



HHS Public Access

Author manuscript

Health Commun. Author manuscript; available in PMC 2016 May 09.

Published in final edited form as:

Health Commun. 2013 ; 28(2): 101–109. doi:10.1080/10410236.2011.651709.

Delivering Health Information via Podcast or Web: Media Effects on Psychosocial and Physiological Responses

Gabrielle Turner-McGrievy,

Department of Health Promotion, Education, and Behavior, University of South Carolina

Sri Kalyanaraman, and

Department of Journalism and Mass Communication, University of North Carolina at Chapel Hill

Marci K. Campbell

Department of Nutrition, University of North Carolina at Chapel Hill

Abstract

This study explored differences in psychosocial and physiological variables in response to being presented with information on weight loss through either reading text on a website or listening to the same information via podcast. Participants were randomized to receive a weight loss website ($n = 20$) or podcast ($n = 20$). Participants had skin conductance levels measured and completed questionnaire items assessing demographic characteristics, user control, novelty, and knowledge. Participants in the podcast group exhibited greater levels of physiological arousal and reported the intervention to be more novel than those in the Web group; however, the Web group reported greater user control. There was no difference in knowledge between the groups. This study presents the first step in examining the role that novelty and user control may play in two different weight-loss electronic media, as well as differences in knowledge acquisition. Future research should explore adding additional media features, such as video content, to the podcasts and websites in order to optimize fully the different mediums and to examine whether user control and novelty are potential mediators of weight loss outcomes.

With increasing rates of overweight and obesity (Flegal, Carroll, Ogden, & Curtin, 2010), the health behavior research community has been charged with finding new and innovative methods of helping people to achieve health weights (Bock, 2009). Mediated interventions have been particularly effective, with past research showing that electronic media can be used to deliver weight-loss interventions (Berkel, Poston, Reeves, & Foreyt, 2005). Not surprisingly, the Web has been employed in health behavior interventions for weight loss (Berkel et al., 2005), with several studies showing that delivering interventions entirely through Web-based methodologies has been a means of creating health behavior changes (such as increasing physical activity or assisting with weight loss maintenance) and increasing health-related knowledge (Wantland, Portillo, Holzemer, Slaughter, & McGhee, 2004). Increasingly, as technology becomes more mobile, weight-loss interventions using mobile devices have assumed prominence, with a growing number of people accessing

health information via technologies such as podcasting (Trelease, 2008). For example, a recent survey found that 80% of Web users have reported they turn to the Internet for health information (Fox, 2011).

As an emerging technology, it appears that podcasting has the potential to reach large numbers of people who are interested in changing health behaviors as it seems to be a way to deliver a weight loss intervention via entirely remote means (Turner-McGrievy et al., 2009). Podcasts are downloadable, electronic audio files that may be listened to on portable audio players (MP3 players) or computers. One in two U.S. adults are MP3 player owners (Smith, 2010), and one in five Internet users have accessed a podcast before (Madden & Jones, 2008). As the popularity of cloud computing (storing and accessing data online) has increased, there is the potential for a growth in podcast use due to improvements in creating and listening to podcasts (Madden, 2008). While there are numerous 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. Before large-scale interventions comparing these methods should take place, it is important to understand the potential differences in communication and psychosocial variables that may be present between these two modalities. The purpose of this study is to examine the psychological and physiological differences between two different weight-loss media: podcast and Web.

User/Information Control

One theoretical framework that is especially pertinent in explaining intermedia differences, particularly around new media, is user/information control theory (Southwell & Lee, 2004), which pertains to how one controls one's own information flow (Ariely, 2000). Consumers can control their information flow many different ways, such as deciding how the information is presented, the order of information, and length of information (Ariely, 2000). Kristof and Satran (1995) have suggested that different aspects of media can affect levels of user control. For example, aspects of user control would be equated to different electronic modalities in the following manner: The first level is control over the pace of learning, such as being able to listen to the podcast content all at once or at different times (Kristof & Satran, 1995). This is followed by control over sequence (such as being able to choose different parts of a website to read), control over media (being able to start and stop the podcast), control over variables (accessing the website from different devices), control over transaction (subscribing to a podcast or downloading the file directly), control over objects (customizing a homepage), and control over simulation (being able to listen to the podcast in different places such as a car or at home) (Kristof & Satran, 1995).

The lines between Web and podcasting have begun to blur more as the Web becomes more accessible on mobile devices. The unique qualities of mobile technology, which allows the user to access information without regard to a wired connection, may provide an increase in freedom and user control. This suggests that mobile interventions may be a promising alternative to delivering health information that should be compared to wired technologies. Mobile interventions 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 or view websites on a desktop computer or can be mobile while accessing information via an Internet-capable mobile device. As technologies rapidly increase, however, repeatedly learning new methodologies may lead to a decrease in user control, if only temporarily.

