase in hunger or a need to intentionally decrease caloric intake (Kendall, Levitsky, Strupp, & Lissner, 1991). Improved weight loss maintenance has been seen among people who continue on a low-fat diet. In a study examining weight maintenance, women in the lowest tertile of fat intake (<25% of energy) regained the least amount of weight (Leser, Yanovski, & Yanovski, 2002).

III.G. Consumer use of electronic media for health information

Health information can be obtained from a variety of sources. While virtually no research has been conducted on the use of podcasting to deliver health information, researchers have examined what other media people use to retrieve health information. In a Canadian survey, researchers found that the most common sources of health information that people sought were from print items—such as books, magazines, food labels, and brochures—and the Internet (Marquis, Dubeau, & Thibault, 2005). Every year, the Internet has been steadily growing in popularity as a resource for health information. However, while the Internet has surpassed radio as a health information source, some research shows it still lags behind print and television. Results of the OSTEOSURV-II show that prevalence rates for the use of various sources of health information are 69% for magazines or newspapers, 30% for radio, 56% for television, and 32% for the Internet. The survey also found that people who live in rural areas are much less likely to use the Internet for health information than their urban or suburban

counterparts. Internet use was also less common among people over the age of 60 or by those with less than a high school education (Licciardone, Smith-Barbaro, & Coleridge, 2001).

Although Internet use for health information is rising, most research shows it has not yet had an impact on health care and is often difficult for people to navigate and understand. In a survey of people with Internet access, researchers found that only 40% had searched for health information and only 6% had e-mailed a question to their health care professional. The researchers also examined the responses of users who had one of five specific health conditions (heart disease, hypertension, depression, cancer, and diabetes). Although two-thirds of these Internet users said that using the Web helped them to understand more about the health topic they were searching, only 7% said that the information led them to seek out care from a different health care provider and only 16% said it led to changes in the treatments for their disease. Encouragingly though, 32% said the information they found online changed how they ate or exercised (Baker, Wagner, Singer, & Bundorf, 2003).

In another survey of Internet use, researchers examined health-seeking behavior in patients before and after cardiac surgery. In this study, the Internet was the information source of choice second to the family doctor and ahead of magazines, television, and relatives. Only 16% of patients, however, reported that the information found on the Internet was easy to comprehend. All patients surveyed said they would prefer to visit a Web site that was designed by their doctor and would view this as highly credible (Murero, D'Ancona, & Karamanoukian, 2001).

III.H. Measuring physiological and psychosocial responses in media studies

Researchers often use measures of psychosocial and physiological response to assess reactions to media or study mediators of a behavior. For example, heart rate, blood volume pulse, and galvanic skin resistance can be used as ways to measure physiological arousal among participants using different types of media (Wilson & Sasse, 1999) and several studies have shown that emotional responses trigger measurable physiological reactions (Partala & Surakka, 2004). One advantage to using physiological responses in media studies is that it is an objective measure. Measuring, for example, whether or not someone likes a Web site is highly subjective and can be difficult to measure in a valid way (Wilson & Sasse, 1999). There are some problems, however, with using physiological measures in studies. One issue is trying to determine if the physiological arousal is caused by outside stress or other emotions such as happiness or excitement (Wilson & Sasse, 1999). Therefore, it will be important to include psychosocial measures in our research study as well.

Psychosocial variables, such as elaboration, perceived novelty, and knowledge, will be important to measure in our study. Studies have successfully used the Elaboration Likelihood Model to increase elaboration among participants in Web- (Warden, Wu, & Tsai, 2006), audio- (Wiese, Wilson, Jones, & Neises, 1992) and video-based studies (Withers & Wertheim, 2004). It has been hypothesized that the more novel a medium is perceived to be, the more a user will learn from it. There has been very little research on this topic (Clark, 1983). There has been research, however, on learning through technology, which has shown that Web-based and other technology-based interventions

are effective in increasing knowledge (Wilkinson, Forbes, Bloomfield, & Fincham Gee, 2004).

III.I. Summary

Finding innovative ways to reach overweight and obese adults and help them lose weight can be difficult. Many researchers are now employing the use of the Internet to deliver weight loss interventions (Berkel et al., 2005). These interventions, however, often lack portability, restricting where and when interventions can be delivered. Web-based interventions typically also require participants to be literate and able to process information well through reading.

As rates of obesity continue to climb, it is important to find inexpensive and wide-reaching ways to access people. While the Web has held promise, relying on the Web to deliver interventions may neglect some minority groups. Other portable or audio-based media have been studied but none have the combination of features—asynchronous learning, portability, ease of updating information, audio-based learning, feeling of personal interaction—that podcasting has. This combination of attributes makes podcasting well-suited to deliver an effective, low-cost weight loss intervention.

CHAPTER IV

PODCASTING AS A WAY TO DELIVER AND RECEIVE WEIGHT LOSS INFORMATION: A CONTENT ANALYSIS AND SURVEY

IV.A. Abstract

Podcasting is a new medium that has been growing over the past five years but very little is known about how podcasting affects behavior of the listeners or the experience of podcast hosts. This study design includes both a content analysis and survey methodology and took place between January and March 2007. A content analysis of weight loss podcasts was conducted by 2 different reviewers to determine the current number, accuracy, and commercial content (N =13). The content analysis was performed using the five criteria from the American Heart Association's Guidelines for Selecting a Weight Loss & Maintenance Program. Each AHA category was awarded 1 to 5 points with 1 to 2 meaning information in that category was inaccurate or did not meet AHA criteria, 3 meaning criteria was not mentioned, and 4 to 5 meaning AHA criteria were met. Podcasts had an average accuracy score of 19.5 (range 15.5-22) out of 25. Only 3 (23%) had no commercial content on their podcast or Web site. Both podcast hosts (N=10) and listeners (N=22) in the surveys were mostly male and white. The majority (91%) of listeners reported making at least one healthy change as a result of listening to podcasts and cited getting healthy tips and staying motivated as the main reasons why they find podcasts useful. While few of the assessed weight loss podcasts provided

accurate information, listeners surveyed have reported making healthy behavior changes as a result of listening to podcasts.

IV.B. Introduction

Podcasts are audio files that may be downloaded and listened to on a computer or any portable audio player (MP3 player). Podcasting is a relatively new medium that has been growing over the last five years. In early 2006, 7% of Internet users reported downloading a podcast. By late 2006, this increased to 12% of Internet users (Pew, 2005). Of adults 18-28, 19% own MP3 players, 14% of those aged 29-40 have a player, and 11% of those 41-50 own one. Additionally, minorities (African-Americans and Latinos) are more likely to own MP3 players than Whites (16% and 9%, respectively) (Pew, 2005). Of those adults who own an MP3 player, one-third have downloaded a podcast (Pew, 2005). Both men and women equally download podcasts. Almost 50% of MP3 player owners age 28 and younger have listened to podcasts, whereas 20% of those over 28 have. There is no difference in podcast downloading between broadband and dial-up users (Pew, 2005). This is a pattern which differs compared to other technology use, such as the Internet (U.S. Census Bureau, 2000).

Other forms of technology have been used to deliver health messages. In a review of Web-based, health-related interventions, 16 of the 17 studies found greater improvements in knowledge and behavior in the Web groups as compared to non-Web-based interventions (Wantland et al., 2004). The Internet is also an efficient way to teach behavior modification principles, like self-monitoring and stimulus control, to overweight participants seeking help with weight loss (Berkel et al., 2005). Other studies have examined the use of portable audio media, such as compact discs (CDs) or audio

cassettes, to deliver an intervention. These studies have found that CDs or cassettes are effective in many areas of health behavior, including improving communication between teens and parents about sex (O'Donnell et al., 2005), helping patients learn breathing techniques to reduce hypertension (Schein et al., 2001), reducing anxiety in patients who are about to undergo surgery (Diaz & Larsen, 2005), and improving coping skills among patients undergoing treatment for depression (Blenkiron, 2001). Other portable media, such as portable digital assistants (PDAs) and cell phones, have also been used in health behavior research. PDAs have been used to enhance weight loss interventions by improving self-monitoring (O'Neil, 2001) and text messaging through cell phones has been used to text messaging send health-related messages on a variety of topics including smoking cessation (Rodgers et al., 2005), diabetes management (Ferrer-Roca et al., 2004), and asthma treatment (Neville et al., 2002).

Very little is known about how podcasting affects behavior of the listeners or the experience of podcast hosts. This may be especially important to understand in the area of podcasting health information and advice. The purpose of this study was to examine health-related podcasts, specifically weight loss podcasts, and their use by people seeking to improve their health. The study's hypothesis was that weight loss podcasts, on the whole, are offering accurate information and that listeners report that the podcasts have helped them make healthy behavior changes. There have been no scientific evaluations of the type, quality, accuracy, and commercial content of weight loss podcasts or on the experience of weight loss podcast hosts or their listeners. This study was comprised of three steps: a content analysis of current weight loss podcasts, a survey of weight loss and fitness-related podcast hosts, and a survey of weight loss podcast listeners.

IV.C. Methods

Content Analysis.

This study design includes a content analysis that took place between January and March 2007. The objectives of the content analysis were to determine: 1) the number of current weight loss podcasts, 2) the accuracy of these podcasts, and 3) the number that are being used for commercial purposes or contain advertisements. The first step in the content analysis was to assess the number of podcasts about weight loss that are currently listed in five popular podcasting directories. Using the search engine, Google, the term “podcast directories” (in January 2007) was searched for and the first four directories that were listed were used in the content analysis. iTunes was also included because it is not searchable on Google but has one of the largest lists of podcasts of any directory. The directories used include:

- *Podcasting News: <http://www.podcastingnews.com/>*
- *Podcast Directory: <http://www.podcastdirectory.com/>*
- *Yahoo! Podcasts: <http://podcasts.yahoo.com/>*
- *Podcast.net: <http://www.podcast.net/>*
- *iTunes*

In order to be included in this analysis, podcasts had to be directly related to weight loss, be in English, be free to download, be listed in at least 2 of the 5 directories (in order to assess the most popular podcasts), be less than 3 months old, and be an audiocast (versus a videocast which broadcasts video content). Only the two most recent episodes were used to examine the accuracy and commercial content of their podcasts.

Content Rating

Accuracy of the podcasts was graded by using the American Heart Association's (AHA) Guidelines for Selecting a Weight Loss & Maintenance Program (AHA, 2006).

Briefly, the criteria the 5 AHA categories analyzed in this study included:

- 1. Diet and nutrition:** Podcasts should mention a healthy food plan.
- 2. Realistic goals for weight loss:** Podcasts should not encourage excessive weight loss and the goal should be a moderate loss of 1-2 pounds per week.
- 3. Nutrition education:** Nutrition education should be the focus of the weight loss podcasts. Every podcast should contain information about healthy eating and when to work with a health professional.
- 4. Physical activity:** Podcasts should encourage participants to exercise on a regular basis.
- 5. Behavior modification:** Podcasts should provide behavior modification tips, such as self-monitoring. Hosts should also encourage participants to reach out to others for support—either online or in-person.

A registered dietitian (RD) who was familiar with podcasting and had previously conducted research with other interactive media and a trained research assistant graded each podcast separately. Each AHA category was awarded 1 to 5 points with 1 to 2 meaning information in that category was inaccurate or did not meet AHA criteria (i.e. told listeners exercise was not important for weight loss), 3 meaning criteria was not mentioned (i.e. no mention of exercise), and 4 to 5 meaning AHA criteria were met (i.e. were encouraged to get some form of physical activity each day). A range of scores was used for each AHA category in order to allow grading on the degree of inaccuracies or

accuracies. For example, if a podcast host told listeners that fruit and vegetables were unnecessary in a healthy diet, that podcast would receive a 1 on the diet and nutrition category. If the show stated that one need 3 servings of fruits and vegetables per day (versus 5 or more per day), that would receive a score of 2. Since each AHA category was also relatively broad, this score range also allowed for some flexibility in grading each category. For example, in the diet and nutrition category, a podcast host may state that fruits and vegetables are not necessary for a healthy weight loss diet but may also say whole grains are important. The scores between the 2 reviewers were averaged to come up with a final score for each category.

On March 20, 2007, all 5 directories were searched for podcasts relating to weight loss using the term “weight loss.” The number of podcasts that were listed under weight loss categories was calculated in order to determine the cumulative number of non-overlapping, unique weight loss podcasts. This resulted in a list of podcasts categorized as being about weight loss and eliminated any duplicates found between multiple directories. Inclusion criteria for the content analysis included that podcasts appear in one of the five listed podcast directories, are directly related to weight loss (i.e. the majority of episodes needed to address weight loss), are in English, and are free to download. Exclusion criteria included podcasts that are video-based (versus audio) and are over 3 months old.

Interviews with podcast hosts and their listeners.

In an attempt to understand the experience of weight loss podcast hosts and their listeners, podcasters and listeners of weight loss and fitness podcasts were surveyed. Podcast hosts used in the content analysis were asked to complete a brief questionnaire

assessing their podcasts. This was a 20-item questionnaire which asked podcast hosts about basic demographic information (age, gender, ethnicity, etc.), details on their podcast (number of listeners, how long they have been podcasting, podcast topics and frequency, etc.), and listener feedback they have received. The podcast hosts who completed the survey were also asked to place a recruitment ad on their Web site and read the podcast recruitment advertisement on their podcast in order to recruit listeners for the listener survey. Persons who completed the listener survey were all subscribers of weight loss podcasts. The listener survey included 18 questions and asked questions about demographics, listening behavior (how often they listen, where they listen, what devices they use to listen and download, etc.), and their experience with listening to weight loss-related podcasts (why they listen and have they made health behavior changes as a result of listening). Podcasts listeners and hosts received a \$10 gift card for completing the survey. Both the survey and the content analysis was approved by the University of North Carolina at Chapel Hill's Institutional Review Board and all participants provided informed consent.

IV.D. Results

Content Analysis.

There were 113 podcasts that were categorized as “weight loss” in the five directories. After examining these podcasts, several podcasts were excluded including 48 (42%) podcasts that were not directly about weight loss, 3 (3%) that were non-English podcasts, 4 (4%) that were videocasts, and 33 (29%) that were not current (> 3 months old). This resulted in 25 (22%) weight loss podcasts. In order to analyze the most popular or most listened to weight loss podcasts for the content analysis, only those podcasts that

appeared in more than one podcast directory were used. Out of the 25 weight loss podcasts, 13 (52%) were listed in 2 or more directories and were used for the analysis. These podcasts were analyzed for the accuracy of their content, number of commercials, and use to promote a product or service. Podcasts were on average 22 minutes and 21 seconds long, with a range of 1 minute and 20 seconds to 70 minutes.

The mean accuracy score for the 13 podcasts was 19.5 (range 15.5 - 22) (Table 4.1). Podcasts with a score of 20 or higher were considered to be acceptable (i.e. a score of 80% or higher) and with those less than 20, not recommended. Six podcasts received a score of greater than 20, with the remaining 7 podcasts receiving scores between 15.5 and 19.

Podcasts were also analyzed for commercial content. Commercial content appeared in podcasts and on their Web sites in several different forms including no commercial content (n=3; 23%), advertisements in the podcast for products or services not associated with the host (n=1; 8%), podcast Web sites with advertisements for products or services not associated with the host (n=5; 38%), podcasts that promote host's products or services (n=7; 54%), and podcast Web sites that promote host's products or services (n=6; 46%). Advertisements on the podcast Web site (where the podcast show is housed online) were mainly ads for products sold on other sites related to weight loss (i.e. scales and weight loss books). About half of the podcasts were produced by people promoting products and services including weight loss coaching and counseling services, books, Compact Disks, and seminars.

Survey with podcast hosts.

The study aimed to survey a minimum of 10 podcast hosts. The 13 podcasts hosts of the shows used in the content analysis were sent an e-mail detailing the study and were given a link for the survey. Of those 13 hosts, 6 completed the survey (46%). In order to get a larger sample size, hosts of current (updated in the past 3 months) weight loss and fitness podcasts that appeared in one of the five directories under a “weight loss” category and had a working e-mail address were contacted (N =11), of which 4 responded to the survey. This resulted in a total of 8 weight loss and 2 fitness shows. Table 4.2 presents the results of the podcast host survey. Respondents all lived in the United States and were predominantly male (80%) and White (90%). The majority of podcast hosts reported posting shows at least weekly (80%). Most hosts (80%) also said that they had listeners report health benefits as a result of listening to their show. Podcasters reported podcasting on a variety of topics with over half of respondents saying they regularly discuss cardiovascular exercise (90%), healthy eating tips (80%), self-monitoring (70%), weight lifting (60%), dealing with friends and family (60%), finding group support (60%), eating out tips (50%), and setting weight loss goals (50%). Credentialing or qualifications of the podcast hosts who responded to the survey were determined from their hosting Web site. Six of the podcasts were produced by people who had lost weight or were trying to lose weight and 1 was produced by someone who enjoys exercising. Only 3 of the podcasts had hosts with some type of qualifications including a Masters in Counseling, Bachelors in Exercise Physiology, and a certified personal trainer. None of the podcasts were produced by RDs.

Survey with podcast listeners.

A total of 24 podcast listeners responded to the survey and 22 completed it. They represented listeners from a wide variety of shows. Table 4.3 presents the results of the podcast listener survey. Participants were mostly white males from the United States. The majority (91%) of participants reported making at least one healthy change, such as losing weight or improving their diet, as a result of listening to podcasts. Most participants reported accessing podcasts at home (45%) versus other locations, listening to their favorite weight loss or fitness podcast at least weekly (64%), and using an iPod to listen to podcasts (64%). Participants most often cited getting healthy tips and staying motivated as reasons why they find podcasts useful.

IV.E. Discussion

To our knowledge, no other study has examined the accuracy of podcasts—health-related or otherwise—or experience of podcast hosts. Podcasting is an inexpensive way to deliver audio content to people with access to the Internet (Savel, Goldstein, Perencevich, & Angood, 2007). Research on podcasting so far has mainly examined its role in education (Ragon & Looney, 2007; Rowell, Corl, Johnson, & Fishman, 2006; Savel et al., 2007; Tripp, Duvall, Cowan, & Kamaau, 2006) and academic publishing (Abbasi, 2006; Johnson & Grayden, 2006). Podcasting allows listeners who are seeking information to receive it when and where they want it (Boulos, Maramba, & Wheeler, 2006). The availability of free or low-cost audio software allows podcast hosts to set up a podcast at little or no cost. The software needed to download podcasts (such as iTunes or using Really Simple Syndication or RSS feeds) is free for the listener (Boulos et al.,

2006). Podcasting has very little to no costs to host or listener; therefore anyone with access to a computer with an Internet connection can be a podcast host or listener.