Role of Perceived Novelty

New technologies represent a way to deliver health information and may present a great deal of novelty to people accessing the information. Products that are perceived as being more novel than another similar product are often perceived as having more value (Mukherjee & Hoyer, 2001). The novelty effect may lead to research greater attention and effort paid to a new medium than a familiar one (Clark, 1983). Kalyanaraman and Sundar (2006) found that perceived novelty was a strong mediating factor between levels of customization in media and the attitude towards that medium. Therefore, media that are perceived as more novel by a participant may lead to greater attention paid to that medium, but, because of the newness of the medium, there is the potential for a reduction in the sense of user control.

Use of Physiological Measures to Assess Reactions to Media

Researchers often use measures of psychosocial and physiological response to assess reactions to media. For example, heart rate, blood volume pulse, and skin conductance level or SCL (a measure of electrical conductance of the skin as related to sweat production) (Ravaja, 2004) can be used 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). Prior studies have observed a linear relationship between SCL and technological sophistication such that as sophistication goes up, so does SCL (Ivory & Kalyanaraman, 2007). For example, greater arousal may also be associated with greater recall of information (Sundar & Kalyanaraman, 2004) and conversely, greater user control may lead to higher levels of SCL (Wise & Reeves, 2009).

Why Examine User Control, Novelty, Knowledge, and Skin Conductance in Ehealth Interventions

While health-related interventions tend to focus on domains from health behavior theories, such as social cognitive theory (Bandura, 2004), theories from the field of health communication can allow for an exploration of information-processing variables that can be manipulated to improve information delivery, retention, and behavior change. User or information control is one such variable that has been shown to be beneficial in communication research. Health communication interventions that emphasize information control may provide users with a greater satisfaction with the media (Zhang & von Dran, 2000) and, in turn, allow for better learning (Ariely, 2000). eHealth interventions can be enhanced by improving user control through accommodating different learning styles (Ariely, 2000) and providing more motivation to learn (Eveland & Dunwoody, 2001). This points to the benefits of measuring user control and finding ways to enhance it in eHealth interventions. Novelty, particularly around new media, can also be an important construct to

examine. A user may find an intervention novel if it deviates from expectations (Mendelson, 2001) and may place more value on (Mukherjee & Hoyer, 2001) and respond better to a novel intervention (Mendelson, 2001). Therefore, novelty is useful to measure as a way to explain differences in between new and more established media.

In addition to user control and novelty, assessing basic difference in knowledge and recall between media is also important. Improving a knowledge deficit around a health-related issue is a central tenet of health behavior research (Hansen, Holm, Frewer, Robinson, & Sandøe, 2003). Measuring recall is important when delivering a health behavior intervention since recall of information has been shown to be predictive of achieving behavior change (Ley, 1988). Therefore, in the laboratory setting, measuring knowledge after delivery of an intervention allows for an examination of the potential to change behavior in the future. Lastly, including an objective measure, such as SCL, in the study allows for a way to complement standard psychosocial measures that circumvents issues such as social desirability (Ravaja, 2004). While skin conductance does not measure how people feel about the media they accessed, coupled with subjective measures, skin conductance can help comprise a broader overview of response to media (Wilson & Sasse, 1999). In addition to being an objective measure, SCL can also provide a continuous measurement whereas a survey is usually only administered before and/or after media has been accessed (Ravaja, 2004).

Importance and Purpose of the Current Study

While media-based interventions for weight loss may have promise as a way to help people lose weight, teasing out the reactions and responses to different media forms that comprise electronic interventions is important. Determining which theoretical components of electronic media could be potential mediators of objective outcomes can allow for a stronger design of intervention-related media. Technology changes frequently and thus it is important to test theoretical aspects of media that can be applied to a variety of different technologies (Bock, 2009). This exploration of psychosocial and physiological variables assists with strengthening interventions using media by knowing which theoretical constructs are important, and thus, should be emphasized. Testing and using these theoretical constructs also allows other researchers to adapt findings to their own work, using the components found effective in one study for use within another (Eccles, Grimshaw, Walker, Johnston, & Pitts, 2005).

The purpose of this study is to explore potential mediators and differences in how people process information on weight loss through either reading text on a website or listening to the information via podcast, measuring both psychological and physiological variables. Although there is a theoretical basis to demonstrate the strength of using podcasting to deliver health information (Turner-McGrievy et al., 2009), research shows that recall of information is often better obtained through a written medium versus auditory (Furnham, 2001). Our conceptual model (Figure 1)—which demonstrates how concepts of novelty, user control, and knowledge interrelate—illustrates the following hypotheses:

H1: We hypothesize that users of podcasts will find the medium to be more novel than those receiving a Web-based intervention, in turn leading to greater physiological arousal as measured through skin conductance.

H2: We also hypothesize that podcast participants will have a decreased sense of user control and this in turn will also lead to greater physiological arousal. This may be especially true in the laboratory setting where participants may be more comfortable navigating the Web versus a desktop audio player.

H3: Since recall of information may be greater in print versus auditory information, we hypothesize that recall, as tested through our knowledge post test, will be greater in the Web group.

Our study design will allow us to test the effects of different media on both novelty and user control and in turn examine both the direct effects of media on physiological arousal and to examine whether those effects are mediated by novelty and user control.

Methods

Two different media-based materials were developed for this study: A Healthy Weight website and a podcast—both with identical content and both active conditions. The podcast and website contained components that are common to both media: (1) a welcome section (1 minute on podcast) and (2) a first-person account (i.e., a blog) (4 minutes, 30 seconds on podcast). In addition, each contained components that are important standard elements in behavioral weight loss interventions (Anderson-Bill, Winett, & Wojcik, 2011): (3) nutrition and exercise information (5 minutes) and a goal-setting activity (1 minute, 30 seconds). Participants 18 years and older were recruited through two undergraduate classes and received \$20 for completion of the study. A university institutional review board approved the study.

Physiological Measure

Participants were randomly assigned to the Web or podcast condition using a random numbers table as they entered the media laboratory. The laboratory has both an experimental area, which has a bank of computers, and an observation room, which houses the computer used for data recording and is partitioned by a one-way mirror. Equipment is maintained and regularly calibrated by laboratory staff using established procedures. Both the Web and podcast content were delivered via a desktop computer. SCL was measured using established procedures (Kalyanaraman & Sundar, 2004). After participants completed informed consent, they were told to sit in front of a computer. Their index and pointer fingers on the nondominant 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 physiological arousal through obtaining 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 1-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 webpage 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 website or started the podcast, depending on the condition to which the person was assigned. 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 website had four pages of content.

Psychological Measures

After participants listened to the podcast or read the Web content, they were instructed to raise their dominant hand to signal completion. The research assistant, who was monitoring them through a two-way mirror, stopped the SCL recording at this time. The participant was then instructed to complete questionnaires, which assessed the following:

- Demographic characteristics including reported weight and height.
- User/information control questionnaire aimed to assess how much control the user felt over the information they were receiving. The questionnaire contained six 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”), was based on key constructs from user/information control (Eveland, & Dunwoody, 2001), and was used in a previous podcasting intervention (Turner-McGrievy et al., 2009).
- Perceived Novelty questionnaire aimed to measure how new, distinct, and innovative the user felt the medium was (Kalyanaraman & Sundar, 2006). It contained two statements (“I found Healthy Weight to be very new and innovative” and “I found Healthy Weight to be very unusual and something I haven't done before” rated on a 1 to 9 Likert scale anchored by “strongly disagree” and “strongly agree”) and was used in a previous podcasting intervention (Turner-McGrievy et al., 2009)
- Knowledge was measured using a post-test on information presented in both the podcast and website containing five recall and five recognition questions on the content of Healthy Weight.

Data Analysis and Calculation

Power calculations used a similar study and examined changes in SCL with an effect size r of .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 $\alpha = .05$ and power $1 - \beta = 80\%$ were 16 per group. In order to account for attrition, the recruitment goal was 20 participants per group. Survey questions were scored so that all answers were in the same direction (e.g., some items were reverse scored to match the other survey questionnaire items that were in the positive direction). Factor analysis was conducted using Varimax rotation on the user/information control questionnaire and Cronbach's alpha was calculated. Between-subjects t -tests were calculated to examine differences in demographics with continuous variables. For categorical variables, the chi-squared test of independence was used to

determine differences between groups at baseline. In order to examine whether user perceptions of novelty or user control could possibly mediate the relationship between modality and physiological arousal, follow-up analyses to determine whether there was a mediation effect were conducted using established procedures (Baron & Kenny, 1986; Kalyanaraman & Sundar, 2006). Results that had outliers that were 2 standard deviations (SDs) from the mean were run both with and without these data to explore the effect of outliers. All analyses were conducted using SPSS 16.0 for Windows software with a p value of .05 used to indicate statistically significant differences (SPSS for Windows 16.0.1, 2007, SPSS, Inc., Chicago).