Findings show that less than half of the podcasts met the criteria. There was also a large discrepancy between reviewers with reviewer one finding 69% of the podcasts to be accurate and reviewer 2 finding 15% of the podcasts to be accurate. The 2 categories that had the most discrepancies between reviewers were the *Diet and Nutrition* and the *Realistic Goals for Weight Loss* categories. This could be due to the wide variety of weight loss methods covered by each podcast. While most podcasts mentioned some sort of physical activity, encouraged participants to find outside support and use self-monitoring techniques, and suggested participants work with a health professional if needed, the nutrition information discussed varied widely. Several podcasts encouraged a high-protein, low-carbohydrate diet or the use of weight loss medications. And podcasts also often mentioned unrealistic weight loss goals (such as dropping more than 2 lbs per week). The use of more reviewers may have helped to paint a more cohesive picture of current weight loss podcasts.

Podcasts in this study were often used to promote the host's own products or services and the qualifications of the host to provide health information is often unknown. While almost half of the podcasts analyzed in the content analysis received an acceptable score according to the AHA criteria, 54% still received an unacceptable score. Without the guidance of a health professional, people who decide to download a weight loss podcast may have a difficult time finding one that provides accurate health information.

It is impressive that the majority (80%) of respondents said that they had listeners report at least one healthy change as a result of listening to their weight loss or fitness

podcast. Since some of these listeners may have made changes in health behavior as a result of listening to an inaccurate podcast, not all health behaviors may have been positive. For example, a listener may have reported losing weight but it may have been the result of an unhealthy practice, such as an extremely low calorie diet. These results, however, point to the possibility of podcasting being used to create behavior change since the majority of listeners were motivated to change behavior as a result of listening to a podcast.

Although surveys have shown that more minorities than whites own MP3 players and both men and women equally download podcasts (Pew, 2005), this study found that the majority of hosts were white males. This gender profile may be different from other weight loss methodologies such as the Web (Wantland et al., 2004) or commercial weight loss programs (Heshka et al., 2003) and has implications for reaching males who may be otherwise uninterested in trying other more conventional methods of weight loss. And while minorities may be more likely to own MP3 players, this may not mean they are more likely to download podcasts. Perhaps since most of the podcast hosts were white males, then their audience tends to be of the same demographic.

There are several limitations to this study. The content analysis was limited only to the two most recent podcast shows. It is possible that the podcast hosts may have covered some of the AHA weight loss criteria on earlier shows that were not analyzed. The content analysis also did not include all weight loss podcasts. There may be podcasts that are not listed in podcast directories or are in less popular podcast directories, and therefore were not included in this study. There were also just two reviewers of the podcasts for the content analysis and additional reviewers or another RD may have rated

the podcasts differently. There were also some scores that varied greatly (up to 2 points difference) between the 2 reviewers so more reviewers may have provided a more accurate score for each podcast. The survey had a small sample size and only provided a snapshot of the experiences of podcast hosts.

Overall this survey and content analysis demonstrated that podcasting is a popular and possibly effective way to deliver health information but many podcasts are not delivering accurate information.

Table 4.1: Individual rater and average accuracy scores in the five American Heart Association (AHA) categories (possible range 1-5 per category) ^a and total score (possible range 5-25) of the 13 weight loss podcasts

Podcasts	Diet and nutrition		Realistic goals for weight loss		Nutrition education		Physical activity		Behavior Modification		Total Score	
	Rater 1	Rater 2	Rater 1	Rater 2	Rater 1	Rater 2	Rater 1	Rater 2	Rater 1	Rater 2	Rater 1	Rater 2
1	5	3	5	3	5	4	5	4	5	5	25	19
mean score	4		4		4.5		4.5		5		22	
2	5	5	4	3	5	4	5	5	4	4	23	21
mean score	5		3.5		4.5		5		4.0		22	
3	5	3	5	3	5	4	3	4	5	5	23	19
mean score	4		4		4.5		3.5		5		21	
4	5	5	4	3	4	4	5	5	3	4	21	21
mean score	5		3.5		4		5		3.5		21	
5	5	5	3	3	5	3	5	5	4	3	22	19
mean score	5		3		4		5		3.5		20.5	
6	4	4	4	3	5	3	5	4	5	4	23	18
mean score	4		3.5		4		4.5		4.5		20.5	
7	4	3	5	3	4	4	3	3	5	5	21	18
mean score	3.5		4		4		3		5		19.5	
8	3	3	5	4	3	3	5	4	5	3	21	17
mean score	3		4.5		3		4.5		4		19	
9	3	3	4	3	3	3	5	5	5	4	20	18
mean score	3		3.5		3		5		4.5		19	
10	3	5	2	2	4	4	4	5	4	3	17	19
mean score	4		2		4		4.5		3.5		18	
11	5	3	3	3	5	4	3	4	3	3	19	17
mean score	4		3		4.5		3.5		3		18	
12	4	3	5	3	4	3	3	3	3	3	19	15

mean score	3.5		4		3.5		3		3		17	
13	2	1	4	3	2	4	4	4	3	4	15	16
mean score	1.5		3.5		3		4		3.5		15.5	

^a Score of 1 = Information not accurate; 5 = Accurate.

Table 4.2: Survey results with weight loss and fitness podcast hosts including demographic information, podcast details, and listener feedback

	Podcast Hosts (%)
	(N = 10)
Race	
Black, Non-Hispanic	1 (10%)
White, Non-Hispanic	9 (90%)
Gender	
Male	8 (80%)
Female	2 (20%)
Mean Age (range)	34.7 years (28-41)
Length of time the show has been on offered	
< 6 months	1 (10%)
6 months to < 1 year	7 (70%)
1 to 2 years	1 (10%)
> 2 years	1 (10%)
Mean number of listeners per show (range)	937.1 (35-2000)
Frequency in which a new show is posted	
> 1 day per week but < 7 days per week	2 (20%)
Weekly	6 (60%)
Every 2 weeks	2 (20%)
Main topic of podcast	
Weight Loss/Dieting	5 (50%)

Exercise	3 (30%)
Both Exercise and Weight Loss	1 (10%)
Healthy Living	1 (10%)
Listeners reported improving health behaviors	
as a result of listening to podcast	
Yes	8 (80%)
No	2 (20%)
Topics discussed on podcast shows¹	
Cardiovascular exercise (running, elliptical trainer) information	9 (90%)
Healthy eating tips	8 (80%)
Importance of self-monitoring (i.e. encouraging listeners to keep a food diary or weight log)	7 (70%)
Weight lifting tips	6 (60%)
Dealing with family and friends	6 (60%)
Getting group support	6 (60%)
Eating out tips	5 (50%)
Ideal weekly weight loss goals	5 (50%)
Reducing calorie intake	4 (40%)
Working with your doctor or other health professional	4 (40%)

¹ Participants were asked to select all that apply so the number of responses is greater than the N of 10

Table 4.3: Survey results with weight loss and fitness podcast listeners including demographic information, listening behavior, and experience with listening to weight loss or fitness podcasts

	Podcast Listeners (%)
	(N = 22)
Race	
Black, Non-Hispanic	2 (8%)
White, Non-Hispanic	19 (86%)
Hispanic	2 (8%)
Gender	
Male	13 (59%)
Female	9 (41%)
Mean Age (range)	38.6 years (23-54)
Country of residence	
United States	19 (88%)
Canada	1 (4%)
Bulgaria	1 (4%)
Israel	1 (4%)
Frequency of listening to favorite weight loss or fitness podcast	
Daily	3 (14%)
At least 2 days per week but less than 7 days per week	6 (27%)

Weekly	5 (23%)
2-3 times per month	4 (18%)
Monthly	1 (4%)
A few times per year	3 (14%)
Device used to listen to podcast	
iPod	14 (64%)
Other MP3 player	4 (18%)
Directly on computer	4 (18%)
Location where podcasts are listened to the most	
At home	10 (45%)
At work	3 (14%)
While exercising	5 (23%)
In the car	3 (14%)
Commuting to work	1 (4%)
While traveling	0
What participants find most useful about listening to weight loss or fitness podcasts¹	
I get good healthy tips	20 (91%)
Keeps me motivated	19 (86%)
Helps to hear someone going through the same thing as I am	12 (55%)
Makes me feel less alone	7 (32%)

I don't find them useful	0
Healthy changes made as a result of listening to weight loss or fitness podcasts¹	
Made healthy changes to my diet	15 (68%)
Lost weight	13 (59%)
Increased exercise	12 (55%)
No changes	2 (9%)
Sought medication changes from my doctor	1 (4%)

¹ Participants were asked to select all that apply so the number of responses is greater than the N of 22

CHAPTER V

DELIVERING WEIGHT LOSS INFORMATION VIA PODCAST OR WEB: THE MEDIA EFFECTS ON PSYCHOSOCIAL AND PHYSIOLOGICAL RESPONSES

V.A. Abstract

The Web has been employed in weight loss interventions but little is known about the use of podcasting in health promotion. The purpose of this study was to explore differences in how people process information on weight loss either through reading text on a Web site or listening to the information via podcast, measuring both psychosocial and physiological variables. Participants were randomly assigned to receive one of two different media-based materials: A Healthy Weight Web site (N = 20) or a Healthy Weight podcast (N = 20). Participants completed questionnaire items assessing demographic characteristics, Likeability of the Healthy Weight Web site or podcast, Perception of the Web site or podcast, Need for Cognition, User/Information Control, Perceived Novelty, and weight loss-related knowledge. Participants also had skin conductance levels (SCL) measured while reading the Web site or listening to the podcast. There was no difference in SCL levels between the groups; however, the Web group reported greater ease of navigation and user control. In addition, the Web group viewed the Web site as a less novel way to deliver information on weight loss than a podcast.

V.B. Introduction

Overweight and obesity are increasing at an alarming rate in the U.S. (Ogden et al., 2006). Finding innovative ways to reach overweight adults and help them lose weight is critical to address. Past research has shown electronic media to be an effective way to deliver a weight loss intervention (Berkel et al., 2005). Podcasting is one emerging technology that has the potential to reach large numbers of people who are interested in changing health behaviors. Podcasts are downloadable, electronic audio files that may be listened to on portable audio players (MP3 players) or computers. While there are hundreds of weight loss- and other health-related podcasts available online for download, little is known about how accessing health information via podcast differs from accessing the same information via the Web. Research on the use of podcasting has mainly been conducted in the realm of education (Jham, Duraes, Strassler, & Sensi, 2008). With the increasing availability of wireless technologies, more people are accessing health information via technologies such as podcasting (Trelease, 2008). Other forms of technology, such as the Web, have already been employed in health interventions (Berkel et al., 2005). Several studies have shown the Web to be an effective way to create health behavior changes and increase health-related knowledge (Wantland et al., 2004).

A variety of health behavior theories have been used to help inform weight loss studies using technology. Internet interventions for weight loss have been made more effective when designed using a behavioral theory, such as Social Cognitive Theory (SCT) (Winett et al., 2005). Whereas health behavior theories, such as SCT, have been used in the design of technology-based weight loss interventions, communication theories may help explain possible differences in effects between media, such as podcasting or the

Web. Two such theories include User/Information Control Theory and Cognitive Load Theory. The literature on user control/information control shows that allowing a user to have control over the pace and content of instruction allows for better and more effective learning (Ariely, 2000). People learn in different ways so the more control learners have with their experience, the more variety of learning styles can be accommodated (Ariely, 2000). Providing control over the educational process also allows the users to feel more motivated to learn (Eveland & Dunwoody, 2001). Cognitive Load Theory states that people have limited cognitive processing abilities and in order for learning to be effective, the burden on working memory must be lessened (Paas et al., 2003).

Theoretical perspectives of User/Information Control and Cognitive Load Theory suggest that elements of podcasting may be more effective than other media—such as print or Web—in promoting freedom in learning and decreasing cognitive load (Eveland & Dunwoody, 2001). Both these theories posit that a freedom in the learning process (Eveland & Dunwoody, 2001) and reduced cognitive burden (Brunken et al., 2003; Paas et al., 2003) produce more effective learning. While the Web provides a greater freedom in navigation as compared to print, learning through the Web can increase cognitive load (Eveland & Dunwoody, 2001). Podcasting may also allow for greater individual heterogeneity (i.e. allowing for different learning environments), which can increase a sense of user control (Ariely, 2000). One can be sedentary and listen to a podcast on a desktop computer or can be mobile (listening to podcasts on a portable media player in a car or while walking).

Kristof and Satran (1995) have developed an interactivity scale with seven levels of increasing interactivity activity that correspond with increases in user control. The

seven levels are 1) control over the pace of learning, such as being able to listen to the podcast content all at once or at different times; 2) control over sequence, such as being able to skip ahead to other content; 3) control over media, such as being able to start and stop the podcast; 4) control over variables, such as listening to a podcast on different devices; 5) control over transaction, such as subscribing to a podcast or downloading the file directly; 6) control over objects, such as reordering playlists; and 7) control over simulation, such as being able to listen to the podcast in different places such as a car or at home (Kristof & Satran, 1995). In turn, this greater sense of information control can lead to a greater satisfaction with the media (Zhang & von Dran, 2000). The unique qualities of podcasting, which allow the user to be mobile and access the information anytime or anyplace, may provide an increase in freedom without increasing cognitive load. This suggests that podcasting may be a promising alternative to delivering health information that should be compared to the Web in terms of effectiveness.

Perceived novelty may also point to podcasting as an effective way to deliver health information. In the realm of advertising, perceived novelty of a product has been shown to help sales of that product (Mukherjee & Hoyer, 2001). Products that are perceived as being more novel than another similar product are often perceived as having more value as well (Mukherjee & Hoyer, 2001). A novel medium may also be perceived as communicating a more meaningful message than a less novel medium (Carpenter et al., 1994).

Different types of media can lead to varying impressions formed by the user. The separate streams hypothesis theorizes that visual and auditory inputs are processed differently. These two streams are often processed separately when presented together.

Differences in the characteristics of these two streams account for the differing effects in these modalities (Penney & Butt, 1986). The way information is presented also has an effect on impression formation. For example, the more someone is involved in the topic presented and the more interactive the media is, the greater impression formation will be (Sundar, Kalyanaraman, & Brown, 2003). In general, impression formation refers to the impression a user gets from the person perceived as delivering the message through the technological medium—such as the person viewed as the author of a particular Web site (Kalyanaraman & Sundar, 2008). Impression formation, however, can also be formed about the technology itself (Kalyanaraman & Sundar, 2008). For example, because podcasting involves listening to a human voice, it may form a different impression on a user than a Web site with similar content.

Researchers often use measures of psychosocial and physiological response to assess reactions to media or to study mediators of a behavior. For example, heart rate, blood volume pulse, and galvanic skin resistance can be used as ways to measure physiological arousal among participants using different types of media (Wilson & Sasse, 1999); several studies have shown that emotional responses trigger measurable physiological reactions (Partala & Surakka, 2004). One advantage to using physiological responses in media studies is that it is an objective measure. Measuring, for example, whether or not someone likes a Web site is highly subjective and can be difficult to gauge in a valid way (Wilson & Sasse, 1999).

The purpose of this study was to explore differences in how people process information on weight loss either through reading text on a Web site or listening to the information via podcast, measuring both psychosocial and physiological variables.

Although there is a theoretical basis to demonstrate the strength of using podcasting to deliver health information, research shows that recall of information is often better obtained through a written medium versus auditory (Furnham, 2001). Therefore, this study also measured differences in knowledge after use of each medium. We hypothesized that podcasting would create a greater physiological response, greater feelings of user control, and a greater sense of novelty but that changes in knowledge will be greater in the Web group.

V.C. Methods

Two different media-based materials were used for this study: A Healthy Weight Web site and a Healthy Weight podcast. Both the podcast and Web site were designed by the researchers based on Social Cognitive Theory (SCT) (Bandura, 2004). The content of the Web site and podcast were identical. Table 5.1 outlines the content on the podcast and Web site and how the different components targeted four SCT constructs. Participants were recruited through two undergraduate journalism and mass communication classes and signed up for research appointment time slots. Inclusion criteria included being 18 years of age or older and a current student. The University of North Carolina at Chapel Hill Institutional Review Board approved the study on November 8, 2007, and all the participants gave written informed consent for this study (clinical trial registry # NCT00775008). Participants received \$20 for completion of the study.

As participants entered the media lab, a research assistant randomly assigned them to the Web or podcast condition. After participants completed informed consent, they were told to sit in front of a computer and their index and pointer fingers on the non-dominant hand were attached to two Ag-AgCl electrodes with 6 mm contact. This

connected to the BIOPAC™ machine (*www.biopac.com*), which was used to measure skin conductance level (SCL). Participants were also instructed to wear a pair of provided headphones plugged into the computer. Participants were told to sit quietly while the research assistant went to the adjoining office with the monitoring equipment. During this time, a baseline measurement was taken for 30 seconds. Measurements were taken at one second intervals at a rate of 200 Hz. After the baseline reading was obtained, the research assistant returned and turned on the computer monitor, which displayed an introduction Web page about the study. A second SCL recording was initiated when the participant had completed reading the instruction page and clicked the button on the screen that loaded a Web site or podcast—depending on the condition to which they were assigned. This reading was continuous until the participant signaled they had completed the intervention. The podcast was played on the computer, using a media player, and the Web site was viewed on the screen. To control for prior arousal, a percent change in arousal from baseline was calculated by subtracting the mean baseline arousal from the mean condition arousal and dividing that by the mean baseline arousal (Sundar & Kalyanaraman, 2004). The podcast lasted approximately 12 minutes and the Web site had 4 pages of content.

After participants listened to the podcast or read the Web content, they were instructed to raise their dominant hand to signal that they were completed. The research assistant, who was monitoring them through a two-way mirror, stopped the SCL reading at this time. The sensors were removed from the participant's fingers and the participant was then instructed to complete questionnaires, which assessed the following:

- Demographic characteristics including reported weight and height

- Likeability of the Healthy Weight Web site or podcast (listed 12 attributes and asked participants to rate each on a Likert scale of 1 to 9 anchored by “Very Poorly” and “Very Well”).
- Perception of the Web site or podcast (35 statements such as “I paid a great deal of attention when going through Healthy Weight” rated on a 1 to 9 Likert scale anchored by “Strongly Disagree” and “Strongly Agree”).
- Need for Cognition (18 statements such as “I like to have the responsibility of handling a situation that requires a lot of thinking” rated on a 1 to 9 Likert scale anchored by “Strongly Disagree” and “Strongly Agree”).
- User/Information Control (6 statements such as “I felt that I had a lot of control while going through Healthy Weight” rated on a 1 to 9 Likert scale anchored by “Strongly Disagree” and “Strongly Agree”).
- Perceived Novelty (2 statements such as “I found Healthy Weight to be very new and innovative” rated on a 1 to 9 Likert scale anchored by “Strongly Disagree” and “Strongly Agree”).
- Knowledge (5 recall and 5 recognition questions on the content of Healthy Weight).

Data analysis.