Results

Twenty participants completed each arm. Participants were mainly white (87.5%) females (90%) with a mean age of 21.8 ± 5.1 years and a mean body mass index (BMI) of 23.0 ± 5.1 kg/m² who owned MP3 players and had attempted weight loss in the past. The majority of participants were senior- or junior-level, undergraduate students ($n = 28$). There were no significant differences in demographics between groups. There was also no significant difference between groups in baseline SCL (8.4 ± 3.3 podcast vs. 7.4 ± 2.2 website; $p = .23$ between groups).

The main outcomes by group are presented in Table 1. Participants in the podcast group spent a significantly longer time listening to the podcast than the Web group spent reading the website ($p < .001$). Participants in the podcast condition exhibited greater levels of physiological arousal ($0.12 \pm 0.15\%$) (sweat gland output as measured through electrical conductance by the skin; Kalyanaraman & Sundar, 2004) compared to those participants in the Web condition ($0.003 \pm 0.14\%$) ($p < .05$ between groups). The six-item user/information control questionnaire loaded on one factor (eigenvalue of 4.446; $\alpha = .89$). The Web group reporting a greater sense of user control than the podcast group ($p < .001$). Participants in the podcasting intervention reported the intervention to be significantly more novel in the podcast condition than in the Web condition ($p < .001$). There was no difference between groups in knowledge score ($p = .85$).

Given the significant relationship between modality condition and physiological arousal, we employed established procedures (Baron & Kenny, 1986; Kalyanaraman & Sundar, 2006) and performed follow-up analyses to determine whether perceptions of novelty and user control could possibly mediate the relationship between modality and physiological arousal. There was a significant relationship between modality and physiological arousal ($p = .02$) and modality and novelty ($p < .001$), but novelty was not a significant mediator between modality and arousal ($p = .09$). A similar pattern emerged for user control with a significant relationship between modality and physiological arousal ($p = .02$) and modality and user control ($p < .001$), but user control was not a significant mediator between modality and arousal ($p = .09$). Novelty and arousal were significantly correlated ($r = .41$, $p = .008$) but user control and arousal were not ($p = .12$).

Discussion

The present study is among the first to examine the differences in physiological and psychological measures between a podcast and website to deliver health-related content. Both the Web (Tate, Jackvony, & Wing, 2003; 2006; Tate, Wing, & Winett, 2001; Wing et al., 2009) and podcasting (Turner-McGrievy et al., 2009) have been shown to be ways to help people achieve weight loss and create health behavior changes all through remote delivery means. We hypothesized that the podcasting intervention would create greater changes in SCL than the Web intervention, and the study confirmed this hypothesis.

Collecting psycho-physiological measures in media studies is important as it provides objective data on psychosocial arousal and engagement during message processing (Ravaja, 2004). Very few studies in the area of communication and media interface, however, have taken advantage of these objective measures (Ravaja, 2004). The present study employed physiological measures as a way to objectively measure arousal and engagement. Participants listening to a podcast had a greater increase in SCL than those reading the same information on a website. The podcast group accessed the podcast through headphones provided to them, and this may have affected SCL. Information delivered via headphones may provide a more immersive learning experience than listening to the information over speakers (Kallinen & Ravaja, 2007).

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, less than half of all participants reported ever having downloaded a podcast. This lack of familiarity with podcasting may have resulted in a greater sense of novelty among the podcasting group. Although it has been hypothesized that the more novel a medium is perceived to be, the more a user will learn from it (Clark, 1983), we did not find a difference in knowledge between groups. It is unclear whether novelty would persist after listening to several podcasts (versus a single podcast). Novelty of a new media type may not last as a user becomes used to the media (Serif & Ghinea, 2008), so it would be pertinent to see whether these findings would remain consistent over exposure to several podcasts or would be the same among experienced podcast users. Although novelty did not mediate the relationship between modality and physiological response, it is possible that novelty was overlapping with an unmeasured factor that was indeed a mediating variable (Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001). Future research may wish to broaden the psychosocial measures collected that are theoretically driven in order to capture such potential overlapping factors.

A previous weight loss podcasting study comparing two different podcasts found equal numbers of podcast downloads between groups, but the podcast designed using health behavior theory produced significantly greater levels of user control and weight loss than the control podcast (Turner-McGrievy et al., 2009). Because exposure (number of podcasts) was the same between conditions, this difference in user control points to a potential benefit to enhancing user control in electronically delivered interventions to promote weight loss. In the present study, the website group felt more user control than the podcast group. The sense of user control may have been lessened in the podcast group due to a lack of familiarity with the media player for the podcasts. The Web may have been more familiar to participants,

which could have resulted in easier navigation and greater levels of user control. Research has shown that a lower sense of familiarity with device controls leads to a lower sense of user control (Southwell, Anghelcev, Himmelboim, & Jones, 2007). User control, however, did not emerge as a mediating variable in this study for SCL, nor was there higher knowledge gained by the Web group, which reported greater user control than the podcast group. Future research should test whether user control is related to repeated use of the media and health outcomes, neither of which were assessed in the present study.

Web-based and other technology-based interventions can increase knowledge (Wilkinson, Forbes, Bloomfield, & Fincham Gee, 2004). The present study found no differences in knowledge between groups. The website 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 nonlinear 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 regard to knowledge.

Because very few of the participants were currently trying to lose weight, participants may have been less interested in the material presented, and therefore may have had less impression formation (Sundar, Kalyanaraman, & Brown, 2003). Research has shown that if messages presented to the user do not match some aspect of the person's self—such as the person's own goals—then the user will not be persuaded by the information (Petty, Barden, & Wheeler, 2002). Future research should explore these outcomes among participants who are interested in losing weight.

This study presents the first step in examining the role that novelty and user control may play in two different weight loss electronic media, as well as differences in knowledge acquisition. In addition, explorations of physiological responses using SCL allowed for a broader overview of response to the two media (Wilson & Sasse, 1999). The laboratory setting can provide a unique way to measure both psychosocial and physiological variables in a controlled setting before deciding on which variables to include in an intervention among free-living participants. This study provided the first step in seeing whether, with content held similar, differences in user control, novelty, and SCL exist between two different online media. Knowledge acquisition did not differ between media, suggesting both podcasts and Web can be used to deliver information on weight loss. The next step would be to include these potential mediators in a future weight-loss intervention comparing Web and podcast. If differences in weight loss emerged between groups, differences in novelty and user control could help explain the variation in weight loss. If these variables mediated weight loss, they would point to ways the intervention could be enhanced in the future (further increasing user control and/or novelty).

There are some limitations to this study. This laboratory setting held mobility consistent—limiting movement and mobile access to the media in both groups. Podcast participants also 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 content identical to that of the website, it is also possible that the Web group skipped much of the content or selectively scanned the material. Although we were powered

to detect differences in SCL, our sample size was small and may have limited our ability to assess mediating variables. Future research may wish to take these results and test them in a real-world setting, allowing participants to access both audio and written content outside the laboratory. In addition, adding video content to podcasts has been shown enhance the value placed on the information presented (Shantikumar, 2008), and therefore combining audio with video content may enhance knowledge over the use of audio alone.

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 presenting health information via a website. The study employed the use of SCL, which allowed for an objective measure of testing theory-based predictors of arousal and attention. This study was a randomized design and allowed for a controlled comparison of two different media types.

Conclusion

As rates of overweight and obesity continue to rise, it is becoming increasingly important to find ways to deliver health information in a far-reaching, inexpensive, and effective manner. Testing the delivery of these health communication messages using two different media in a laboratory setting is important for several reasons. First, it provides an opportunity to conduct formative work on the content and delivery method of health communication interventions prior to a large scale trial. Formative work has been shown to be a key component of behavioral interventions and allows for greater success in achieving behavior change among participants (Coreil et al., 1998; Corneli et al., 2007; Creed-Kanashiro et al., 2003). Second, it allows for the design of theory-based media and then the ability to test the theory in a laboratory setting, enabling the examination of both psychosocial and physiological variables. Lastly, this study design allows for an interdisciplinary approach to addressing overweight and obesity by drawing on theories and ideas from public health, psychology, medicine, and communication fields.

This study found the podcasts on weight loss produced more physiological arousal and was perceived as more novel than a website with similar information. The Web, however, allowed participants to feel more user/learner control. Given that MP3 players and other mobile devices have greater ownership rates among minority groups (Rainie & Madden, 2005; Smith, 2010), these findings have implications for developing mobile interventions to reach populations that are normally difficult to reach in health behavior research (Robinson & Trochim, 2007; Shavers-Hornaday, Lynch, Burmeister, & Torner, 1997). In order to test the messages among a population that is interested in the topic, future studies should be conducted among overweight individuals interested in achieving a healthy weight. 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 or a website with more interactive content (including video).

Acknowledgments

The authors thank the Lineberger Cancer Control Education Program as part of the Cancer Control Education Program (R25 CA057726-17) for providing funding for this study and Lelia Crosby for her research assistance. The CHAI core, supported in part by a grant from the National Institutes of Health (NIH; DK056350) to the University

of North Carolina Clinical Nutrition Research Unit, was used for design of the website. This article is in memory of our coauthor, Marci Campbell. This research work would not have been possible without her wisdom, support, and guidance.