Power calculations used a similar study and examined changes in SCL with an effect size r of 0.37 and a change in SCL between groups of 42% (Sundar & Kalyanaraman, 2004). Sample size per intervention arm for two-sided tests of significance at $\alpha=0.05$ and power $1-\beta=80\%$ were 16 per group. In order to account for the

potential for participants not to show up to their research visit, 20 participants per group were recruited.

Survey questions were scored so that all answers were in the same direction (e.g. “While going through Healthy Weight, I had absolutely no control over what I could do” was reverse scored to match the other survey questionnaire items that were in the positive direction). Factor analysis was conducted using Varimax rotation on the Likeability of the Healthy Weight Web site or podcast, Perception of the Web site or podcast and use of the Internet for health-related purposes, Need for Cognition, and User/Information Control questionnaires. Cronbach’s alpha for each questionnaire was calculated. The factors on each of these questionnaires that grouped together were then tallied to come up with individual scores. Between-subjects *t* tests were calculated for all measures with the exception of the baseline demographic information, which contained multiple categories (such as education), and correlations between Need for Cognition score and SCL. For these measures, the Chi-square test of independence was used to determine differences between groups at baseline and bivariate correlations between Need for Cognition score and the SCL measures were calculated. All analyses were conducted using SPSS 16.0 for Windows software with a *p* value of 0.05 used to indicate statistically significant differences (SPSS for Windows, 16.0.1 2007. Chicago: SPSS Inc.).

V.D. Results

Twenty participants completed each arm. There were no significant differences in baseline demographics between groups (Table 5.2). Participants were primarily normal weight, White females who owned MP3 players and had attempted weight loss in the past.

The 12-item Likeability of the Healthy Weight Website or Podcast questionnaire loaded on 1 factor (Eigenvalue of 6.02; $\alpha=0.90$), the 35-item Perception of the Web site or podcast survey had 5 factors (Eigenvalues ranging from 9.47 to 1.92; $\alpha=0.87$; 5 questions did not load and 3 were not included due to loading on only 1 factor each). These factors assessed how much the participant trusted the information presented in Healthy Weight, the level of personal involvement, the ease of navigation, the participant's intention to use Healthy Weight in the future, and the relevance the information presented had to the participant. The 18-item Need for Cognition questionnaire loaded on 1 factor (Eigenvalue of 7.307; $\alpha=0.89$) and the 6-item User/Information Control questionnaire loaded on 1 factor (Eigenvalue of 4.446; $\alpha=0.89$). Table 5.3 presents the differences between groups for the variables measured. Participants in the podcast group spent a significantly longer time listening to the podcast than the Web group spent reading the Web site (764.4 ± 33.2 seconds vs. $376.2 (\pm 102.0)$, respectively; $P < 0.001$).

There was no significant difference between the groups with regards to the mean percent change in arousal from baseline ($3.3 \pm 15.3\%$ podcast vs. $0.4 \pm 13.7\%$ Web group, $P = 0.530$). Both the podcast and Web groups reported liking the intervention equally (score out of 108; 63.9 ± 12.4 podcast vs. 62.3 ± 15.9 Web, $P = 0.725$). Only one (ease of navigation) of the five Perception factors was significantly different between groups. The Web group found the intervention easier to navigate (40.9 ± 6.8 out of 63) than the podcast group (49.3 ± 5.1 ; $P < 0.001$ between groups). The factor of Information Relevance (e.g. "The information featured on Healthy Weight was relevant to me") was approaching significance ($P = 0.052$) with the Web group having a mean score of 21.6

± 3.0 and the podcast group having a mean score of 18.7 ± 5.6 . There were no differences between the groups in the Need for Cognition questionnaire scores with both groups equally reporting a high level of enjoyment for complex problem-solving activities. Need for Cognition score was not correlated with the percent change in SCL arousal from baseline ($r(37) = 0.04, P = 0.82$).

There were significant differences in reported User/Information Control and Novelty with the Web group reporting a greater sense of user control (50.7 ± 9.2 out of 63) than the podcast group ($30.2 \pm 9.1; P < 0.001$ between groups) but the podcast group feeling the intervention was more novel (8.4 ± 3.5 out of 18) than the Web group ($4.4 \pm 2.6; P < 0.001$). The knowledge test was administered once, after the participant completed the intervention. There was no difference between groups in knowledge score with both groups getting approximately 70% of the questions correct. There also were no differences between groups with scores on recall versus recognition questions or any of the individual questions.

Overall, both groups showed similar responses to weight loss information presented in podcast or Web form; however, the Web group reported greater ease of navigation and user control and there was a trend for greater information relevance among the Web group. In addition, the Web group viewed the Web site as a less novel way to deliver information on weight loss than a podcast.

V.E. Discussion

The present study examined the use of two different electronic media to deliver health-related content. The Web has been shown to be an effective way to help people achieve weight loss and create health behavior changes (Tate et al., 2003, 2006; Tate et

al., 2001; Wing et al., 2009). There were very little differences observed between the groups in this study. This may have resulted because both the podcast and the Web were designed using SCT and had identical content and structure.

We hypothesized that the podcasting intervention would create greater changes in SCL than the Web intervention. This study did not confirm this hypothesis. Both groups had similar changes in SCL from baseline. These changes were also much lower than produced in similar studies using SCL to assess arousal while viewing Web sites (Kalyanaraman & Sundar, 2004) or video games (Ivory & Kalyanaraman, 2007). This was an unexpected finding but may help to explain why there were also very few differences reported in psychosocial variables, such as likeability of the medium and personal involvement, between the 2 groups. These results suggest that both mediums may be equally effective in delivering health information.

Some research has shown that the more control a user has over his or her learning environment the more they will learn; however, the findings in this area have been mixed (Reed, 1996). Although podcasting in its true form allows for a great deal of user or information control (in terms of when, where, and how a user accesses the information), this is not possible in the laboratory setting. Participants in this study were required to listen to the podcast all in one sitting, on a desktop computer. The mean time recording SCL was slightly longer than the podcast length of 12 minutes mainly because a few second lag between clicking the start of the podcast and the podcast loading as well as many participants waited a few seconds at the end of the podcast before signaling they were done. Although they could press pause or fast forward through content using the media player on the computer, no participant chose to do this. The Web site used for this

study, on the other hand, allowed participants to access the content in whatever order they chose and allowed them to ignore content if they chose to do so. No data, however, was recorded on which pages participants visited. The participants in the Web group also reported greater ease of navigation and greater relevance of the material presented, which may have increased the sense of user control. While most participants were very familiar with how to navigate through a Web site, participants in the podcasting group may have been unsure how to navigate through a podcast using the media player software. The podcast group also spent twice as much time receiving the information than the Web group, which may have led to an increase in frustration among the podcast group. If they were able to navigate through the podcast, this may have increased the sense of user/information control. However the users may have felt compelled to listen to the whole podcast, whereas participants in the Web arm were able skip around and focus on the material relevant to them.

Web- and other technology-based interventions can be an effective way to increase knowledge (Wilkinson et al., 2004). The Web site for this study was designed to present information in a linear manner; this type of design structure has been shown to increase factual learning over Web presentations in a non-linear structure (Eveland & Cortese, 2006). The podcast presentation was also linear and went through the same four topic areas, which could account for why there were no differences between the groups with regards to knowledge. Participants in the podcast groups reported the intervention as more novel than the Web group. Although both groups reported a high degree of MP3 player ownership, fewer participants reported ever having downloaded a podcast. Because podcasting may have been unfamiliar to participants, this could be why

participants in the podcasting group reported more difficulty with navigation and less user control.

It has been hypothesized that the more novel a medium is perceived to be, the more a user will learn from it (Clark, 1983). Despite the podcasting intervention being viewed as more novel, there were no differences found in knowledge or SCL. Because very few of the participants were currently trying to lose weight, and the mean reported Body Mass Index (BMI) was in the normal range for both groups, participants may have been less interested in the material presented, and therefore had less impression formation (Sundar et al., 2003). Research has shown that if messages presented to the user do not match some aspect of their self—such as their own goals—then the user will not be persuaded by the information (Petty, Barden, & Wheeler, 2002).

There are several limitations to this study. We had a small sample size in this study. Although a power calculation based on a similar study was used to determine the sample size, there may not have been enough participants to see differences between SCL and other variables. This study was designed to allow a more precise comparison of Web and podcasting but constrained both media in terms of what the possibilities are. Participants did not have the freedom to move around or to listen to different parts of the podcast and skip other sections. The Web site also did not include many of the features that make the Web interactive, such as chat rooms, videos, and discussion boards. The podcasts could have been enhanced with other features as well. Only audio was used to present the material in the podcasts. Adding visual content to podcasts has been shown to enhance the learning experience over audio alone (Shantikumar, 2008). Combining the visual aspects of the Web with the audio capabilities of podcasting may have produced

greater differences than those observed between the 2 groups utilized in the present study. There was also a significant difference between groups in the length of time participants spent on the condition. Podcast participants spent twice as long listening to the podcast as the Web group spent reading the site. This greater time spent in the podcast group may have created an increase in frustration. Since the podcast had identical content to the Web site, it is also possible that the Web group skipped much of the content or selectively scanned the material. We included SCL in order to have an objective measure of interest in the conditions used in this study. It may be difficult, however, to determine if the physiological arousal is caused by outside stress or other emotions such as happiness or excitement (Wilson & Sasse, 1999). Because of this, a 30 second baseline measure was included as part of the SCL measurement. The recruitment method led to a very homogenous sample. Future research should examine should examine if results are different in older or younger populations or different ethnicities.

There are also several strengths to this study. To our knowledge, this is the first study to compare the differences between presenting health information via podcast or a Web site. This study also included a combination of objective and subjective measurements and was a randomized design. Overall, these initial results suggest more research is needed to see if there are differences between presenting health information via podcast or Web when each media is closer to their true form.

Table 5.1: Stimulus material components and how each targets the theory constructs

Podcast	Web site	Social Cognitive Theory Construct
Welcome (1 minute)	Welcome	
<p>Audio diary of someone who is trying to lose weight (discussed his successes, failures, and personal tips) (4 minutes, 30 seconds)</p>	<p>Blog of someone who is trying to lose weight (discussed his successes, failures, and personal tips)</p>	<ul style="list-style-type: none"> • Expectations: Provided a first-hand experience of weight loss and informed participants about what to expect from trying to lose weight.
<p>Nutrition and Exercise Information (5 minutes)</p>	<p>Nutrition and Exercise Information</p>	<ul style="list-style-type: none"> • Expectancies: Emphasized the importance of achieving a healthy weight to increase the value participants place on weight loss. • Behavioral Capability: Presented knowledge about how to lose weight, exercise, and make dietary changes.

Goal for the week (1 minute, 30 seconds)

Goal for the week

- Self-efficacy: Encouraged participants to monitor calories and exercise. The aim of goal achievement was to increase confidence.

Table 5.2: Baseline demographic data for podcast and Web participants

	Podcast Group	Web Group
<i>n</i>	20	20
Age (years) (mean \pm SD)	21.2 (\pm 2.6)	22.4 (\pm 7.5)
Body Mass Index (kg/m ²) (mean \pm SD) ^a	24.7 (\pm 7.4)	21.3 (\pm 2.7)
Sex [<i>N</i> (%)]		
Male	2 (10)	2 (10)
Female	18 (90)	18 (90)
Race, ethnicity [<i>N</i> (%)]		
Black	2 (10)	1 (5)
White	17 (85)	18 (90)
Other	1 (5)	1 (5)
Hispanic [<i>N</i> (%)]		
Yes	1 (5)	2 (10)
No	19 (95)	18 (90)
Marital status [<i>N</i> (%)]		
Not married	18 (90)	18 (90)
Married or domestic partnership	2 (10)	2 (10)
Number of participants who own an MP3 player [<i>N</i> (%)]	19 (95)	19 (95)
Number of participants who had previously downloaded a podcast [<i>N</i> (%)]	10 (50)	7 (35)
Number of participants who are currently	6 (30)	4 (20)

trying to lose weight [<i>N</i> (%)]		
Number of participants who have attempted weight loss in the past [<i>N</i> (%)]	17 (85)	13 (65)
Hours per day spent online (mean ± SD)	2.4 (± 1.2)	2.7 (1.2)
Hours per day spent online for health information (mean ± SD)	0.2 (± 0.2)	0.3 (± 0.3)

^a BMI from self-reported height and weight

Table 5.3: Survey and Skin Conductance Level Results Measured in the Podcast and Web groups after the Intervention

	Podcast Group	Web Group	P-value for Difference Between Groups
<i>n</i>	20	20	
<i>Length of time participants spent on condition (seconds)</i>	764.4 (± 33.2)	376.2 (± 102.0)	<0.001
☞ <i>Mean percent change in Skin Conductance Level arousal from baseline</i> (higher value corresponds with greater arousal)	3.3 (± 15.3) %	0.4 (± 13.7) %	0.530
<i>Likeability of the Healthy Weight Web site or Podcast questionnaire</i> ^a	63.9 (± 12.4)	62.3 (± 15.9)	0.725
<i>Perception of the Web site or Podcast questionnaire</i>			
Trust of information presented in Healthy Weight	42.7 (± 10.9)	40.3 (± 10.3)	0.478
Personal involvement	32.6 (± 10.4)	33.1 (± 10.0)	0.877
Ease of navigation	40.9 (± 6.8)	49.3 (± 5.1)	<0.001

	Intentions to use Healthy Weight in the future ^c	10.1 (± 5.1)	9.0 (± 5.1)	0.499
	Information relevance ^c	18.7 (± 5.6)	21.6 (±3.0)	.052
	<i>Need for Cognition questionnaire</i> ^d (a higher score reflects a greater desire to work on complex problems)	106.2 (± 23.1)	110.1 (± 16.7)	0.539
	<i>User/Information Control questionnaire</i> ^b (a higher score reflects a greater sense of control)	30.2 (± 9.1)	50.7 (± 9.2)	<0.001
	<i>Novelty questionnaire</i> ^e (higher score reflects a greater perceived sense of novelty)	8.4 (± 3.5)	4.4 (± 2.6)	<0.001
49	<i>Knowledge Test score</i> ^f	7.3 (± 1.4)	7.4 (± 1.5)	0.849

^a possible score range 12-108

^b possible score range 7-63

^c possible score range 4-36

^d possible score range 18-62

^e possible score range 2-18

^f possible score range 0 -10

CHAPTER VI

POUNDS OFF DIGITALLY (POD) STUDY: A RANDOMIZED PODCASTING WEIGHT LOSS INTERVENTION

VI.A. Abstract

As obesity rates rise, new weight loss methods are needed. Little is known about the use of podcasting (audio files for a portable music player or computer) to promote weight loss, despite its growing popularity. In this 12-week randomized controlled trial, overweight men and women (body mass index, 25–40 kg/m²) (n=78) were recruited and randomly assigned to receive 24 episodes of a currently available weight loss podcast (control podcast) or a weight loss podcast based on Social Cognitive Theory (SCT) designed by the researchers (enhanced podcast) for 12 weeks. Weight was measured on a digital scale at baseline and follow-up. Both groups also completed questionnaires assessing demographic information, food intake, physical activity, and SCT constructs at the introductory and 12-week meetings. Additional questionnaires at the 12-week meeting assessed perceptions of the intervention. Intention-to-treat analysis was used. Enhanced group participants (n=41) had a greater decrease in weight (-2.9 ± 3.5 kg enhanced group vs. -0.3 ± 2.1 control group; $P < 0.001$ between groups) and BMI (-1.0 ± 1.2 kg/m² enhanced group vs. -0.1 ± 0.7 kg/m² control group; $P < 0.001$ between groups) than the control group (n=37) and had greater weight loss-related knowledge ($P < 0.05$), elaboration ($P < 0.001$), and user control ($P < 0.001$) and less cognitive load ($P < 0.001$).

The results of this study suggest that a well-designed, theory-based podcast may be an effective way to promote healthy weight loss.

VI.B. Introduction

Latest figures reveal that 66.3% of U.S. adults are overweight or obese (Body Mass Index $>25 \text{ kg/m}^2$) (Ogden et al., 2006). People who are overweight or obese are at a significantly higher risk of developing many chronic diseases, including some forms of cancer, cardiovascular disease, hypertension, and type 2 diabetes (Jee et al., 2005). The main treatments for overweight and obesity include dietary changes, increases in physical activity, and other behavioral modifications (Banning, 2005). Technology-enhanced approaches to weight loss have begun to emerge with the increased development of electronic media. Many researchers are now using the Internet to deliver interventions (Berkel et al., 2005). These interventions, however, often lack portability, restricting where and when interventions can be delivered. Web-based interventions typically also require participants to be literate and capable of effectively processing written information.

Obesity has been consistently on the rise over the past three decades (Hedley et al., 2004). This rise has occurred concomitantly with an increase in “screen time”—which is the use of computers, televisions, and video games—by both children and adults (Gordon-Larsen et al., 2004). Since many adults and children are spending increased amounts of time in front of screens or connected to the Internet (Wiecha et al., 2001), it may be important to use portable media in weight loss interventions so as not to increase screen time further.

An emerging new portable technology is “podcasting,” a term that came into existence in 2004. Podcasts are audio files that may be downloaded and transferred to portable audio players (MP3 players). There are hundreds of health-related podcasts available on the Web, but very little research has been done on the relative impact of this new technology in health behavior research. Podcasting represents a largely untapped conduit for providing public health weight loss information to people with internet access. Examining the role of podcasting in weight loss will advance the field of Public Health Informatics—defined as “the science of applying Information-Age technology to serve the specialized needs of public health” (Friede et al., 1995)—and fill gaps in the current knowledge regarding the efficacy of portable technology to promote weight loss. Previous public health weight loss interventions have generally not been effective (Jeffery, 2001; Schmitz & Jeffery, 2000) and it is imperative that innovative, inexpensive, and far-reaching ways to deliver weight loss interventions are found. The Internet has been shown to be an effective method of delivering a weight loss intervention but it has mainly been tested in older, well-educated, white women (Tate et al., 2003, 2006; Tate et al., 2001). More importantly, many people do not want to participate in face-to-face weight loss interventions as they are seen as time consuming and often inconvenient (Sherwood et al., 1998).

Podcasting Demographics.

Podcasting has seen amazing growth in the past few years. In September 2004, a search on Google for “podcasts” yielded 24 hits (Wikipedia, 2005). Just two years later, a search on Google conducted by our research team yielded 146 million hits. In 2008, Podcast Alley (a podcast directory) had 43,000 podcast shows available for download, up

from 26,000 just two years earlier (Madden, 2008). A 2008 survey conducted by the United Kingdom's RAJAR (Radio Joint Audience Research Limited) found that 6 million people in England have reported downloading a podcast—up from 4.3 million just 12 months earlier. RAJAR also found that 3.7 million users report listening to a podcast each week (up from 1.87 million from the previous year)(RAJAR 2008). Of the 317 podcast users surveyed by RAJAR, only 3.1% reported being currently subscribed to a health-related podcast; the majority reported favoring comedy-related content (RAJAR 2008).