References

- Anderson-Bill ES, Winett RA, Wojcik JR. Social cognitive determinants of nutrition and physical activity among web-health users enrolling in an online intervention: The influence of social support, self-efficacy, outcome expectations, and self-regulation. *Journal of Medical Internet Research*. 2011; 13:e28. [PubMed: 21441100]
- Ariely D. Controlling the information flow: Effects on consumers' decision making and preferences. *Journal of Consumer Research*. 2000; 27:233–248.
- Bandura A. Health promotion by social cognitive means. *Health Education and Behavior*. 2004; 31:143–164. [PubMed: 15090118]
- Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*. 1986; 51:1173–1182. [PubMed: 3806354]
- Berkel LA, Poston WS, Reeves RS, Foreyt JP. Behavioral interventions for obesity. *Journal of the American Dietetic Association*. 2005; 105:S35–43. [PubMed: 15867894]
- Bock BC. Opportunities and challenges in behavioral informatics: Observations on the pounds off digitally study. *American Journal of Preventive Medicine*. 2009; 37:377–378. [PubMed: 19765512]
- Clark RE. Reconsidering research on learning from media. *Review of Educational Research*. 1983; 53:445–459.
- Coreil J, Losikoff P, Pincu R, Mayard G, Ruff AJ, Hausler HP, et al. Halsey NA. Cultural feasibility studies in preparation for clinical trials to reduce maternal–infant HIV transmission in Haiti. *AIDS Education and Prevention*. 1998; 10:46–62. [PubMed: 9505098]
- Corneli AL, Piwoz EG, Bentley ME, Moses A, Nkhoma JR, Tohill BC, et al. van der Horst C. Involving communities in the design of clinical trial protocols: The ban study in Lilongwe, Malawi. *Contemporary Clinical Trials*. 2007; 28:59–67. [PubMed: 17000137]
- Creed-Kanashiro HM, Bartolini RM, Fukumoto MN, Uribe TG, Robert RC, Bentley ME. Formative research to develop a nutrition education intervention to improve dietary iron intake among women and adolescent girls through community kitchens in Lima, Peru. *Journal of Nutrition*. 2003; 133:3987S–3991S. [PubMed: 14672300]
- Eccles M, Grimshaw J, Walker A, Johnston M, Pitts N. Changing the behavior of healthcare professionals: The use of theory in promoting the uptake of research findings. *Journal of Clinical Epidemiology*. 2005; 58:107–112. [PubMed: 15680740]
- Eveland WP, Cortese J. How web site organization influences free recall, factual knowledge, and knowledge structure density. *Human Communication Research*. 2006; 30:208–233.
- Eveland WPJ, Dunwoody S. User control and structural isomorphism or disorientation and cognitive load?: Learning from the web versus print. *Communication Research*. 2001; 28:48–78.
- Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among us adults, 1999–2008. *Journal of the American Medical Association*. 2010; 303:235–241. [PubMed: 20071471]
- Fox, S. Pew Internet and American Life Project: The social life of health information, 2011. 2011. <http://pewinternet.org/reports/2011/social-life-of-health-info/summary-of-findings.aspx>, archived at <http://www.Webcitation.Org/61imndlxs>.
- Furnham A. Remembering stories as a function of the medium of presentation. *Psychological Reports*. 2001; 89:483–486. [PubMed: 11824703]
- Hansen J, Holm L, Frewer L, Robinson P, Sandøe P. Beyond the knowledge deficit: Recent research into lay and expert attitudes to food risks. *Appetite*. 2003; 41:111–121. [PubMed: 14550309]
- Ivory JD, Kalyanaraman S. The effects of technological advancement and violent content in video games on players' feelings of presence, involvement, physiological arousal, and aggression. *Journal of Communication*. 2007; 57:532–555.

- Kallinen K, Ravaja N. Comparing speakers versus headphones in listening to news from a computer— Individual differences and psychophysiological responses. *Computers in Human Behavior*. 2007; 23:303–317.
- Kalyanaraman S, Sundar SS. Arousal, memory, and impression-formation effects of animation speed in web advertising. *Journal of Advertising*. 2004; 33:7–17.
- Kalyanaraman S, Sundar SS. The psychological appeal of personalized content in web portals: Does customization affect attitudes and behavior? *Journal of Communication*. 2006; 56:110–132.
- Kraemer HC, Stice E, Kazdin A, Offord D, Kupfer D. How do risk factors work together? Mediators, moderators, and independent, overlapping, and proxy risk factors. *American Journal of Psychiatry*. 2001; 158:848–856. [PubMed: 11384888]
- Kristof, R.; Satran, A. *Interactivity by design*. Mountain View, CA: Adobe Press; 1995.
- Ley, P. *Communicating with patients: Improving communication, satisfaction and compliance*. London: Chapman Hall; 1988.
- Madden, M. Podcasting into the cloud. Pew Internet and American Life project. 2008. <http://www.pewinternet.org/commentary/2008/september/podcasting-into-the-cloud.aspx>, archived at <http://www.webcitation.org/5ydulsor0>
- Madden, M.; Jones, S. Podcast downloading 2008. Pew Internet and American Life project. 2008. <http://www.pewinternet.org/reports/2008/podcast-downloading-2008.aspx?R=1>, archived at <http://www.webcitation.org/5ydudqk0o>
- Mendelson A. Effects of novelty in news photographs on attention and memory. *Media Psychology*. 2001; 3:119–157.
- Mukherjee A, Hoyer WD. The effect of novel attributes on product evaluation. *Journal of Consumer Research*. 2001; 28:462–472.
- Partala T, Surakka V. The effects of affective interventions in human-computer interaction. *Interacting With Computers*. 2004; 16:295.
- Petty, RE.; Barden, J.; Wheeler, SC. Elaboration likelihood model of persuasion: Health promotions that yield substantial behavioral change. In: DiClemente, RJ.; Crosby, RA.; Kegler, M., editors. *Emerging theories in health promotion practice and research: Strategies for improving public health*. San Francisco, CA: Jossey-Bass; 2002. p. 71-99.
- Rainie, L.; Madden, M. Pew Internet and American Life data memo: Podcasting (April 2005). 2005. http://www.pewinternet.org/~media/files/reports/2005/pip_podcasting2005.pdf, archived at <http://www.webcitation.org/60kgbm3eh>
- Ravaja N. Contributions of psychophysiology to media research: Review and recommendations. *Media Psychology*. 2004; 6:193–235.
- Robinson JM, Trochim WMK. An examination of community members', researchers' and health professionals' perceptions of barriers to minority participation in medical research: An application of concept mapping. *Ethnicity & Health*. 2007; 12:521–539. [PubMed: 17978947]
- Serif T, Ghinea G. Mobile information access in the real world: A story of three wireless devices. *Computers in Human Behavior*. 2008; 24:1385–1403.
- Shantikumar S. From lecture theatre to portable media: Students' perceptions of an enhanced podcast for revision. *Medical Teacher*. 2008; 31:535–538. [PubMed: 18937140]
- Shavers-Hornaday VL, Lynch CF, Burmeister LF, Torner JC. Why are African Americans under-represented in medical research studies? Impediments to participation. *Ethnicity & Health*. 1997; 2:31–45. [PubMed: 9395587]
- Smith, A. Mobile access 2010. Pew Internet and American Life project. 2010. <http://pewinternet.org/reports/2010/mobile-access-2010.aspx>, archived at <http://www.webcitation.org/5yduuw6z6>
- Southwell BG, Anghelcev G, Himmelboim I, Jones J. Translating user control availability into perception: The moderating role of prior experience. *Computers in Human Behavior*. 2007; 23:554–563.
- Southwell BG, Lee M. A pitfall of new media? User controls exacerbate editing effects on memory. *Journalism & Mass Communication Quarterly*. 2004; 81:643–656.
- Sundar SS, Kalyanaraman S. Arousal, memory, and impression-formation effects of animation speed in web advertising. *Journal of Advertising*. 2004; 33:7–17.