In the United States, podcast use and MP3 ownership has also been on the rise (Madden, 2008). A 2008 Pew Internet and American Life survey examined several traits of podcast listeners and found that the percentage of internet users who have downloaded a podcast increased from 7% in 2006 to 19% in 2008 (Madden, 2008). In the U.S., technology is the most popular category (Madden, 2008). A 2005 Pew survey found that both men and women equally download podcasts (Pew, 2005). This has changed in recent years however, with 22% of men and 16% of women reporting having ever downloaded a podcast in 2008 (Madden, 2008). Of adults 18-29, 27% have reported downloading a podcast, 20% of those aged 30-49 have downloaded a podcast, and 23% of those 50 and older have downloaded one. The 2005 Pew survey on podcasting also found that minorities (African-Americans and Latinos) are more likely to own MP3 players than Whites (16% and 9%, respectively) (Pew, 2005). This demographic pattern differs somewhat compared to other technology use (U.S. Census Bureau, 2000) and has implications for reaching both younger and older adults, men and women, Latinos, and African Americans.

Theoretical framework: Why podcasting may be an effective way to deliver a weight loss intervention.

Constructs from User Control Theory, Cognitive Load Theory, and the Elaboration Likelihood Model suggest that elements of podcasting may be more effective than other media—such as print or Web—in promoting freedom in learning (Eveland & Dunwoody, 2001), decreasing cognitive load (Eveland & Dunwoody, 2001), and increasing elaboration (Eveland & Dunwoody, 2002). User Control Theory states that an increase in freedom of learning adds to the control a user feels and therefore increases learning (Eveland & Dunwoody, 2001) whereas Cognitive Load Theory states that the more cognitive burden a user feels when learning, the less able they will be to retain what they learn (Brunken et al., 2003; Paas et al., 2003). Learning through the Web can increase cognitive load and therefore some theorists have suggested that the increase in freedom to navigate (over print) is negated by an increase in cognitive load (Eveland & Dunwoody, 2001). Podcasting allows for mobility—since podcasts can be listened to anytime and anyplace—without increasing cognitive load, thereby possibly leading to greater learning versus Web. The Elaboration Likelihood Model (ELM) states that there are two routes to cognitive processing: central and peripheral. The more someone is able to process and elaborate on information, the more likely they are to use the central route and adopt long-lasting changes in attitudes and behaviors (Petty & Cacioppo, 1986). Elaboration refers to how much someone processes and thinks about an idea or argument. Research has shown that there is an increase in elaboration, and therefore learning, with Web-based interventions versus print interventions, but there is also an increase in selective scanning. This scanning decreases overall learning as compared to other media

because users tend to skip over important messages (Eveland & Dunwoody, 2002).

Podcasting does not allow selective scanning since it is an audio medium, not written; however, it may allow for selective attention.

While the above characteristics may point to podcasting as an effective way to create health behavior change, we hypothesize that a theory-based podcast will improve upon these attributes. Because there are weight loss podcasts already available for download, we felt it was important to compare a currently available weight loss podcast to a theory-based podcast. Further, using a podcast as the comparison group controlled for unique factors related to the medium presented in the preceding discussion. The hypothesis of this study is that a weight loss podcast designed with health behavior theories will produce a greater weight loss than a currently available podcast not theoretically-based.

VI.C. Methods

Overweight and obese men and women (body mass index, 25–40 kg/m²) were recruited through newspaper advertisements and university e-mail in the Raleigh-Durham metropolitan area. Exclusion criteria included an unstable medical status, history of an eating disorder, pregnancy, alcohol or drug abuse, tobacco use, mental illness, diabetes mellitus, or an uncontrolled thyroid condition. Participants owned their own digital music player (MP3 player) and had access to a body weight scale. The University of North Carolina at Chapel Hill Institutional Review Board approved the study on November 8, 2007, and all the participants gave written informed consent for this study (clinical trial registry # NCT00771095). Participants received a \$20 gift card for completion of all pre- and post-intervention activities.

After a participant was accepted into the study, they were randomly assigned using a random numbers table to receive a currently available weight loss podcast (control podcast) considered to be accurate and popular based on a content analysis ((Turner-McGrievy, Campbell, & Truesdale, 2008)^{:Unpublished observation}) or a theory-based weight loss podcast designed by the researchers (enhanced podcast) in 2008. They were not told the condition to which they were assigned until they arrived at the meeting. Participants received 2 podcasts per week for 12 weeks. The control podcast consisted of discussions on how to lose weight conducted by 2 hosts. This podcast focused on using mental exercises to avoid overeating in order to achieve a healthy weight. Figure 2.1 describes the theoretical framework used to design the enhanced podcast. The enhanced podcast was designed using constructs from Social Cognitive Theory (SCT)(Bandura, 2004) and consisted of an introduction, an audio diary of a man and a woman who were also trying to lose weight, nutrition and exercise information, a continuing soap opera centered around weight loss, and goals to achieve for the week.

Table 6.1 outlines the intervention components and how they target the SCT constructs. The average length of each control podcast episode was 18 minutes and 34 seconds (range 7 minutes and 7 seconds to 31 minutes and 46 seconds) and the average length of each enhanced podcast was 15 minutes, 42 seconds (range 7 minutes and 7 seconds to 23 minutes and 28 seconds).

Participants attended an introductory meeting where they were weighed in light clothing with a digital scale accurate to 0.1 kg, measured for height with shoes off, completed information on baseline demographics, and learned how to download podcasts. Participants also completed questionnaires that assessed knowledge of weight

loss topics (such as how to reduce calorie intake and increase exercise), food intake (PrimeScreen Questionnaire) (Rifas-Shiman et al., 2001), physical activity (short International Physical Activity Questionnaire, IPAQ) (Hagstromer, Oja, & Sjostrom, 2006), and elaboration (the Elaboration Likelihood Model—or ELM—questionnaire slightly modified for this study) (Marks et al., 2006). Participants also answered questions on a 7-point Likert scale which assessed user control (Eveland & Dunwoody, 2001), cognitive load (Brunken et al., 2003), and social cognitive theory constructs (self-efficacy, expectancies, and outcome expectations) (Bandura, 2004). The same questionnaires were completed at the 12-week follow-up meeting, along with additional questionnaires which assessed perceptions of the intervention including ease of use, perceived effectiveness, likeability, place of use, and number of downloads. Weight was also measured at this time.

The PrimeScreen Questionnaire assesses 18 different food groups by asking participants to categorize consumption as occurring less than once per week (scored as 1), once per week (scored as 2), 2-4 times per week (scored as 3), nearly daily or daily (scored as 4), or twice or more per day (scored as 5). Changes in fruit, vegetable, and fatty food intake were assessed by averaging the consumption category reported for servings of all vegetables, all fruits, and all fatty foods listed on the questionnaire. Changes in physical activity were assessed by examining the reported changes on the IPAQ in number of days and total time spent on vigorous, moderate, walking, and sedentary activity. Using a Likert scale, participants were asked pre- and post-intervention to rate their knowledge of 6 weight loss related topics such as dining out, exercise, and calorie restriction (total possible score range of 6 to 42).

The ELM questionnaire (Marks et al., 2006) consisted of 9 questions which assessed how much participants were able to elaborate on the topic information presented in the podcasts. User control was assessed by asking the participants a series of 10 questions which asked the participant how much control they felt over their learning environment. Cognitive load was assessed by asking participants 2 questions about difficulty in processing the information and mental effort needed. Finally, participants were asked 3 questions about their perception of the study, including ease of accessing information, study effectiveness, and enjoyment. These questionnaires used a 7-point Likert scale and the answers were totaled for each category to establish an overall score for elaboration (possible score range 9-63), user control (possible score range 10-70), cognitive load (possible score range 2-14), and intervention perception (possible score range 3-21).

Both groups were given a book with calorie and fat gram amounts of popular foods. An e-mail reminder was sent out when a new podcast was available and participants were told to log on to the study Web site to record how many podcasts they had listened to that week and to describe the topics covered. Participants who failed to record in their weekly online journal were contacted by e-mail and phone and encouraged to listen to the latest podcasts.

Statistical Analyses.

All analyses were conducted in 2008 using intention-to-treat by bringing baseline values forward for participants who did not complete the study. Between-subjects *t* tests were calculated for all measures with the exception of the baseline demographic information, which contained multiple categories (such as education). For these

measures, a linear regression was used to predict follow-up weight controlling on gender and group assignment and education and group assignment. All analyses were conducted using SPSS 16.0 for Windows software with a p value of 0.05 used to indicate statistically significant differences (SPSS for Windows, 16.0.1 2007. Chicago: SPSS Inc.).

VI.D. Results

Of the 120 volunteers who inquired about the study between September 2007 to January 2008, 94 were enrolled in the study, 10 declined participation, and 16 did not meet inclusion criteria. Of the 94 who were accepted into the study, 16 did not show up to the introductory meeting (9 in the control group and 7 in the enhanced group) and randomization was not revealed, thus they are not included in the intent-to-treat analysis. Seven dropped out of the study after the introductory meeting, but completed baseline data (3 in the control group and 4 in the enhanced group). There were no significant differences in baseline characteristics between completers and noncompleters. This left 37 participants in the control group and 41 participants in the enhanced group in the intention-to-treat analysis, of which 34 in the control group and 37 in the enhanced group completed both baseline and follow-up data. See Figure 6.1 for flowchart of screening, recruitment, and completer information.

Table 6.2 outlines baseline demographics. The control and enhanced group did not differ significantly across any of the variables. There were a disproportionately greater number of subjects in the control group without a graduate degree. A linear regression was conducted using baseline weight to predict follow-up weight controlling for gender and group, as well as education and group. There was no effect of education (β

= -0.03, $P = 0.16$) or gender ($\beta = -0.19$, $P = 0.85$). Of those participants who reported having previously downloaded a podcast, only 1 participant (in the enhanced podcast group) reported being currently subscribed to a weight loss-related podcast.

Table 6.3 outlines the results of weight, food group changes, physical activity, and knowledge changes. Participants in the enhanced podcast group had a greater decrease in weight (-2.9 ± 3.5 kg) and BMI (-1.0 ± 1.2 kg/m²) compared to the control group (-0.3 ± 2.1 kg and -0.1 ± 0.7 kg/m²; $P < 0.001$ between groups). The enhanced group also reported greater increases in fruit (reported 0.4 ± 0.7 increase in consumption category) and vegetable (reported 0.2 ± 0.9 increase in consumption category) intake than the control group (change of 0.01 ± 0.4 for fruit and -0.2 ± 0.7 for vegetables; $P < 0.05$ for both categories for between groups). There was no difference between groups with regard to high-fat food intake. There was also no significant difference between groups with regards to reported moderate activity, walking, or sedentary behavior changes. There was, however, a difference in reported vigorous activity, with a greater increase in the number of days participants engaged in vigorous activity seen in the enhanced group (increase of 0.8 ± 0.9 days/week) as compared to the control group (decrease of -0.4 ± 1.4 days/week; $P < 0.01$ between groups). Participants in the enhanced group also saw a greater increase in the weight loss knowledge scores as compared to the control group. There were no significant differences between the groups with regards to changes in the SCT constructs self-efficacy, expectancies, and outcome expectations. The changes within group for the SCT variables were also not significant.

Table 6.4 outlines the results of hypothesized communication mediators and adherence data collected at follow-up. There were significant differences in the enhanced

group as compared to the control group in all of the variables related to the hypothesized communication mediators, including greater elaboration, user control, and satisfaction with the intervention and less cognitive load (where a higher score means greater elaboration, user control, and satisfaction and less cognitive load). In contrast, there were no differences between groups in reported rates of listening to podcasts. Out of the 24 episodes available, participants reported listening to an average of 16.6 ± 7.5 in the control group and 17.5 ± 8.1 episodes in the enhanced group ($P < 0.67$). Participants were asked at 12 weeks about their listening behaviors during the study. The majority of participants reported listening to podcasts at home most often (53.7%), followed by in their office/at work (20.9%), or while walking or exercising (13.4%). Most participants reported being sedentary while listening to the podcasts (either sitting at their desk at 44.8% or sitting at home at 22.4%). Slightly over half of the participants reported listening to the podcasts on their computer (52.2%) versus a portable MP3 player. The majority of participants did not listen to any other weight loss or health-related podcasts during the study (85%). There was no significant difference between groups with regard to these variables.

VI. E. Discussion

An enhanced, theory-based podcast produced greater weight loss than a general weight loss podcast. Participants in the enhanced podcast group reported greater increases in fruit and vegetable intake than control participants, but not fat intake. The enhanced podcast intervention emphasized reducing calories through favoring low-fat foods, fruits, and vegetables and also encouraged participants to increase physical activity—mainly through daily walking. Participants in the enhanced group reported

greater vigorous activity compared to the control group; however, they did not report an increase in walking or moderate activity.

Participants in this study were able to achieve a modest weight loss by listening to a carefully designed, theory-based podcast on weight loss. These results were achieved with minimal face-to-face interaction—participants only attended one meeting at baseline and received all their information on weight loss via the bi-weekly podcast. Whereas the podcast based on SCT proved to be effective in producing a weight loss of 2.9 kg, in this study, the weight loss achieved in the control podcast group was minimal (0.3 kg).

Theory-based weight loss interventions using other technologies have also been shown to be effective. For example, the Web has been used effectively to deliver an SCT-based weight loss intervention (Winett et al., 2005). Concepts from SCT, such as outcome expectations, expectancies, and self-efficacy were all used in the present study to increase weight loss and deliver health information. Though the enhanced podcast was developed using constructs from SCT, when participants in both groups were asked about changes in these constructs, such as self-efficacy, no differences between groups or within groups were seen. These constructs were each assessed with one item and that may not have been sensitive enough to assess differential changes in the groups. In addition, one of the goals of the enhanced podcast was to increase confidence, outcome expectations (what the participant expects will occur when they attempt to lose weight), and expectancies (the value a participant places on weight loss), 12 weeks may not have been enough time to produce significant changes in these constructs.

Since both the enhanced and control podcasts covered various topics, participants were asked more global questions about weight loss knowledge, such as “I know the right

foods to eat in order to lose weight” and “I know how to order healthy foods when dining out.” As hypothesized, participants in the enhanced group had greater increases in reported knowledge on weight loss topics. The enhanced podcast also included a continuing soap opera, which was an entertaining way to provide additional information on healthy eating and exercise

Participants in the enhanced group reported greater elaboration, suggesting that participants used the central route to process the information in the podcasts, which should lead to an enduring behavior change (Cialdini, Petty, & Caccioppo, 1981). Participants also reported greater user control. Although both podcast groups accessed the audio files in similar ways (on portable MP3 players or on their computers), the enhanced group reported feeling more control over the pace and content of instruction, which should allow for better and more effective learning (Eveland & Dunwoody, 2001). The enhanced podcast also produced less cognitive load than the control podcast. Cognitive Load Theory states that the more cognitive burden a user feels when learning, the less able they will be to retain what they learned (Brunken et al., 2003; Paas et al., 2003). The enhanced podcast followed the same format every week and perhaps this allowed the participants to have a sense of structure in their weight loss efforts. The format control podcast varied from each episode. The enhanced podcast group also reported greater satisfaction with the intervention. This greater satisfaction could have been due to the participants in the enhanced group achieving more weight loss, however, research participants who feel more satisfaction with the intervention may achieve better weight loss (Metz et al., 2000). Thus it appears that communication variables, such as

elaboration and user control, may help explain the differential effects of the two podcast interventions.

Despite podcasting having the potential to be a mobile way to deliver an intervention, the majority of participants reported being sedentary—either sitting at home or at work—while listening to the podcasts. This may be due to the fact that over half of all participants regularly listened to the podcasts on a computer instead of a portable media player. This is a similar finding to that of the RAJAR survey, in which participants were asked to list all the devices they used for podcast listening.¹⁷ Desktop computers were the most common device (80%) followed by portable media players (66.1%) (RAJAR 2008). This survey also found similar results to the present study with the majority of respondents reporting listening to podcasts mostly at home (79%) (RAJAR 2008).

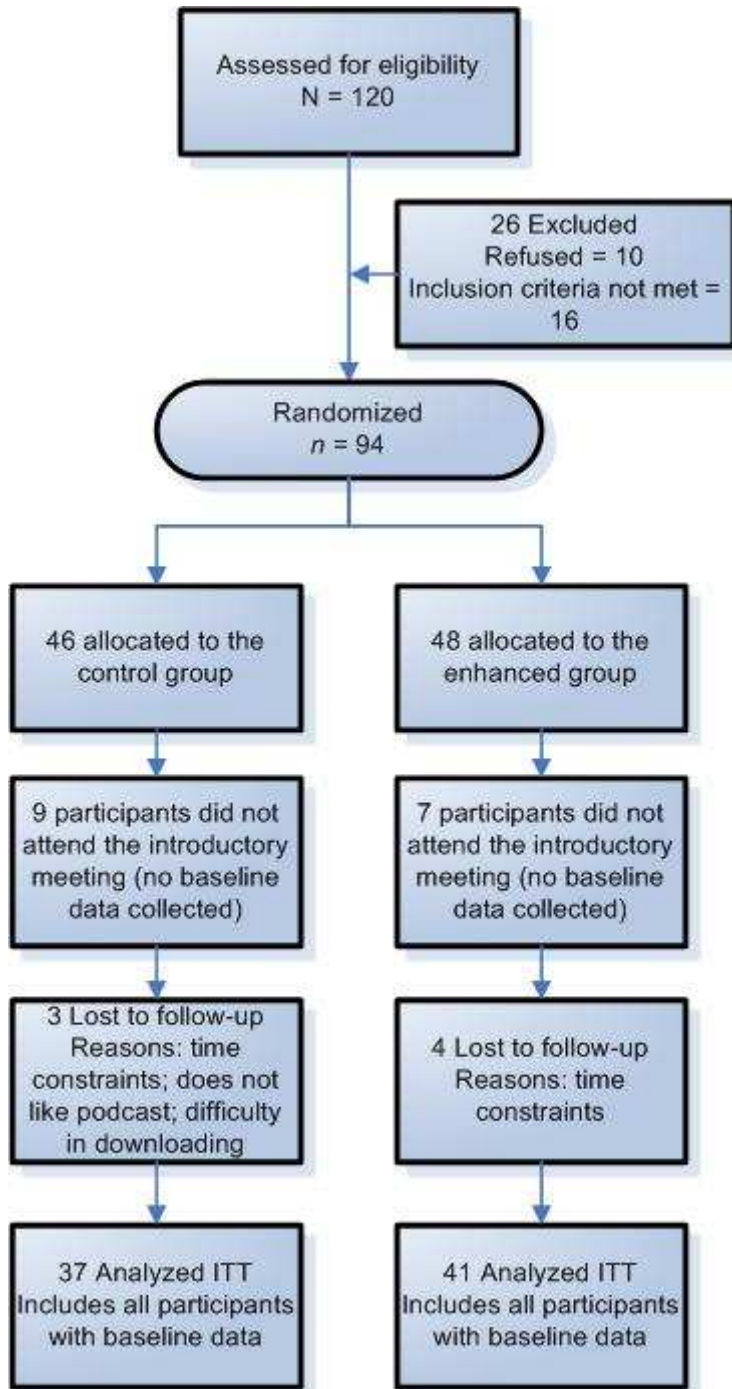
There were several strengths of the present study. These included a randomized design and an intention-to-treat analysis, which allowed for examination of all participants regardless of study compliance or withdrawal. The results are applicable outside the research setting because participants were able to take part in the study with minimal face-to-face intervention, prepared all their own meals, and found their own ways to increase physical activity. The intervention was also very low cost and would be easy to disseminate. There were also several limitations to our study. The participant sample for this study was mostly white and highly educated. Dietary data was measured using a brief questionnaire instead of more detailed methods, such as a 24-hour recall or food record (Friedenreich, Slimani, & Riboli, 1992). Physical activity was also measured using a questionnaire when less subjective methods, such as a pedometer, may have

provided more accurate results (Neilson, Robson, Friedenreich, & Csizmadi, 2008). Also, this was a short-term intervention with modest weight loss, and therefore, it is unknown whether the weight loss seen in this study would be maintained over the long term.

Table 6.1: Intervention components and how each targets the theory constructs

Theory Construct	Intervention Component
Expectancies	The nutrition and exercise information of each Podcast emphasized the importance of achieving a healthy weight to increase the value participants place on weight loss.
Expectations	The Audio Diary (Podcast) allowed for a first-hand experience of weight loss and informed participants about what to expect from trying to lose weight.
Self-efficacy	The end of the Podcast included a goal to achieve. Participants were encouraged to track their weight, calories, and exercise. The aim of goal achievement was to increase confidence.
Behavioral Capability	Knowledge about how to lose weight, exercise, make dietary changes, etc. was presented during the nutrition and exercise information and soap opera sections of the podcast.

Figure 6.1: Participant recruitment and analysis flow diagram



ITT, Intention to Treat

Table 6.2: Baseline demographic data for control and enhanced podcast group participants

	Control Group	Enhanced Group
<i>n</i>	37	41
Age (years) (mean \pm SD)	39.6 (\pm 12.2)	37.7 (\pm 11.8)
Sex [<i>N</i> (%)]		
Male	7 (19)	13 (32)
Female	29 (81)	28 (68)
Race, ethnicity [<i>N</i> (%)]		
Black	6 (17)	5 (13)
White	28 (78)	35 (85)
Other	2 (5)	1 (2)
Hispanic [<i>N</i> (%)]		
Yes	4 (11)	2 (5)
No	32 (89)	39 (95)
Marital status [<i>N</i> (%)]		
Not married	19 (43)	19 (47)
Married	17 (47)	22 (53)
Education [<i>N</i> (%)]		
High school, partial or graduate	11 (31)	8 (20)
College, partial or graduate	18 (50)	15 (37)
Graduate degree	7 (19)	18 (43)

Occupation [<i>N</i> (%)]		
Unemployed	0 (0)	2 (5)
Service occupation	4 (11)	1 (2)
Technical, sales, administrative	11 (31)	8 (20)
Professional, specialty	8 (22)	14 (34)
Executive, managerial	1 (3)	6 (15)
Retired	1 (3)	1(2)
Student	11 (31)	9 (22)
Number of years participant has owned an MP3 player (mean ± SD)	2.0 (± 2.0)	1.8 (± 1.7)
Hours a day spent online (mean ± SD)	4.1 (2.7)	4.7 (± 3.1)
Number of participants who had previously downloaded a podcast [<i>N</i> (%)]	15 (42)	26 (63)
Number of podcasts to which participants are currently subscribed (mean ± SD)	2.8 (± 1.8)	2.5 (± 1.5)

Data are mean (± SD) or *n* (%) unless otherwise indicated.

Table 6.3: Differences between groups with weight, food group intake, physical activity, and knowledge during study period

	Control group (n = 36)	Enhanced group (n = 41)	P-value for Difference Between Groups
Weight (kg)			
Baseline	89.0 ± 13.6	91.9 ± 15.0	
12-weeks	88.7 ± 13.9	89.0 ± 13.6	
Difference	-0.3 ± 2.1	-2.9 ± 3.5	<0.001
BMI (kg/m²)			
Baseline	31.4 ± 4.1	31.8 ± 3.2	
12-weeks	31.3 ± 4.3	30.8 ± 3.4	
Difference	-0.1 ± 0.7	-1.0 ± 1.2	<0.001
Vegetables consumption category ^a			
Baseline	2.4 ± 0.6	2.3 ± 0.7	
12-weeks	2.6 ± 0.7	2.6 ± 0.7	
Difference	0.01 ± 0.4	0.4 ± 0.7	<0.05
Fruit consumption category ^a			
Baseline	2.9 ± 0.8	2.5 ± 1.0	
12-weeks	2.7 ± 0.6	2.7 ± 0.7	
Difference	-0.2 ± 0.7	0.2 ± 0.9	<0.05
Fatty foods consumption category ^a			

Baseline	2.1 ± 0.5	2.1 ± 0.5	
12-weeks	1.9 ± 0.5	1.8 ± 0.5	
Difference	-0.2 ± 0.4	-0.3 ± 0.4	0.14
Vigorous activity (days/week)			
Baseline	1.8 ± 1.8	1.2 ± 1.4	
12-weeks	1.4 ± 1.6	2.1 ± 1.9	
Difference	-0.4 ± 1.4	0.8 ± 0.9	<0.01
Moderate activity (days/week)			
Baseline	1.6 ± 1.9	1.3 ± 1.6	
12-weeks	1.9 ± 2.2	2.2 ± 2.0	
Difference	0.3 ± 2.2	0.9 ± 2.0	0.22
Walking (days/week)			
Baseline	4.3 ± 2.2	3.8 ± 2.5	
12-weeks	4.5 ± 2.3	4.6 ± 2.2	
Difference	0.2 ± 2.2	0.7 ± 2.0	0.29
Sitting (hours spent/day)			
Baseline	9.5 ± 6.1	9.0 ± 3.2	
12-weeks	9.2 ± 6.2	8.2 ± 3.8	
Difference	-0.3 ± 8.7	-0.8 ± 4.8	0.73
Knowledge score ^b			
Baseline	28.1 ± 7.3	31.3 ± 7.1	
12-weeks	30.5 ± 7.8	36.8 ± 4.7	
Difference	2.4 ± 5.2	5.4 ± 6.5	<0.05

All data are mean \pm SD

^a possible score range 1-5

^b possible score range 6-42

CHAPTER VII

SUMMARY AND RECOMMENDATIONS

VII.A. Summary of findings

Taken together, the results of this dissertation suggest that podcasting may be an effective way to reach out to a large number of people who desire achieving a healthy weight. It is unknown, however, if podcasting may be more effective than other technologies, such as the Web, in helping people lose weight. Producing and delivering podcasts is a low-cost option for weight loss information delivery (Boulos et al., 2006) and may appeal to people who prefer a portable media source. The information presented in this dissertation contributes to the understanding of using mobile technologies in the delivery of weight loss interventions in four ways: (1) by providing information about the current content and accuracy of weight loss podcasts, (2) by examining how weight loss podcasts are used by those who subscribe to them and create them, (3) by assessing the psychosocial and physiological differences between people receiving weight loss information via a podcast or Web site, and (4) by comparing a current weight loss podcast to a theoretically-based weight loss podcast among adults trying to lose weight.

In the first aim, found in chapter four, a content analysis was conducted on 13 popular weight loss podcasts. The analysis showed that there is a wide range of content and quality exhibited among weight loss podcasts. Many of the podcasts were used to advertise the host's products or services and most of the podcasts were not providing accurate information. Weight loss podcast listeners, however, reported a high degree of

enjoyment for these podcasts. The majority (91%) of listeners reported making at least one healthy change as a result of listening to podcasts and cited getting healthy tips and staying motivated as the main reasons why they find podcasts useful. No previous research has assessed the content and accuracy of weight loss podcasts or surveyed weight loss podcast hosts and listeners. These findings suggest that podcasting may be an appealing way to reach people, but that the content of currently available podcasts is not ideal.

In the second aim, found in chapter five, we examined the use of two different electronic media to deliver health-related content. A weight loss podcast based on SCT was compared to a Web site with similar content. We measured several psychosocial variables and the physiological variable of SCL and found very little differences between groups. The Web group did report greater user control and the podcasting group felt the intervention was more novel. The results of this aim suggest that both forms of media may be similar in their ability to affect potential mediators of health behavior change.

In the third aim, found in chapter six, we designed an enhanced, theory-based weight loss podcast and compared that to an existing weight loss podcast. Participants were randomly assigned to one of the podcasts and received 24 episodes over the course of 12 weeks. We assessed several variables including weight and BMI, weight loss-related knowledge, SCT variables, elaboration, and constructs from communication theories such as user control and cognitive load. Participants in the enhanced podcast group had a significant decrease in weight and BMI as compared to the control podcast. The enhanced group also reported greater elaboration and user control and less cognitive load. These participants also reported liking the intervention more than the control

podcast group. These results suggest that podcasting can be a valuable way to deliver a weight loss intervention, but that the podcasts must be based on theory in order to be effective. Of particular note from aim three is that the intervention in this study was fairly minimal. Although that corresponded with a rather minimal weight loss of a half pound per week, it is noteworthy none-the-less since the length of in-person exposure (around 2 hours) during the study and the exposure via podcast (about 25.5 minutes per week) was also minimal.

VII.B. Theoretical implications

The podcasts in both Aims 2 and 3 were designed using theoretical constructs from SCT, User/Information Control Theory, ELM, and Cognitive Load Theory. In Aim 2, we saw no differences between the groups on most of the theoretical constructs with the exception of the Web group feeling more user control. Since both media used in this study had identical content, this is not completely surprising. Both media used the same ways of communicating information (diary, goal setting, etc.) to target SCT constructs and increase elaboration and we saw no differences between the groups on these outcomes. In Aim 3, however, the control podcast did not specifically target any of the theoretical constructs used in the design of the enhanced podcast. Although we saw differences between the groups on user/information control, cognitive load, and elaboration, we saw no differences between the groups with regards to SCT constructs.

Because several theories were used in the design of the enhanced podcast, it is not possible (with our current analysis) to determine if the use of behavioral theories in the podcast design allowed for enhanced participants to lose more weight. It is possible there was some other aspect of the enhanced podcast—the audio blog, the use of both male and

female voices, greater interactivity—that led to the difference in weight loss. Regardless of whether or not using theory to design podcasts led to the changes seen in Aim 3, we think that constructing podcasts using theory allowed for the enhanced podcast to be well-organized and required us to think about different ways to target different theory components. This, in turn, led to the enhanced podcast providing varied and, hopefully, engaging content.

VII.C. Recommendations

Aim 1.

Weight loss and fitness are growing podcast categories, but very few podcasts are produced by people who are qualified to provide health information. The findings from Aim 1 suggest that podcasting is a popular way to access health information, but few weight loss podcasts are providing accurate information. Public Health practitioners may wish to ask their patients or clients about their use of podcasts and help them assess which podcasts are best suited for them. Podcasting may also provide a way for Registered Dietitians (RDs) or other health professionals to market themselves and their knowledge to potential clients or to keep current clients engaged between appointments. For example, RDs working in a clinical setting could ask their facility to provide health-related podcasts on the facility's Web site. These podcasts could be used to encourage new clients for out-patient counseling or be an educational tool for existing patients to use once they're discharged.

Podcasts may allow RDs to provide a more personal way to keep in contact with patients between appointments, or allow clients to have access to information that can continue to motivate them after the counseling sessions are over. Patients who hear an

RD's voice, versus reading an e-mail or Web site content, may feel that the dietetic professional is still speaking to them and encouraging them to maintain healthy changes. Although learning a new technology can be intimidating, providing podcasts to patients or clients can be easy to do. Hosting sites are free or charge a low monthly fee and audio recording software can be downloaded for free. The Web site Podcast 411 (<http://www.podcast411.com/>), which has podcasting tutorials and lists of audio software, is a good place to start for someone interested in podcasting.

Aim 2.

There are several explanations for why we found very few differences between groups on SCL and psychosocial variables that lead us to make recommendations in our Aim 2 study. Participants were required to remain still during the study in order to get an accurate SCL measurement. This limited the participants' ability to listen to the audio files in a way that may have optimized the portable quality of podcasting. Participants in both groups may not have been interested in the topic presented. On average, only 25% of participants reported currently trying to lose weight. Those participants not interested in weight loss may not have attended to the information presented in the podcast or Web site. Participants in this study were mostly college-aged, White females and the results found in this study may not be representative of other populations. We recommend that researchers conducting a similar study recruit participants interested in losing weight and try to make the podcasting condition as close as possible to typical podcasts (portable and played on a media player familiar to the participant). Even though our second aim found few differences between delivering information on weight loss using a Web site or podcast, given that designing a podcast may be less expensive than designing a Web site,

this result has implications for finding budget-conscious ways to deliver health information. Although the two media sources were relatively equal on the items measured, it is not clear if the results would have differed if participants were able to use portable media players or if the Web site contained more interactive features, such as discussion boards and video. This study was a limited presentation of a podcast and Web site.

Aim 3.

Our third aim found that a theory-based podcast produced modest, but significantly better, weight losses than a popular podcast. Although differences in weight were achieved, SCT variables did not show differences. This could be due to the limitations of the measure or perhaps the podcasts worked via a different mechanism, such as differences in the communications variables measured (user control, cognitive load, and elaboration). We recommend researchers measuring SCT constructs use more in-depth measures to assess these changes. This lack of changes in SCT variables could also be the result of SCT constructs not mediating behavior changes or weight loss outcomes. Participants in this study were mostly White females. Future studies should strive to recruit a more diverse sample. This may be achieved by providing participants with MP3 players instead of requiring participants to own their own devices. With MP3 ownership being high among young adults and adolescents, future research may also wish to explore weight loss outcomes in this population.

Future weight loss intervention studies should also find ways to encourage participants to be more mobile while listening to the podcasts—such as requiring participants to listen to the podcasts on portable players during exercise—in order to

increase physical activity. Podcast episodes could contain a portion that describes how to exercise (e.g. pumping arms while walking, doing sit-ups, etc.) and encourages the participant to exercise while listening to the podcast.

The results of this study suggest that presenting weight loss information alone via podcast may not be enough to produce behavior changes. Podcasts should also find ways to target important communication variables, such as user control and elaboration, in order for behavior change to occur. The design of weight loss podcasts can be improved upon by being carefully designed, engaging, and well-organized.

VII.D. Future directions and research needs

This dissertation project suggests several possible areas of future research:

- 1) Podcasts have continued to grow in popularity since this content analysis and survey was conducted for Aim 1. It is not known if the accuracy of weight loss podcasts has improved since the initial survey was conducted. Future research should be conducted to assess the accuracy of current weight loss podcasts. Any future content analyses conducted should include more than two reviewers in order to get a broader interpretation of the podcast accuracy. More in-depth qualitative research should be conducted on how weight loss podcasts are used by listeners and how they are created and disseminated by hosts. This could include focus groups with podcast listeners and in-depth interviews with podcast hosts.
- 2) In order to increase user control and ease of navigation, future media effects studies should allow users to become familiar with how to navigate through a podcast prior to the start of the intervention. Future research may also want to examine other media features, such as the addition of video content to a podcast, and compare that to a

basic podcast and/or a Web site with more interactive content (including video). More research should also be conducted among overweight individuals interested in achieving a healthy weight, participants who are interested in the topics presented, and among different age groups and ethnicities. Exploring how podcast listeners and Web users utilize these media in their natural settings (while mobile, at home, etc.) and using these settings in future studies may provide a more accurate view of how these media differ with regards to arousal, user control, novelty, and other variables. Recruiting participants who are both regular Web and podcast users may also provide an enhanced assessment of these media. This would allow participants to be equally familiar with how to navigate through a podcast or Web site.

- 3) Future media studies on the use of podcasting for weight loss could examine source credibility—examining whether the person(s) delivering the information on the podcasts is viewed as credible. Studies could also examine altering the levels of user control. For example, participants could be randomized to one of three podcasts—each with similar content but with increasing levels of user control. Similar studies could also be conducted on varying the levels of elaboration and cognitive load. These types of studies would help to assess if aspects of these theories were why we saw changes between the groups in Aim 3.
- 4) Technology continues to advance at a rapid pace. Over the course of this study, Apple’s portable Web devices, the iPhones and iTouch, saw enormous growth. The iPhone is currently available in 81 countries and 37 million iPhones and iTouches have been purchased since they were released on the market (Heisler). This has led to an increase in the availability of video podcasts. During our content analysis in 2007,

there was only one podcast that was video-based on iTunes in the weight loss category. Just two years later, there are 27 weight loss video podcasts available on iTunes. Adding video and other interactive features to a podcasting intervention was not feasible two years ago; however, it would be now. Future studies could use iPhones or iTouches to deliver audio, video, and interactive Internet-based support via e-mail or online discussion boards.

- 5) Over the course of this study, social networking sites, such as Facebook and Twitter, have seen considerable growth. These sites are currently the fourth most popular Web activity (Bausch). We theorize that one of the reasons that podcasts may be so popular is that it allows subscribers to have a feeling of personal connection (by regularly listening to someone's voice and receiving updates) to the podcast host. Social networking sites may also allow for feeling connected to others as well as being able to share experiences. Future studies using podcasting may also wish to have participants join a social networking site so participants may receive support and encouragement from other study members and study coordinators in between podcast episodes. This would allow for more frequent participant contact, possibly increasing the sense of participation in the study and increasing the amount of weight lost.
- 6) Although there were greater feelings of elaboration, user control, and less cognitive load in the podcast enhanced group as compared to the control group, it is not known if these factors, or some other factors, were the reasons why there were differences in weight loss between the groups. A mediation analysis would be the next logical step. Potential mediators, such as the communication and SCT variables were collected in this study but it is not known if any one or a combination of several had an effect on

the outcome of weight loss. A mediation analysis could help tease out what factors were mediators of the behavior changes.

- 7) Long-term studies should also be carried out to see if podcasting weight loss information can produce long-lasting effects and if these results can be replicated in other populations. While there were mostly males who responded to the Aim 1 weight loss podcast listener survey, mostly females responded to recruitment advertisements for the Aim 3 weight loss intervention. This study, however, had more male participants (35%) than many other Internet-based weight loss interventions (12 – 18%) (Harvey-Berino, Pintauro, Buzzell, & Gold, 2004; Tate et al., 2003, 2006). Since 59% of weight loss podcast listeners in our survey were male, recruiting a greater number of males for future studies may more accurately reflect who is subscribing to and using weight loss podcasts.

In summary, this research has provided insight into the use of podcasting weight loss information among men and women. This research sets the stage for the continuation of this work in several other arenas, such as the use of other portable media and more interactive forms of the Web and podcasting. While this research has provided a glimpse into how podcasting health information can be useful to adults wishing to lose weight, more research is needed. Recruiting more diverse populations for podcasting research, using better measures for potential mediators, extending the intervention and providing a follow-up period, and utilizing podcasting and Web in their optimal forms will create more accurate and disseminable results.

APPENDIX A

PODCAST HOST SURVEY

Thank you for taking the time to answer this brief survey. Please answer the following questions about your podcast.

1. What is the name of your podcast?
2. What is the web address for your podcast?
3. How long have you been hosting this podcast?
 - A. < 6 months
 - B. 6 months – <1 year
 - C. 1 – 2 years
 - D. > 2 years
4. How many podcast listeners do you have on average per episode?
(Enter a number or select “I don’t know”)
5. Please enter any other information you know about your listeners:
Average age:
Predominantly a male or female listenership: M/F
Other:
6. How often do you post a new podcast episode?
 - A. Daily
 - B. > 1 day per week but < 7 days per week
 - C. Weekly
 - D. > Weekly but < Monthly
 - E. Monthly
 - F. A few times per year
 - G. Never
 - H. Other: _____
7. What is the main topic you cover on your podcast?
 - A. Healthy Eating
 - B. Exercise
 - C. Weight Loss/Dieting
 - D. Improving general health
 - E. Treating a specific disease or illness
 - F. Other:
 - G. None of the above
8. Which topics have you covered on your podcasts? (Select all that apply)
 - A. Healthy eating tips

- B. Reducing calorie intake
- C. Eating out tips
- D. Cardiovascular exercise (running, elliptical trainer) information
- E. Weight lifting tips
- F. Importance of self-monitoring (i.e. encouraging listeners to keep a food diary or weight log)
- G. Ideal weekly weight loss goals
- H. Working with your doctor or other health professional
- I. Dealing with family and friends
- J. Getting group support
- K. Other:
- L. None of the above

9. Are listeners able to post comments about your podcasts or send you feedback?

- A. Yes (go to #10)
- B. No (go to #12)

10. Describe some of the feedback you have received. Has it been mainly positive or negative?

Open ended: _____

11. Have any of your listeners said that they changed their health behaviors (such as improving their diet, exercising more, losing weight, etc.) as a result of your podcast?

- A. Yes
- B. No

12. Where can listeners access your podcast? Check all that apply.

- A. iTunes
- B. Podcast Pickle
- C. Libsyn
- D. My own domain or server
- E. iPodder
- F. Other: _____

13. Describe your experience with podcasting. Would there be anything you would do differently or plan to change in the future?

Open ended: _____

14. What is your age?

15. What is your gender?

- A. Male
- B. Female

16. Which best describes your ethnicity?

- A. Caucasian/White
- B. African American/Black
- C. Asian/Pacific Islander
- D. Hispanic/Latino
- E. Native American
- F. Other: _____

APPENDIX B

PODCAST LISTENER SURVEY

Thank you for taking the time to answer this brief survey. Please answer the following questions about the health-related podcasts you listen to.

1. Which of the following podcasts have you listened to before? (Select all that apply)
(List all podcasts that were included in the podcaster survey)

Other: _____

2. How often, on average, do you listen to the podcasts listed above?

- A. Daily
- B. > 1 day per week but < 7 days per week
- C. Weekly
- D. > Weekly but < Monthly
- E. Monthly
- F. A few times per year
- G. Never
- H. Other: _____

3. Thinking of the health-related podcasts you listen to the most, how do you access the podcast?

- A. I subscribe to the podcast (for example, using iTunes). The podcast is automatically downloaded to my MP3 player each time I plug it in.
- B. I listen to the podcast directly on a Web site.
- C. I listen to the podcast directly on iTunes.
- D. I save the audio file and upload it to my MP3 player.
- E. Other: _____
- F. I don't know.
- G. None of the above

4. What device do you use the most to listen to your podcasts?

- A. iPod
- B. Other MP3 player
- C. Directly on computer
- D. Other: _____

5. Where do you listen to your podcasts? (Select all that apply.)

- A. Home
- B. Work
- C. While exercising
- D. In the car
- E. Commuting to work
- F. During travel
- G. Library
- H. Other: _____

6. Where do you listen to podcasts the most? (Select one.)

- A. Home
- B. Work
- C. While exercising
- D. In the car
- E. Commuting to work
- F. During travel
- G. Library
- H. Other: _____

7. What type of connection do you use to download your podcasts?

- A. DSL
- B. Cable
- C. T1 line
- D. Dial-up
- E. I don't know

8. What software do you use to access podcasts? (Select all that apply.)

- A. iTunes
- B. Podcast Pickle
- C. Libsyn
- D. iPodder
- E. Other: _____
- F. I don't know

9. What do you find most useful about listening to health-related podcasts? (Select all that apply.)

- A. Helps to hear someone going through the same thing as I am.
- B. I get good healthy tips.
- C. Keeps me motivated.
- D. Makes me feel less alone.
- E. Other: _____

10. Have you made any of the following healthy changes as a result of listening to podcasts? (Select all that apply.)

- A. Lost weight
- B. Increased exercise
- C. Made healthy changes to my diet
- D. Other: _____

11. Describe your experience with listening to podcasts. Are there any things you would like to see changed or improved to make your listening experience better?

Open ended: _____

14. What is your age?

15. What is your gender?

- A. Male
- B. Female

16. Which best describes your ethnicity?

- A. Caucasian/White
- B. African American/Black
- C. Asian/Pacific Islander
- D. Hispanic/Latino
- E. Native American
- F. Other: _____

APPENDIX C
MEDIA EFFECTS STUDY SURVEY
Questionnaire for Healthy Weight

1. Your gender: Male Female
2. Your age: _____ years
3. Your height (in inches): _____
4. Your weight (in pounds): _____
5. Are you Hispanic or Latino: Yes No
6. Ethnicity (circle one):
 - a. American Indian or Alaska Native
 - b. Asian
 - c. Black or African American
 - d. Native Hawaiian or Other Pacific Islander
 - e. White
7. Year in School (circle one):
 - a. 1st year
 - b. 2nd year
 - c. 3rd year
 - d. 4th year or higher
 - e. Masters student
 - f. Doctoral student
 - g. Law student
 - h. Professional school (dentistry, medicine, etc.)
8. Your major: _____
9. Highest educational level attained (**Note:** If you are currently an undergraduate student, please state so) : _____
10. Marital Status (circle one):
 - a. Single
 - b. Married
 - c. Domestic partnership
 - d. Divorced or Separated
 - e. Widowed
11. Do you own an MP3 player (circle one)? Yes No
12. Have you ever downloaded a podcast (circle one):

- a. Yes
- b. No
- c. I don't know
- d. I've never heard of a podcast

13. On average, how many hours a day do you spend **browsing** the **World Wide Web (WWW)**?

_____ Hours

14. How often do you use the Web for health-related information? _____ Hours/day

15. Where do you get the majority of your health information from? (please specify)

16. Are you actively trying to lose weight now?

Yes No

17. Have you tried to lose weight in the past?

Yes No

Please answer the following questions about Healthy Weight.

1. In this section, please provide an overall evaluation of Healthy Weight using the scales below. On a 1 – 9 scale, where “1” means the term describes *very poorly*, and “9” means the term describes *very well*, please circle the number that indicates how well each term describes Healthy Weight you just listened to.

	Very Poorly									Very Well								
Appealing	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
Useful	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
Positive	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
Good	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
Favorable	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
Attractive	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
Exciting	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
Pleasant	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
Likeable	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
High Quality	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

Interesting	1	2	3	4	5	6	7	8	9
Sophisticated	1	2	3	4	5	6	7	8	9

2. Please rate your level of agreement with the following statements on a scale from 1 to 9, where “1” means you strongly *disagree* and “9” means you strongly *agree*. Please read each statement carefully, then circle the number that best expresses your feeling about Healthy Weight.

	Strongly disagree			Neither agree or disagree			Strongly agree		
I was familiar with the information featured on Healthy Weight.	1	2	3	4	5	6	7	8	9
I've heard of Healthy Weight before.	1	2	3	4	5	6	7	8	9
I paid a great deal of attention when going through Healthy Weight.	1	2	3	4	5	6	7	8	9
The information featured on Healthy Weight was relevant to me.	1	2	3	4	5	6	7	8	9
It is a good idea to be able to access all health-related information from a single online source.	1	2	3	4	5	6	7	8	9
I would like to have electronic access to health-related information.	1	2	3	4	5	6	7	8	9
I would like to visit Healthy Weight again in the future.	1	2	3	4	5	6	7	8	9
I would be willing to pay a small fee for access to health information provided by Healthy Weight.	1	2	3	4	5	6	7	8	9
I was overwhelmed by the amount of information featured on Healthy Weight.	1	2	3	4	5	6	7	8	9
I feel comfortable using Healthy Weight.	1	2	3	4	5	6	7	8	9
I feel using Healthy Weight is a good way for me to spend my time.	1	2	3	4	5	6	7	8	9
I think Healthy Weight is easy to use.	1	2	3	4	5	6	7	8	9
I think Healthy Weight works well.	1	2	3	4	5	6	7	8	9
I found myself responding strongly to Healthy Weight.	1	2	3	4	5	6	7	8	9
I got involved with the information and content on Healthy Weight.	1	2	3	4	5	6	7	8	9
I got emotionally involved in this Healthy Weight.	1	2	3	4	5	6	7	8	9

I experienced emotion while going through Healthy Weight.	1	2	3	4	5	6	7	8	9
I found the information presented on Healthy Weight to be credible.	1	2	3	4	5	6	7	8	9
I would trust information on Healthy Weight.	1	2	3	4	5	6	7	8	9
The information on Healthy Weight was of high quality.	1	2	3	4	5	6	7	8	9
I found the information presented on Healthy Weight to be accurate.	1	2	3	4	5	6	7	8	9
I found the information presented on Healthy Weight reliable.	1	2	3	4	5	6	7	8	9
I found the information presented on Healthy Weight believable.	1	2	3	4	5	6	7	8	9
The content of Healthy Weight made it interactive.	1	2	3	4	5	6	7	8	9
The way Healthy Weight was designed made it interactive.	1	2	3	4	5	6	7	8	9
Healthy Weight effectively enabled two-way communication.	1	2	3	4	5	6	7	8	9
I had a good sense of control over the information while going through Healthy Weight.	1	2	3	4	5	6	7	8	9
It was easy to find my way through Healthy Weight.	1	2	3	4	5	6	7	8	9
It was difficult to locate information in Healthy Weight.	1	2	3	4	5	6	7	8	9
The information featured on Healthy Weight was unmanageable.	1	2	3	4	5	6	7	8	9
The information featured on Healthy Weight was clear.	1	2	3	4	5	6	7	8	9
It was clear how all the information featured on Healthy Weight was organized.	1	2	3	4	5	6	7	8	9
I had difficulty understanding how the information on Healthy Weight was structured coherently.	1	2	3	4	5	6	7	8	9
Sometimes, I felt “lost” when going through the information on Healthy Weight.	1	2	3	4	5	6	7	8	9
I use the Web regularly to access health information.	1	2	3	4	5	6	7	8	9

I am concerned about my health.	1	2	3	4	5	6	7	8	9
I am concerned about the quality of health-related information that I receive.	1	2	3	4	5	6	7	8	9
I am concerned about privacy issues if personal health records are available online.	1	2	3	4	5	6	7	8	9

3. In this section, please rate your level of agreement with the following statements on a scale from 1 to 9, where “1” means you strongly *disagree* and “9” means you strongly *agree*. Note that some of the statements are inverted (meaning their scale is reversed, compared to the other questions). So please read each statement carefully, then circle the number that best expresses your feeling.

	Strongly disagree				Neither agree or disagree				Strongly agree	
a. I would prefer complex to simple problems.	1	2	3	4	5	6	7	8	9	
b. I like to have the responsibility of handling a situation that requires a lot of thinking.	1	2	3	4	5	6	7	8	9	
c. Thinking is not my idea of fun.	1	2	3	4	5	6	7	8	9	
d. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.	1	2	3	4	5	6	7	8	9	
e. I try to anticipate and avoid situations where there is likely chance I will have to think in depth about something.	1	2	3	4	5	6	7	8	9	
f. I find satisfaction in deliberating hard and for long hours.	1	2	3	4	5	6	7	8	9	
g. I only think as hard as I have to.	1	2	3	4	5	6	7	8	9	
h. I prefer to think about small, daily projects to long-term ones.	1	2	3	4	5	6	7	8	9	
i. I like tasks that require little thought once I've learned them.	1	2	3	4	5	6	7	8	9	
j. The idea of relying on thought to make my way to the top appeals to me.	1	2	3	4	5	6	7	8	9	
k. I really enjoy a task that involves coming up with new solutions to problems.	1	2	3	4	5	6	7	8	9	

l. Learning new ways to think doesn't excite me very much.	1	2	3	4	5	6	7	8	9
m. I prefer my life to be filled with puzzles that I must solve.	1	2	3	4	5	6	7	8	9
n. The notion of thinking abstractly is appealing to me.	1	2	3	4	5	6	7	8	9
o. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.	1	2	3	4	5	6	7	8	9
p. I feel relief rather than satisfaction after completing a task that required a lot of mental effort.	1	2	3	4	5	6	7	8	9
q. It's enough for me that something gets the job done; I don't care how or why it works.	1	2	3	4	5	6	7	8	9
r. I usually end up deliberating about issues even when they do not affect me personally.	1	2	3	4	5	6	7	8	9

4. Please rate your level of agreement with the following statements on a scale from 1 to 9 where “1” means *strongly disagree* and “9” means *strongly agree*. Please read each statement carefully, then circle the number that best expresses your feeling about Healthy Weight.

	Strongly disagree			Neither agree or disagree			Strongly agree		
1. I felt that I had a lot of control while going through Healthy Weight.	1	2	3	4	5	6	7	8	9
2. While I was going through Healthy Weight, I could freely choose what information I wanted to receive.	1	2	3	4	5	6	7	8	9
3. While going through Healthy Weight, I had absolutely no control over what I could do.	1	2	3	4	5	6	7	8	9
4. Healthy Weight was easy to navigate.	1	2	3	4	5	6	7	8	9
5. It was difficult to go back to a section on Healthy Weight once I had already visited it.	1	2	3	4	5	6	7	8	9
6. I could visit different sections in whatever order I chose.	1	2	3	4	5	6	7	8	9
7. I found Healthy Weight to be very new and innovative.	1	2	3	4	5	6	7	8	9
8. I found Healthy Weight to be very unusual and something I haven't done before.	1	2	3	4	5	6	7	8	9
9. I felt like I was able to learn at a good pace while using Healthy Weight.	1	2	3	4	5	6	7	8	9
10. I feel confident in my ability to achieve and/or maintain a healthy weight.	1	2	3	4	5	6	7	8	9
11. I value being able to achieve and/or maintain a healthy weight.	1	2	3	4	5	6	7	8	9
12. I think that when I try to maintain and/or achieve a healthy weight in the future, I will be successful.	1	2	3	4	5	6	7	8	9

The next few questions are about the content of Healthy Weight.

1. There were four different sections covered in Healthy Weight. List what they were:

(4 boxes)

Answers:

Welcome
Audio diary of someone who is trying to lose weight (discusses his or her successes, failures, and personal tips)
Nutrition and Exercise Information
Goal for the week

2. What percentage of fat from calories does Ben aim for each day?

(Answer 20%)

3. How many calories should you subtract from your actual calorie needs each day to lose 1 pound per week?

250

300

425

500 (answer)

4. Switching from regular ranch dressing to a fat-free ranch dressing can save you how many grams of fat per serving?

(Answer 15g)

5. How many calories does a regular 12 ounce soda contain?

75

150 (answer)

225

350

6. Most experts recommend getting at least ____ minutes of physical activity on most days of the week

(Answer 30 minutes)

7. True or False: You don't have to do all your exercise at once. You can split it up into smaller intervals.

(Answer True)

8. Which of the following were the 2 goals you were given?

Increase fiber and buy a digital scale

Exercise at least 30 minutes a day and stay below 1500 calories a day

Monitor your calorie intake and track your exercise (Answer)

Reward yourself when you make progress and weigh yourself each day

9. How many calories a day does Ben need in order to lose 1 pound per week?

(Answer 2300)

10. Women should aim for about _____ to _____ calories per day to lose weight, depending on their current weight.

1000 to 1300

1500 to 2000 (answer)

2200 to 2500

2600 to 3000

6. We are interested in everything that went through your mind as you visited Healthy Weight.

For approximately three minutes, please list these thoughts (**positive** thoughts, **negative** thoughts, and **neutral** thoughts) regarding Healthy Weight. You may use single words or full sentences. Ignore spelling, grammar and punctuation.

We have deliberately included more space than we think people will need to ensure that everyone would have plenty of room.

Please be completely honest. Your responses will be anonymous.

Below contains the form we have prepared for you to record your thoughts and ideas. Simply write down the first thought you had in the first box, the second thought in the second box, etc.

Please put only one idea or thought in a box.

Please continue to the next page.

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.
11.	12.
13.	14.
15.	16.
17.	18.
19.	20.

	Not at all								Extremely
How confident are you in your thoughts?	1	2	3	4	5	6	7	8	9
How certain are you of your thoughts?	1	2	3	4	5	6	7	8	9
How valid is your answer?	1	2	3	4	5	6	7	8	9
How convinced are you of your thoughts?	1	2	3	4	5	6	7	8	9

APPENDIX D

SCREEN SHOTS OF HEALTHY WEIGHT WEB SITE



The screenshot shows the top of the 'healthyweight' website. On the left is a scale with feet on it. The logo 'healthyweight' is in green and red. A navigation menu on the left lists: > Introduction, > Ben's weight loss blog, > Nutrition information for weight loss, > Exercise information for weight loss, and > Setting healthy goals for the week. The main content area has a heading 'Introduction' and a welcome message from Jennifer Snow, a registered dietitian. To the right is a photo of two women in a kitchen setting.

healthyweight

- > Introduction
- > Ben's weight loss blog
- > Nutrition information for weight loss
- > Exercise information for weight loss
- > Setting healthy goals for the week

Introduction

Welcome to the Healthy Weight Web site. I'm Jennifer Snow and I'm a registered dietitian who has worked with many people who want to lose weight. I know how difficult it can be to achieve and maintain a healthy weight and so that's why we have this Web site for you. This Web site will tell you about healthy ways to make sure you maintain a healthy weight or lose weight, if that's your goal. We'll also have a blog on this site of someone who has just started the weight loss journey. In his blog, you'll get to read a first hand account of someone who is doing their best to shed unwanted pounds. There's also information on healthy eating and exercise-based on the current research that is out there on weight loss. And finally, there's a section on goal setting. It's important when you're trying to eat a healthy diet and exercise that you set goals for yourself. They don't have to be huge but little steps each week can make a huge difference in the long-term.

Feel free to explore the site and learn about achieving and maintaining a healthy weight. I hope this Web site is helpful. Good luck with staying healthy and achieving or maintaining a healthy weight.



The screenshot shows the 'Ben's weight loss blog' page on the 'healthyweight' website. The layout is similar to the introduction page, but the main heading is 'Ben's weight loss blog'. The navigation menu is the same. The blog text is from Ben, a regular guy trying to lose weight. To the right is a photo of a woman sitting at a desk with a laptop.

healthyweight

- > Introduction
- > Ben's weight loss blog
- > Nutrition information for weight loss
- > Exercise information for weight loss
- > Setting healthy goals for the week

Ben's weight loss blog

Hi everyone. Welcome to my blog. My name is Ben and I'm just a regular guy trying to lose weight. I wasn't always overweight. In fact, in high school, I was pretty trim. But then the weight started to pile on. You know, weight comes on really slowly sometimes. I didn't even notice it. It wasn't until I was looking at some vacation pictures and I said "Who's that guy?" I had no idea it was me. I think, in my head, I was still this skinny guy. That picture was a real wake-up call. I knew I had to get into shape. I don't think I'll ever be skinny but I do need to get to a healthier weight. I can tell that the weight is making me age faster than it should. My knees hurt and I get out of breath just climbing the stairs. Embarrassing I know. I'm too young to be feeling this way already.

So it's always hard to know when to begin a diet. I kept thinking, "I'll start tomorrow." I finally set a date and went for it. Trust me, I wasn't looking forward to watching what I eat. I'm a busy guy. Thinking about everything I put in my mouth takes time and energy. I'm not someone who really wanted to count calories or think about what I was going to have for my next meal. But, you have to pay attention to what you eat in order to make this work. That has meant some preparing on my part. When I'm on the go, I used to just stop at a McDonald's if I got hungry. No time for breakfast? No problem, there was a Bojangles on my way to work. So you're starting to see how I got where I am today, huh? So now I keep healthy snacks with me, like fruit, to snack on when I'm out and about. And I make time for breakfast. It doesn't have to take long but a quick bowl of cereal or oatmeal helps me drive right past the fast food drive-thrus.

I've even started to exercise. Nothing crazy, there are no marathons in my future. But I do some walking. I've even done a little jogging. It's only for a few minutes but it gets my heart rate up. I'm thinking about joining a gym too and working with a personal





healthyweight

- > Introduction
- > Ben's weight loss blog
- > Nutrition information for weight loss
- > Exercise information for weight loss
- > Setting healthy goals for the week

Nutrition information

This section will talk about decreasing your calorie intake. Despite all you've probably heard about different diets, research has shown that it all comes down to how many calories you consume each day that makes the most difference in weight loss. So for now, forget what you've heard about high-protein diets, liquid diets, or other fad diets. What I want to talk to you about is how to estimate your calorie needs for healthy weight maintenance and what your needs should be for weight loss.



Calculating calorie needs

There are a lot of formulas online for calculating energy needs. But I'll give you some of the basics for height and weight. Below you'll find a table with some different calorie needs if you're a female and relatively sedentary for different weights.

Female: Current weight (pounds)	Calorie needs to maintain weight
130	1,970
150	2,070
175	2,200
200	2,300

The above values are if you want to maintain your weight. If you want to lose weight, just subtract 500 calories from your recommended needs. So if you're 130 and want to lose weight, then subtract 500 calories from 1,970 to get 1,470 calories per day and at 200 pounds, to lose a pound per week, you'd subtract 500 calories from 2300 calories to get 1800 calories per day. Of course, your needs may be different depending on your exercise level but in general, women will aim for about 1500 to 2000



healthyweight

- > Introduction
- > Ben's weight loss blog
- > Nutrition information for weight loss
- > Exercise information for weight loss
- > Setting healthy goals for the week

Exercise information for weight loss

It's not just about calories in; it's about calories out too. Exercise is an important part of a weight loss plan. Most experts recommend getting at least 30 minutes of physical activity on most days of the week. The more vigorous, and the longer you go, the better. So walking for 30 minutes is good, but jogging for 45 minutes is better. The good news is, you don't have to do all your exercise at once. You can split it up into smaller intervals. For example, you can do a 15 minute walk before breakfast. Then take a 10 minute walk during a break at work. At night, take another 10 minute walk after dinner. You've easily racked up 35 minutes of exercise without taking up too much time all at once. The best thing to do is to set a time to exercise and treat it like any other important appointment-it's something you don't want to miss.





healthyweight

> [Introduction](#)

> [Ben's weight loss blog](#)

> [Nutrition information for weight loss](#)

> [Exercise information for weight loss](#)

> [Setting healthy goals for the week](#)

Setting healthy goals for the week

Setting goals is an important part of losing weight. It's important to monitor your progress and of course, reward yourself when you do well. I'd like you to set 2 goals this week. Your first goal is to monitor your calorie intake. You can use food labels and online nutrient databases to track your calorie intake. Simply write everything you eat or drink down for one day this week. Based on the calorie needs we discussed on this Web site, figure out what your individual calorie needs are. Remember to subtract 500 calories off your calorie needs if you want to lose weight. Once you write down your food and drink intake for one day, see if you're meeting your calorie goals for weight maintenance or weight loss. If you aren't, think of ways you can improve your intake. Your next goal is to track your exercise. Write down all activities you do throughout the day and how many minutes you do the activities. How close are you to getting 30 minutes of exercise on at least 5 days per week? If you're not meeting that goal, figure out ways to improve it.



APPENDIX E

SURVEYS USED FOR PODCASTING INTERVENTION

Demographic Questionnaire-Podcast Intervention Study

1. Participant number _____
2. Age: _____
3. Height: _____
4. Weight: _____
5. Gender (circle one): Male Female
6. Are you Hispanic or Latino: Yes No
7. Ethnicity (circle one):
 - a. American Indian or Alaska Native
 - b. Asian
 - c. Black or African American
 - d. Native Hawaiian or Other Pacific Islander
 - e. White
8. Education (circle one):
 - a. 8th grade or less
 - b. Some high school
 - c. High school or equivalent
 - d. Some college
 - e. College
 - f. Advanced degree (Masters, doctoral, or other post-college degree)
9. Primary Occupation (please select the best option):
 - a. No current employment
 - b. Service occupation
 - c. Technical, sales, administrative
 - d. Professional specialty
 - e. Executive, managerial
 - f. Retired
10. Marital Status (circle one):
 - a. Single
 - b. Married
 - c. Divorced or Separated
 - d. Widowed

11. What type of MP3 player do you own?
- a. iPod
 - b. Other: _____
 - c. Do not own one
 - d. If yes, for how long? (enter number of months and/or years):
12. How long have you owned any type of MP3 player? Enter number of years. If less than one year, enter in a decimal (i.e. for 6 months, enter .5, for 3 months, enter .25)
-
13. Have you ever downloaded a podcast (circle one):
- a. Yes (if yes go to question 13)
 - b. No (go to question 16)
 - c. I don't know (go to question 16)
 - d. I've never heard of a podcast (go to question 16)
14. How many podcasts do you subscribe to?
- a. 0 (go to question 15)
 - b. 1
 - c. 2
 - d. 3
 - e. 4 or more
15. Do you subscribe to any weight loss or physical activity podcasts?
- a. Yes
 - b. No
16. How many hours a day do you spend online on a computer (circle one)?
- a. <1 hour
 - b. 1-2 hours
 - c. 3-4 hours
 - d. > 4 hours

PrimeScreen Questionnaire (adapted for this study)

INSTRUCTIONS: For each question, mark the circle indicating how often **on average** you have eaten the item(s) **during the past 12 weeks**. Remember to include things you cook with. These questions are not intended to assess your total diet, and you may not find all the foods you eat listed.

1. Dark Green Leafy Vegetables

6. Other Fruits (e.g., fresh apples or pears,

(spinach, romaine lettuce, kale, turnip greens, bok choy)

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

2. Broccoli, Cauliflower, Cabbage, Brussel Sprouts

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

3. Carrots

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

4. Other Vegetables (e.g., peas, corn, green beans, tomatoes, squash)

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

5. Citrus Fruits (e.g., orange juice or grapefruit juice, oranges, grapefruit)

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

bananas, berries, grapes, melons)

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

7. Whole Milk Dairy Foods (whole milk, hard cheese, butter, ice cream)

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

8. Low-fat Milk Products (e.g., low-fat/skim milk, yogurt, cottage cheese)

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

9. Whole eggs

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

10. Margarine (stick-type not tub)

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



As before, the following questions refer to your **usual** food intake **during the past 12 weeks**.

11. Whole Grain Foods (e.g., whole grain breads, brown rice)

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

12. Pasta, Rice, Noodles

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

13. Baked Products (donuts, cookies, muffins, crackers, cakes, sweet rolls, pastries)

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

14. Beef, Pork or Lamb as Main Dish

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

15. Processed Meats (sausages, salami, bologna, hot dogs, bacon)

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

16. Fish/Seafood (not fried, but broiled, baked, poached, canned)

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

17. Deep Fried Foods (deep fried chicken, fish or seafood; French fries, onion rings)

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

18. How often do you add salt to food at the table?

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

How often do you have an all-vegetarian (meatless) meal for dinner?

19. Do you currently take a multiple vitamin?

- NO
- YES

If 'YES', how many per week? _____

IPAQ Physical Activity Questionnaire (short version)

In answering the following questions,

- vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal.
- moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

1a. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling? Think about only those physical activities that you did for at least 10 minutes at a time.

_____ days per week »

or

_____ none

1b. How much time in total did you usually spend on one of those days doing vigorous physical activities?

_____ hours _____ minutes

2a. Again, think only about those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ days per week »

or

_____ none

1b. How much time in total did you usually spend on one of those days doing moderate physical activities?

_____ hours _____ minutes

3a. During the last 7 days, on how many days did you walk for at least 10 minutes at a time? This includes walking at work and at home, walking to travel from place to place, and any other walking that you did solely for recreation, sport, exercise or leisure.

_____ days per week »

or

_____ none

1b. How much time in total did you usually spend walking on one of those days?

_____ hours _____ minutes

The last question is about the time you spent sitting on weekdays while at work, at home, while doing course work and during leisure time. This includes time spent sitting at a desk, visiting friends, reading traveling on a bus or sitting or lying down to watch television.

4. During the last 7 days, how much time in total did you usually spend sitting on a week day?

_____ hours _____ minutes

Social Cognitive Theory Questionnaire

Not at all

Very much

2. How motivated were you to listen to the podcasts?

1 2 3 4 5 6 7

Not at all

Very much

3. To what extent did you try hard to think about the information in the podcasts?

1 2 3 4 5 6 7

Not at all

Very much

4. How much would you say the information in the podcasts held your attention?

1 2 3 4 5 6 7

Not at all

Very much

5. How much effort would you say you gave to evaluating the information in the podcasts?

1 2 3 4 5 6 7

Not at all

Very much

6. To what extent did you feel you had enough time to think about the information given in the podcasts?

1 2 3 4 5 6 7

Not at all

Very much

7. To what extent did you find the information in the podcasts well organized and easy to follow?

1 2 3 4 5 6 7

Not at all

Very much

8. In your opinion, how logical and accurate was the information presented in the podcasts?

1 2 3 4 5 6 7

Not at all

Very much

9. To what extent would you say the podcasts made good points about weight loss?

1 2 3 4 5 6 7

Not at all

Very much

User Control Questionnaire

Please rate your level of agreement with the following statements on a scale from 1 to 9 where “1” means *strongly disagree* and “9” means *strongly agree*. Please read each statement carefully, then circle the number that best expresses your feeling about the Podcast.

- B. once a month
- C. once a week
- D. 2 times a week
- E. greater than 2 times per week

2. Where did you listen to the podcasts for the study? Please circle all that apply.

- A. home
- B. office/work
- C. library
- D. café
- E. car
- F. walking
- G. gym/exercising
- H. traveling
- I. commuting
- J. other: _____

3. Where did you listen to the podcasts *most often* for the study? Please circle only one choice.

- A. home
- B. office/work
- C. library
- D. café
- E. car
- F. walking
- G. gym/exercising
- H. traveling
- I. commuting
- J. other: _____

4. What activity were you doing the most when you were listening to your podcast for the study?

- A. sitting at my desk
- B. walking or exercising
- C. sitting at home
- D. eating
- E. driving
- F. cleaning/doing housework
- G. other: Please describe: _____

5. What device did you use the most to listen to your podcasts?

- A. iPod
- B. Other MP3 player
- C. Directly on computer
- D. Other: _____

6. Did you download any other weight loss, healthy diet, or physical activity podcasts during this study?

A. Yes (If yes, please list podcasts)

REFERENCES

- Abbasi, K. (2006). Journals join the podcast revolution. *J R Soc Med*, 99(7), 329.
- AHA. (2006). American Heart Association's guidelines for selecting a weight loss & maintenance program: [Http://www.americanheart.org/presenter.jhtml?identifier=2884](http://www.americanheart.org/presenter.jhtml?identifier=2884). Accessed October 14, 2006.
- Ariely, D. (2000). Controlling the information flow: Effects on consumers' decision making and preferences. *Journal of Consumer Research*, 27(2), 233-248.
- Baker, L., Wagner, T. H., Singer, S., & Bundorf, M. K. (2003). Use of the internet and e-mail for health care information: Results from a national survey. *JAMA*, 289(18), 2400-2406.
- Bandura, A. (2004). Health promotion by social cognitive means. *Health Educ Behav*, 31(2), 143-164.
- Banning, M. (2005). Obesity: Pathophysiology and treatment. *J R Soc Health*, 125(4), 163-167.
- Bausch, S. Nielsen online media. Social networks and blogs now the 4th most popular online activity. [Http://www.nielsen-online.com/pr/pr_090309.pdf](http://www.nielsen-online.com/pr/pr_090309.pdf). Accessed May 12, 2009.
- Berkel, L. A., Poston, W. S., Reeves, R. S., & Foreyt, J. P. (2005). Behavioral interventions for obesity. *J Am Diet Assoc*, 105(5 Suppl 1), S35-43.
- Blenkiron, P. (2001). Coping with depression: A pilot study to assess the efficacy of a self-help audio cassette. *Br J Gen Pract*, 51(466), 366-370.
- Bosco, A. M., & Ward, C. (2005). Welcome to the techno highway: Development of a health assessment cd-rom and website. *Contemp Nurse*, 20(1), 21-27.

- Boulos, M. N., Maramba, I., & Wheeler, S. (2006). Wikis, blogs and podcasts: A new generation of web-based tools for virtual collaborative clinical practice and education. *BMC Med Educ*, 6, 41.
- Brehm, B. J., Spang, S. E., Lattin, B. L., Seeley, R. J., Daniels, S. R., & D'Alessio, D. A. (2005). The role of energy expenditure in the differential weight loss in obese women on low-fat and low-carbohydrate diets. *J Clin Endocrinol Metab*, 90(3), 1475-1482.
- Brunken, R., Plass, J. L., & Leutner, D. (2003). Direct measurement of cognitive load in multimedia learning. *Educational Psychologist*, 38, 53-61.
- Carpenter, G. S., Glazer, R., & Nakamoto, K. (1994). Meaningful brands from meaningless differentiation: The dependence on irrelevant attributes. *Journal of Marketing Research*, 31(3), 339-350.
- Cialdini, R. B., Petty, R. E., & Caccioppo, J. T. (1981). Attitude and attitude change. *Annual Review of Psychology*, 32, 357-404.
- Clark, R. E. (1983). Reconsidering research on learning from media. *Review of Educational Research*, 53(4), 445-459.
- Diaz, M., & Larsen, B. (2005). Preparing for successful surgery: An implementation study. *Permanente Journal*, 9(3), 23-27.
- Elfhag, K., & Rossner, S. (2005). Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. *Obes Rev*, 6(1), 67-85.
- Eveland, W. P., & Cortese, J. (2006). How web site organization influences free recall, factual knowledge, and knowledge structure density. *Human Communication Research*, 30(2), 208 - 233.
- Eveland, W. P., Jr., & Dunwoody, S. (2002). An investigation of elaboration and selective scanning as mediators of learning from the web versus print. *Journal of Broadcasting and Electronic Media*, 46(1), 34(20).

- Eveland, W. P. J., & Dunwoody, S. (2001). User control and structural isomorphism or disorientation and cognitive load? Learning from the web versus print. *Communication Research*, 28(1), 48-78.
- Ferrer-Roca, O., Cardenas, A., Diaz-Cardama, A., & Pulido, P. (2004). Mobile phone text messaging in the management of diabetes. *J Telemed Telecare*, 10(5), 282-285.
- Franklin, V., Waller, A., Pagliari, C., & Greene, S. (2003). "sweet talk": Text messaging support for intensive insulin therapy for young people with diabetes. *Diabetes Technol Ther*, 5(6), 991-996.
- Friede, A., Blum, H. L., & McDonald, M. (1995). Public health informatics: How information-age technology can strengthen public health. *Annu Rev Public Health*, 16, 239-252.
- Friedenreich, C. M., Slimani, N., & Riboli, E. (1992). Measurement of past diet: Review of previous and proposed methods. *Epidemiol Rev*, 14, 177-196.
- Furnham, A. (2001). Remembering stories as a function of the medium of presentation. *Psychol Rep*, 89(3), 483-486.
- Gaertner, J., Elsner, F., Pollmann-Dahmen, K., Radbruch, L., & Sabatowski, R. (2004). Electronic pain diary: A randomized crossover study. *J Pain Symptom Manage*, 28(3), 259-267.
- Glanz, K., & Rimer, B. K. (2005). *Theory at a glance: A guide for health promotion practice*. Washington D.C.: National Cancer Institute, National Institutes of Health, U.S. Department of Health and Human Services. NIH Pub. No. 05-3869.
- Glanz, K., Rimer, B. K., & Lewis, F. M. (2002). *Health behavior and health education. Theory, research and practice*. San Francisco: Wiley & Sons.
- Gordon-Larsen, P., Nelson, M. C., & Popkin, B. M. (2004). Longitudinal physical activity and sedentary behavior trends: Adolescence to adulthood. *Am J Prev Med*, 27(4), 277-283.

- Hagstromer, M., Oja, P., & Sjostrom, M. (2006). The international physical activity questionnaire (IPAQ): A study of concurrent and construct validity. *Public Health Nutr*, 9(6), 755-762.
- Harvey-Berino, J., Pintauro, S., Buzzell, P., & Gold, E. C. (2004). Effect of internet support on the long-term maintenance of weight loss. *Obes Res*, 12(2), 320-329.
- Hedley, A. A., Ogden, C. L., Johnson, C. L., Carroll, M. D., Curtin, L. R., & Flegal, K. M. (2004). Prevalence of overweight and obesity among us children, adolescents, and adults, 1999-2002. *JAMA*, 291(23), 2847-2850.
- Heisler, Y. Apple reports blockbuster earnings with iPhone growth increasing by 123%. *Network World*. <http://www.networkworld.com/community/node/41195>. Accessed May 12, 2009.
- Heshka, S., Anderson, J. W., Atkinson, R. L., Greenway, F. L., Hill, J. O., Phinney, S. D., et al. (2003). Weight loss with self-help compared with a structured commercial program: A randomized trial. *JAMA*, 289(14), 1792-1798.
- Holzman, G. S., Harwell, T. S., Johnson, E. A., Goldbaum, G., & Helgerson, S. D. (2005). A media campaign to promote pneumococcal vaccinations: Is a telephone survey an effective evaluation strategy? *J Public Health Manag Pract*, 11(3), 228-234.
- Intille, S. S., Kukla, C., Farzanfar, R., & Bakr, W. (2003). Just-in-time technology to encourage incremental, dietary behavior change. *AMIA Annu Symp Proc*, 874.
- Ivory, J. D., & Kalyanaraman, S. (2007). The effects of technological advancement and violent content in video games on players' feelings of presence, involvement, physiological arousal, and aggression. *Journal of Communication*, 57(3), 532 - 555.
- Jee, S. H., Kim, H. J., & Lee, J. (2005). Obesity, insulin resistance and cancer risk. *Yonsei Med J*, 46(4), 449-455.

- Jeffery, R. W. (2001). Public health strategies for obesity treatment and prevention. *Am J Health Behav*, 25(3), 252-259.
- Jham, B. C., Duraes, G. V., Strassler, H. E., & Sensi, L. G. (2008). Joining the podcast revolution. *J Dent Educ*, 72(3), 278-281.
- Johnson, L., & Grayden, S. (2006). Podcasts--an emerging form of digital publishing. *Int J Comput Dent*, 9(3), 205-218.
- Kalyanaraman, S., & Sundar, S. S. (2004). Arousal, memory, and impression-formation effects of animation speed in web advertising. *Journal of Advertising*, 33(1), 7-17.
- Kalyanaraman, S., & Sundar, S. S. (2008). Impression formation effects in online mediated communication. In E. A. Konijn, S. Utz, M. Tanis & S. B. Barnes (Eds.), *Mediated interpersonal communication* (pp. 217-233). New York: Routledge.
- Kayman, S., Bruvold, W., & Stern, J. S. (1990). Maintenance and relapse after weight loss in women: Behavioral aspects. *Am J Clin Nutr*, 52(5), 800-807.
- Kendall, A., Levitsky, D. A., Strupp, B. J., & Lissner, L. (1991). Weight loss on a low-fat diet: Consequence of the imprecision of the control of food intake in humans. *Am J Clin Nutr*, 53(5), 1124-1129.
- Kristof, R., & Satran, A. (1995). *Interactivity by design*. CA: Adobe Press.
- Kruger, J., Blanck, H. M., & Gillespie, C. (2006). Dietary and physical activity behaviors among adults successful at weight loss maintenance. *Int J Behav Nutr Phys Act*, 3, 17.
- Leser, M. S., Yanovski, S. Z., & Yanovski, J. A. (2002). A low-fat intake and greater activity level are associated with lower weight regain 3 years after completing a very-low-calorie diet. *J Am Diet Assoc*, 102(9), 1252-1256.

- Licciardone, J. C., Smith-Barbaro, P., & Coleridge, S. T. (2001). Use of the internet as a resource for consumer health information: Results of the second osteopathic survey of health care in America (osteosurv-ii). *J Med Internet Res*, 3(4), E31.
- Linde, J. A., Jeffery, R. W., French, S. A., Pronk, N. P., & Boyle, R. G. (2005). Self-weighting in weight gain prevention and weight loss trials. *Ann Behav Med*, 30(3), 210-216.
- Madden, M. (2008). *Pew internet and American life report: Podcast downloading 2008*. [Http://www.pewinternet.org/pdfs/pip_podcast_2008_memo.pdf](http://www.pewinternet.org/pdfs/pip_podcast_2008_memo.pdf) Accessed January 10, 2009.
- Marks, J. T., Campbell, M. K., Ward, D. S., Ribisl, K. M., Wildemuth, B. M., & Symons, M. J. (2006). A comparison of web and print media for physical activity promotion among adolescent girls. *J Adolesc Health*, 39(1), 96-104.
- Marquis, M., Dubeau, C., & Thibault, I. (2005). Canadians' level of confidence in their sources of nutrition information. *Can J Diet Pract Res*, 66(3), 170-175.
- Metz, J. A., Stern, J. S., Kris-Etherton, P., Reusser, M. E., Morris, C. D., Hatton, D. C., et al. (2000). A randomized trial of improved weight loss with a prepared meal plan in overweight and obese patients: Impact on cardiovascular risk reduction. *Arch Intern Med*, 160(14), 2150-2158.
- Mueller-Cunningham, W. M., Quintana, R., & Kasim-Karakas, S. E. (2003). An ad libitum, very low-fat diet results in weight loss and changes in nutrient intakes in postmenopausal women. *J Am Diet Assoc*, 103(12), 1600-1606.
- Mukherjee, A., & Hoyer, W. D. (2001). The effect of novel attributes on product evaluation. *Journal of Consumer Research*, 28(3), 462-472.
- Murero, M., D'Ancona, G., & Karamanoukian, H. (2001). Use of the internet by patients before and after cardiac surgery: Telephone survey. *J Med Internet Res*, 3(3), E27.
- Neilson, H. K., Robson, P. J., Friedenreich, C. M., & Csizmadi, I. (2008). Estimating activity energy expenditure: How valid are physical activity questionnaires? *Am J Clin Nutr*, 87(2), 279-291.

- Neville, R., Greene, A., McLeod, J., Tracy, A., & Surie, J. (2002). Mobile phone text messaging can help young people manage asthma. *BMJ*, *325*(7364), 600.
- O'Donnell, L., Stueve, A., Agronick, G., Wilson-Simmons, R., Duran, R., & Jeanbaptiste, V. (2005). Saving sex for later: An evaluation of a parent education intervention. *Perspect Sex Reprod Health*, *37*(4), 166-173.
- O'Neil, P. M. (2001). Assessing dietary intake in the management of obesity. *Obes Res*, *9 Suppl 5*, 361S-366S; discussion 373S-374S.
- Obermayer, J. L., Riley, W. T., Asif, O., & Jean-Mary, J. (2004). College smoking-cessation using cell phone text messaging. *J Am Coll Health*, *53*(2), 71-78.
- Ogden, C. L., Carroll, M. D., Curtin, L. R., McDowell, M. A., Tabak, C. J., & Flegal, K. M. (2006). Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA*, *295*(13), 1549-1555.
- Paas, F., Tuovinen, J. E., Tabbers, H., & Van Gerven, P. W. M. (2003). Cognitive load measurement as a means to advance cognitive load theory. *Educational Psychologist*, *38*, 63-71.
- Partala, T., & Surakka, V. (2004). The effects of affective interventions in human-computer interaction. *Interacting with Computers*, *16*(2), 295.
- Penney, C. G., & Butt, A. K. (1986). Within- and between-modality associations in probed recall: A test of the separate-streams hypothesis. *Canadian Journal of Psychology*, *40*(1), 1-11.
- Petty, R. E., Barden, J., & Wheeler, S. C. (2002). Elaboration likelihood model of persuasion: Health promotions that yield substantial behavioral change. In R. J. DiClemente, R. A. Crosby & M. Kegler (Eds.), *Emerging theories in health promotion practice and research: Strategies for improving public health* (pp. 71-99). San Francisco, CA: Jossey-Bass.

- Petty, R. E., & Cacioppo, J. T. (1986). *Communication and persuasion: Central and peripheral route to attitude change*. New York: Springer-Verlag.
- Petty, R. E., & Cacioppo, J. T. (Eds.). (1986). *The elaboration likelihood model of persuasion* (Vol. 19). New York: Academic Press.
- Pew Internet and American life data memo: Podcasting (April 2005).
[Http://www.pewinternet.org/pdfs/pip_podcasting2005.pdf](http://www.pewinternet.org/pdfs/pip_podcasting2005.pdf). Accessed September 22, 2007.
- Pew Internet and American life project. Pew internet project data memo: November 2006. [Http://www.pewinternet.org/pdfs/pip_podcasting.pdf](http://www.pewinternet.org/pdfs/pip_podcasting.pdf). Accessed April 26, 2007.
- Piette, J. D. (2002). Enhancing support via interactive technologies. *Curr Diab Rep*, 2(2), 160-165.
- Ragon, B., & Looney, R. P. (2007). Podcasting at the University of Virginia Claude Moore health sciences library. *Med Ref Serv Q*, 26(1), 17-26.
- RAJAR: Radio Joint Audience Research Limited podcasting and radio listening via the internet survey:
[Http://www.rajar.co.uk/docs/news/2008_07_podcasting_listening_survey.pdf](http://www.rajar.co.uk/docs/news/2008_07_podcasting_listening_survey.pdf). Accessed October 1, 2008.
- Reed, W. M. (1996). Assessing the impact of computer-based writing instruction. *Journal of Research on Computing in Education*, 28, 418-437.
- Reger, B., Cooper, L., Booth-Butterfield, S., Smith, H., Bauman, A., Wootan, M., et al. (2002). Wheeling walks: A community campaign using paid media to encourage walking among sedentary older adults. *Prev Med*, 35(3), 285-292.
- Rifas-Shiman, S. L., Willett, W. C., Lobb, R., Kotch, J., Dart, C., & Gillman, M. W. (2001). Primescreen, a brief dietary screening tool: Reproducibility and comparability with both a longer food frequency questionnaire and biomarkers. *Public Health Nutr*, 4(2), 249-254.

- Rippe, J. M., & Hess, S. (1998). The role of physical activity in the prevention and management of obesity. *J Am Diet Assoc*, 98(10 Suppl 2), S31-38.
- Rodgers, A., Corbett, T., Bramley, D., Riddell, T., Wills, M., Lin, R. B., et al. (2005). Do u smoke after txt? Results of a randomised trial of smoking cessation using mobile phone text messaging. *Tob Control*, 14(4), 255-261.
- Rowell, M. R., Corl, F. M., Johnson, P. T., & Fishman, E. K. (2006). Internet-based dissemination of educational audiocasts: A primer in podcasting--how to do it. *AJR Am J Roentgenol*, 186(6), 1792-1796.
- Savel, R. H., Goldstein, E. B., Perencevich, E. N., & Angood, P. B. (2007). The iCritical care podcast: A novel medium for critical care communication and education. *J Am Med Inform Assoc*, 14(1), 94-99.
- Schade, C. P., & McCombs, M. (2005). Do mass media affect Medicare beneficiaries' use of diabetes services? *Am J Prev Med*, 29(1), 51-53.
- Schein, M. H., Gavish, B., Herz, M., Rosner-Kahana, D., Naveh, P., Knishkowsky, B., et al. (2001). Treating hypertension with a device that slows and regularises breathing: A randomised, double-blind controlled study. *J Hum Hypertens*, 15(4), 271-278.
- Schmitz, M. K., & Jeffery, R. W. (2000). Public health interventions for the prevention and treatment of obesity. *Med Clin North Am*, 84(2), 491-512, viii.
- Schoeller, D. A., Shay, K., & Kushner, R. F. (1997). How much physical activity is needed to minimize weight gain in previously obese women? *Am J Clin Nutr*, 66(3), 551-556.
- Shantikumar, S. (2008). From lecture theatre to portable media: Students' perceptions of an enhanced podcast for revision. *Med Teach*, 1-4.
- Sherwood, N. E., Morton, N., Jeffery, R. W., French, S. A., Neumark-Sztainer, D., & Falkner, N. H. (1998). Consumer preferences in format and type of community-based weight control programs. *Am J Health Promot*, 13(1), 12-18.

- Stone, A. A., Shiffman, S., Schwartz, J. E., Broderick, J. E., & Hufford, M. R. (2003). Patient compliance with paper and electronic diaries. *Control Clin Trials*, 24(2), 182-199.
- Sundar, S. S., & Kalyanaraman, S. (2004). Arousal, memory, and impression-formation effects of animation speed in web advertising. *Journal of Advertising*, 33(1), 7-17.
- Sundar, S. S., Kalyanaraman, S., & Brown, J. (2003). Explicating web site interactivity: Impression formation effects in political campaign sites. *Communication Research*, 30(1), 30-59.
- Sundar, S. S., Kalyanaraman, S., & Brown, J. (2003). Explicating web site interactivity: Impression formation effects in political campaign sites. *Communication Research %R 10.1177/0093650202239025*, 30(1), 30-59.
- Tate, D. F., Jackvony, E. H., & Wing, R. R. (2003). Effects of internet behavioral counseling on weight loss in adults at risk for type 2 diabetes: A randomized trial. *JAMA*, 289(14), 1833-1836.
- Tate, D. F., Jackvony, E. H., & Wing, R. R. (2006). A randomized trial comparing human e-mail counseling, computer-automated tailored counseling, and no counseling in an internet weight loss program. *Arch Intern Med*, 166(15), 1620-1625.
- Tate, D. F., Wing, R. R., & Winett, R. A. (2001). Using internet technology to deliver a behavioral weight loss program. *JAMA*, 285(9), 1172-1177.
- Trelease, R. B. (2008). Diffusion of innovations: Smartphones and wireless anatomy learning resources. *Anat Sci Educ*, 1(6), 233-239.
- Tripp, J. S., Duvall, S. L., Cowan, D. L., & Kamau, A. W. (2006). Academic podcasting: Quality media delivery. *AMIA Annu Symp Proc*, 1125.
- Tufano, J. T., & Karras, B. T. (2005). Mobile ehealth interventions for obesity: A timely opportunity to leverage convergence trends. *J Med Internet Res*, 7(5), e58.

- Turner-McGrievy, G., Barnard, N. D., & Scialli, A. R. (2007). A 2-year randomized weight loss trial comparing a vegan diet to a more moderate low-fat diet. *Obesity*, 15(9): 2276-81.
- Turner-McGrievy, G. M., Campbell, M. K., & Truesdale, K. (2008). Podcasting as a way to deliver and receive weight loss information: A content analysis and survey. *Under Review*.
- U.S. Census Bureau. (2000). Home computers and internet use in the United States: August 2000. <http://www.census.gov/prod/2001pubs/p23-207.pdf> Accessed September 16, 2006. In U. D. o. Commerce (Ed.).
- Varkevisser, M., & Kerkhof, G. A. (2003). 24-hour assessment of performance on a palmtop computer: Validating a self-constructed test battery. *Chronobiol Int*, 20(1), 109-121.
- Wang, D. H., Kogashiwa, M., Ohta, S., & Kira, S. (2002). Validity and reliability of a dietary assessment method: The application of a digital camera with a mobile phone card attachment. *J Nutr Sci Vitaminol (Tokyo)*, 48(6), 498-504.
- Wantland, D. J., Portillo, C. J., Holzemer, W. L., Slaughter, R., & McGhee, E. M. (2004). The effectiveness of web-based vs. Non-web-based interventions: A meta-analysis of behavioral change outcomes. *J Med Internet Res*, 6(4), e40.
- Warden, C. A., Wu, W. Y., & Tsai, D. (2006). Online shopping interface components: Relative importance as peripheral and central cues. *Cyberpsychol Behav*, 9(3), 285-296.
- Wiecha, J. L., Sobol, A. M., Peterson, K. E., & Gortmaker, S. L. (2001). Household television access: Associations with screen time, reading, and homework among youth. *Ambul Pediatr*, 1(5), 244-251.
- Wiese, H. J., Wilson, J. F., Jones, R. A., & Neises, M. (1992). Obesity stigma reduction in medical students. *Int J Obes Relat Metab Disord*, 16(11), 859-868.

- Wikipedia. (2005). Podcasting. <http://en.wikipedia.org/wiki/podcasting>. Accessed October 6, 2005. As cited from Searls, Doc. Sept. 28, 2004. Doc Searls' IT Garage, "DIY Radio with PODcasting."
- Wilkinson, A., Forbes, A., Bloomfield, J., & Fincham Gee, C. (2004). An exploration of four web-based open and flexible learning modules in post-registration nurse education. *Int J Nurs Stud*, 41(4), 411-424.
- Wilson, G., & Sasse, M. A. (1999). Do users always know what's good for them? Utilising physiological responses to assess media. In S. McDonald, Y. Waern & G. Cockton (Eds.), *Proceedings of HCI 2000: People and computer xiv - usability or else!* (pp. 327-339). Edinburgh, Scotland.
- Winett, R. A., Tate, D. F., Anderson, E. S., Wojcik, J. R., & Winett, S. G. (2005). Long-term weight gain prevention: A theoretically based internet approach. *Prev Med*, 41(2), 629-641.
- Wing, R. R., & Hill, J. O. (2001). Successful weight loss maintenance. *Annu Rev Nutr*, 21, 323-341.
- Wing, R. R., & Jeffery, R. W. (1999). Benefits of recruiting participants with friends and increasing social support for weight loss and maintenance. *J Consult Clin Psychol*, 67(1), 132-138.
- Wing, R. R., Pinto, A. M., Crane, M. M., Kumar, R., Weinberg, B. M., & Gorin, A. A. (2009). A statewide intervention reduces BMI in adults: Shape up Rhode Island results. *Obesity advanced online publication*, doi:10.1038/oby.2008.655.
- Wing, R. R., Tate, D. F., Gorin, A. A., Raynor, H. A., & Fava, J. L. (2006). A self-regulation program for maintenance of weight loss. *N Engl J Med*, 355(15), 1563-1571.
- Withers, G., & Wertheim, E. (2004). Applying the elaboration likelihood model of persuasion to a videotape-based eating disorders primary prevention program for adolescent girls. *Eat Disord*, 12(2), 103-124.

Wray, R. J., Jupka, K., & Ludwig-Bell, C. (2005). A community-wide media campaign to promote walking in a Missouri town. *Prev Chronic Dis*, 2(4), A04.

Zhang, P., & von Dran, G. M. (2000). Satisfiers and dissatisfiers: A two-factor model for website design and evaluation. *Journal of the American Society for Information Science*, 51(14), 1253-1268.