- Sundar SS, Kalyanaraman S, Brown J. Explicating web site interactivity: Impression formation effects in political campaign sites. *Communication Research*. 2003; 30:30–59.
- Tate DF, Jackvony EH, Wing RR. Effects of Internet behavioral counseling on weight loss in adults at risk for type 2 diabetes: A randomized trial. *Journal of the American Medical Association*. 2003; 289:1833–1836. [PubMed: 12684363]
- Tate DF, Jackvony EH, Wing RR. A randomized trial comparing human e-mail counseling, computer-automated tailored counseling, and no counseling in an Internet weight loss program. *Archives of Internal Medicine*. 2006; 166:1620–1625. [PubMed: 16908795]
- Tate DF, Wing RR, Winett RA. Using Internet technology to deliver a behavioral weight loss program. *Journal of the American Medical Association*. 2001; 285:1172–1177. [PubMed: 11231746]
- Trelease RB. Diffusion of innovations: Smartphones and wireless anatomy learning resources. *Anatomical Sciences Education*. 2008; 1:233–239. [PubMed: 19109851]
- Turner-McGrievy GM, Campbell MK, Tate DF, Truesdale KP, Bowling JM, Crosby L. Pounds off digitally study: A randomized podcasting weight-loss intervention. *American Journal of Preventive Medicine*. 2009; 37:263–269. [PubMed: 19765496]
- Wantland DJ, Portillo CJ, Holzemer WL, Slaughter R, McGhee EM. The effectiveness of web-based vs. Non-web-based interventions: A meta-analysis of behavioral change outcomes. *Journal of Medical Internet Research*. 2004; 6:e40. [PubMed: 15631964]
- Wilkinson A, Forbes A, Bloomfield J, Fincham Gee C. An exploration of four web-based open and flexible learning modules in post-registration nurse education. *International Journal of Nursing Studies*. 2004; 41:411–424. [PubMed: 15050852]
- Wilson, G.; Sasse, MA. Do users always know what's good for them? Utilising physiological responses to assess media. In: McDonald, S.; Waern, Y.; Cockton, G., editors. *Proceedings of HCI 2000: People and computer XIV—Usability or else!*. Edinburgh, Scotland: 1999. p. 327-339.
- Wing RR, Pinto AM, Crane MM, Kumar R, Weinberg BM, Gorin AA. A statewide intervention reduces BMI in adults: Shape up Rhode Island results. *Obesity*. 2009; 17:991–995. [PubMed: 19180068]
- Wise, K.; Reeves, B. The effects of user control on the cognitive and emotional processing of pictures. Paper presented at the annual meeting of the International Communication Association; New York, NY. 2009.
- Zhang P, von Dran GM. Satisfiers and dissatisfiers: A two-factor model for website design and evaluation. *Journal of the American Society for Information Science*. 2000; 51:1253–1268.

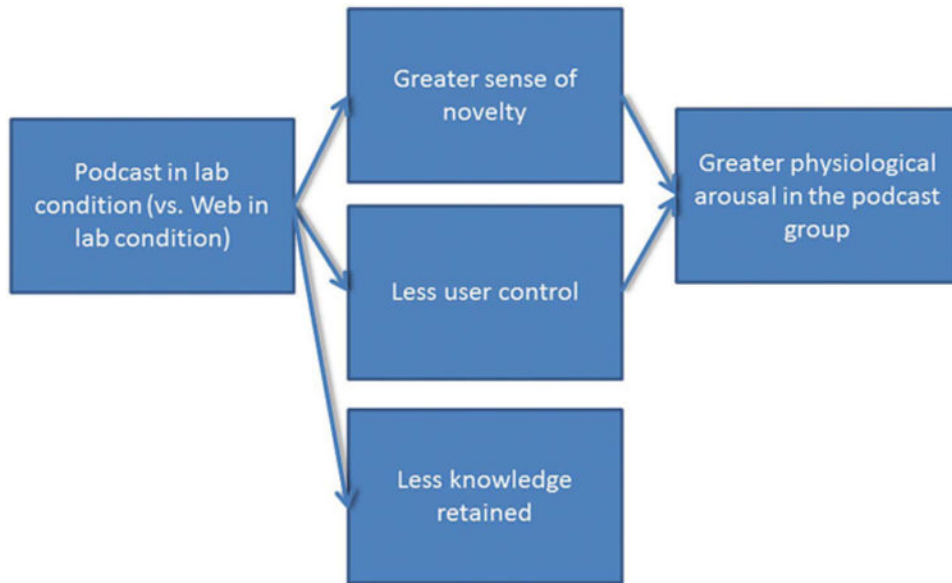


Figure 1. Conceptual model for a podcasting versus Web-based weight-loss intervention examining the role of knowledge and of how novelty and user control related to physiological arousal (color figure available online).

Table 1
Survey and Skin Conductance Level Results Measured in the Podcast and Web groups

	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 (higher value corresponds with greater arousal)</i>	0.12 (±0.15) %	0.003 (±0.14) %	<0.05
<i>User/Information Control questionnaire</i> (possible score range 7–63 where a higher score reflects a greater sense of control)	30.2 (±9.1)	50.7 (±9.2)	<0.001
<i>Novelty questionnaire</i> (possible score range 2–18 where a higher score reflects a greater perceived sense of novelty)	8.4 (±3.5)	4.4 (±2.6)	<0.001
<i>Knowledge Test score</i> (possible score range 0–10)	7.3 (±1.4)	7.4 (±1.5)	.849

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript