INTERNET TECHNOLOGY AND SOCIAL SUPPORT: ARE THEY BENEFICIAL FOR OVERWEIGHT OLDER ADOLESCENTS?

A Dissertation

by

WENDY ANN OLSON

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2010

Major Subject: Psychology

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ABSTRACT

Internet Technology and Social Support: Are They Beneficial for Overweight Older Adolescents? (August 2010)

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In recent years, literature in the area of web-based interventions for health-related concerns has burgeoned due to the increasing popularity and accessibility of the World Wide Web. Researchers have investigated the success of web-based programs to facilitate improved health behaviors, weight loss, and social support. However, due to the relatively recent application of web-based health-behavior programs, little research has studied whether these interventions are effective with overweight older adolescents. The purpose of this study was to test the application of health behavior theory in an on-line intervention designed to address health behaviors such as exercise and nutrition in a sample of overweight older adolescents. Using a pre-test, post-test, randomized, control group design, participants (n=71) were randomly assigned to either the comparison (Information) group, or the treatment (Information plus Discussion) group. Specific aims of the study were: 1) To test a new health behavior theory, the Model of Influence of Social Support on Health Behavior (MISSHRB), in a group of older adolescents; 2) To determine the feasibility and clinical utility of an internet intervention for social

support for overweight older adolescents, and 3) To examine the impact of that intervention on the MISSHB variables. Results provided partial support for the MISSHRB, with social support correlating significantly with expectancies, attitudes, and perceived behavioral control. Results also provided support for the hypotheses that family general support, family specific support, attitudes, and engagement in health behaviors would improve over time. Results supported the feasibility of using an internet intervention with overweight older adolescents, with participants easily engaging in the study, fulfilling study requirements and reporting improved perceptions of the utility of online groups for providing social support. Additionally, results approached significance for medical outcomes, with trends representing Body Mass Index decrease over time, and suggesting that the Information plus Discussion group lost more weight than the Information group. These data suggest that internet information and discussion groups have promise as a means of social support for older overweight adolescents who are interested in improving their health behaviors. These results also provide information about the usefulness of web-based programs in facilitating overweight older adolescents' engagement in health-related behaviors and the utilization of internet support groups for other marginalized or socially stigmatized groups.

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INTRODUCTION

Interest has grown in the use of internet technology and computer-mediated communication (e.g., email, chat, and discussion boards) to promote and facilitate adherence to a variety of health-related behaviors. In recent years, literature in the area of web-based interventions for weight loss, weight management, and social support has burgeoned due to the increasing popularity and accessibility of the World Wide Web. Although some researchers have investigated the success of web-based programs to enhance perceived social support for overweight and dieting persons, little research has addressed these topics together, or with older adolescents.

The current project reviewed health behavior theory as it relates to internet technology, health behaviors, and medical outcomes in overweight older adolescents. Health behavior theory was used to conceptualize and create an online support network for older adolescents who are overweight. The results provide a better understanding of the utility of web-based applications and the role that social support, in a computer-mediated environment, can play in engagement in health behaviors relating to weight management.

Internet Technology

Rapid growth in the area of internet technology has allowed individuals to access

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This dissertation follows the style of *Journal of Pediatric Psychology*.

a variety of information about health, medicine, and lifestyle (Wright & Bell, 2003). This interest in and use of computers as a medium for communication has allowed people with health concerns and questions to engage in correspond with individuals coping with similar issues (Wright & Bell, 2003).

Internet technology has been used to promote information sharing among overweight individuals (Tate, Wing, & Winett, 2001), as a forum for social support (Dew et al., 2004), and as a medication management and information tool (Baker, Wagner, Singer, & Bundorf, 2003). Internet technology has the potential to improve the quality of life for many people, which in turn can lead to a reduction in the cost burden of illness and health care (Gustafson, Robinson, Ansley, Adler, & Brennan, 1999). The trend toward patient involvement and management of health care lends itself nicely to the use of the internet and web-based programs. Therefore, it is a likely medium for increasing social support and healthy behaviors (e.g., exercise, healthy eating habits) among overweight individuals.

It is estimated that between 75 and 80% of the United States population with internet access has used it to access health care information (Fox, 2008). In addition, the U.S. Census Bureau reported that 17% of the population accessed chat rooms or listservs in 2001 (Baker, et al., 2003). Although the internet is increasingly used by the public to learn about health care and treatment, health care consumers are also turning to the internet for support and advice. However, pros and cons exist regarding the use of the internet for health care information, support, and advice.

The internet is accessible by many people with minimal effort and low cost at any time, and increasingly, any place. For consumers seeking information about health care and treatment of illnesses, the internet provides dissemination of expert information and opinions to a large audience. The internet also allows individuals to search for sensitive health care information in the privacy of their own homes, avoiding costly doctor visits and awkward conversations with health care providers (Morahan-Martin, 2004). When used as an informational tool, the internet can also be useful in equipping consumers with information and thoughtful questions that provoke contemplation about health care or health behaviors. This cognitive preparatory activity can enhance physician-patient communication and allow for health care visits that are more productive (Baker et al., 2003; Bull, McFarlane, & King, 2001).

Barriers and concerns also exist regarding the use of the internet. The quality and accuracy of some information found on the World Wide Web has been questioned and concerns have been raised regarding privacy (Baker et al., 2003; Bull et al., 2001). In addition, although many people have access to the internet, accessibility is not universal or consistently predictable. For example, persons less likely to access information via the internet include non-whites, individuals with less than a high school education, and households earning less than $30,000 per year (Morahan-Martin, 2004). Consumers can also reject an internet health site. Some reasons why individuals might navigate away from a health-oriented website include overt commercialism, an inability to determine the source of information, and an inability to determine the veracity of the information (Morahan-Martin, 2004).

Methodological Concerns. Although the internet is a promising medium for the delivery of health care information, social support, and data collection, research in this area has encountered various methodological issues and concerns, such as inability to verify self-report data and eligibility for participation in online surveys and treatment interventions (Baker et al., 2003). For example, it is difficult to verify if individuals in a sample collected online are representative of the population of interest. In addition, information often is not available about individuals who choose not to participate in online surveys or interventions and for individuals who do participate, follow up is difficult (Baker et al., 2003; Bull et al., 2001).

Little is known about individual motivation to access various internet health applications and programs. Without information about who experiences lack of motivation or lack of access to internet programs, researchers and clinicians cannot address these problems or work toward solutions (Bull et al., 2001). Therefore, continued investigations in this area will be important to improve our understanding and develop solutions to these problems.

Forms of Delivery. The internet is used in myriad ways to deliver health care information and social support, such as individual provider websites, discussion and information forums, email, and chat rooms. These information systems may be more passive, allowing users to search for and read about relevant information, or they can be more active. Active information systems include surveys, self-assessments, and opportunities to email, ask questions and receive feedback tailored to an individual's specific interests (Bull et al., 2001). Information systems can also be a combination of

both active and passive, with the user having the ability to search for information and ask questions when desired, as well as simply browse and monitor questions posted by other users (Bull et al., 2001).

Insurance companies, health care groups, health maintenance organizations (HMOs), or individual service providers may maintain provider websites. Websites may include a variety of services for the interested consumer, such as information about services offered, times of operation, frequently asked questions, and links to other medical providers or resources.

One form of computer-mediated communication is email. Email communication can occur within the context of a discussion or information forum, or as a means of contacting health care providers and professionals. For example, a health care provider's website may invite questions and requests for appointments or medical information via email. An information forum may utilize email to respond individually to questions not addressed in the forum or as a way to connect interested members of the group with each other in a more personal manner. Email can be an effective way to increase communication with health care providers, allowing providers to read and answer messages in a convenient manner (Street & Piziak, 2001). Email can also allow clinicians and organizations to easily remind patients about appointments, and provide added support and information relating to patient health care concerns (Street & Piziak, 2001).

Email communication is not without difficulties. For example, the way in which a message is intended to be perceived is not always evident from written words on a

page. Readers of email communication can easily misinterpret or misperceive the tone of the communication, which in turn creates a barrier to effective communication. Further, many providers, based on HIPPA regulations, have a policy to not communicate electronically with patients or individuals seeking services because the privacy or confidentiality of such communications cannot be guaranteed. Federal and other medical record regulations provide consumers with protections regarding information about them and their personal health information that cannot be effectively secured via email or the internet. Practitioners have an ethical and legal obligation to inform consumers about these issues and to not promote unsecured communications (Rice, Peterson, & Christine, 2001).

Another frequently used form of computer-mediated communication is the internet discussion board. Discussion boards are sites where individuals can seek information, ask questions, and interact to give and receive support. Discussion board forums may be either informational or discussion oriented in nature. In an information-centered forum, individuals visiting the website may be allowed to post questions online, and receive answers, as well as to access archived questions and answers (Eysenbach, 2004). A health care professional may moderate these forums to ensure that accurate information is provided. However, the credentials of those moderating such forums are variable, and this has been a concern raised regarding the veracity of information available on health-oriented websites (Eysenbach, 2004). Discussion board information forums allow individuals to access information and topics that have been covered in the past through the use of archived mail strings and subjects. In addition to providing a

source of information, these forums have been shown to be effective in providing social support for people coping with various health concerns (Wright & Bell, 2003).

Akin to discussion boards are internet chat rooms. Chat rooms are websites in which individuals can interact with each other in a real time environment. Chat rooms range from free access, meaning that anyone can log in and communicate, to members only. Typically, the requirements for membership entail registering with the chat room moderator and providing an active email address. Membership can also be more exclusive, with fees involved (e.g., Weight Watchers). In a chat room environment, participants are free to ask and answer questions at their own discretion. This allows individuals to chat about topics of interest to them or topics about which they have some opinion, knowledge, or experience (Eysenbach, 2004). Many people prefer chat rooms because they allow for instant feedback and social contact. These venues have the capability to provide information, enhance and facilitate patient-provider communication, and provide peer support (Eysenbach, 2004). However, criticism has been levied at the use of chat rooms for health care information. Concerns that have been raised include the anonymity of users (and thus the inability to verify personal information or credentials), the veracity of information provided, and the absence of licensed, qualified health care professionals (Rice et al., 2001).

Adolescents and the Internet. Adolescent internet use has increased exponentially since the early 1990s, and recent reports estimate that 93% of adolescents ages 18-29 regularly access the internet (Fox & Jones, 2009). Adolescents may have access to the internet in their homes, at school, and in libraries. Increasingly, internet

access is also available in bookstores, coffee shops, and restaurants, making the World Wide Web easily accessible. Internet access is convenient for current adolescent lifestyles, and adolescents are comfortable with accessing information online, doing so regularly (Gross, 2004). However, an area in which adolescents may need to more easily obtain information is in the area of health care. Older adolescents are at an age where they may be expected to take more responsibility for their health care, particularly once they leave home to go to college. However, adolescents may not have easy access to health information, or they may feel embarrassed to ask parents or health care providers.

The use of the internet for dissemination of health care information marries the need for health care information with the comfort, accessibility, and familiarity of a medium adolescents are used to using. The World Wide Web is available at all hours, and may be accessed in the privacy of one's own home. For older adolescents living away from home, internet accessibility is also often available in dorm rooms or campus computing centers. Web-based programs that include online discussion forums are a medium for older adolescents wishing to change some aspect of their health behavior to share information, discuss concerns of a sensitive nature, and problem-solve. In addition, online discussion forums can offer overweight older adolescents with positive peer interaction and modeling of healthy eating and exercise behaviors.

Overweight in Older Adolescents

In the literature pertaining to health and behavior change, individuals between the ages of 18-24 years have been referred to as older adolescents (e.g., Bass, Enochs, & DiBrezzo, 2002; Johnson, Nichols, Sallis, Calfas, & Hovell, M.,1998). This group of individuals, in the process of transitioning from a developmental period characterized by reliance on parents and caregivers to one characterized by increased autonomy and control, faces unique and varied challenges. The increased autonomy and changing developmental tasks, combined with the health risks and psychosocial implications of being overweight as an older adolescent make this an area in need of research.

Many challenges are faced by older adolescents, such as coping with newly acquired autonomy and accompanying responsibility, role confusion, identity, and relationships. In addition, during this developmental period many older adolescents may attend college and/or live away from home for the first time. This newly acquired independence can often result in feelings of uncertainty, confusion, and loneliness. Older adolescents must cope with, some for the first time, the responsibility of making decisions on their own. Likely, these include decisions about health behaviors such as eating and exercising.

Overweight has been well researched in recent years. According to the Centers for Disease Control, 37.9 % of older adolescents ages 18- to 24-years-old have a BMI above 25 (Schoenborn, Adams, Barnes, Vickerie, & Schiller, 2004). This high percentage of obesity in older adolescents has been linked to lack of exercise, increased portion sizes, unhealthy eating behaviors, and lack of information about proper

nutritional and activity behaviors. An increased awareness about the importance of psychosocial and health outcomes has led researchers to investigate these variables in overweight individuals (e.g., McCabe, Ricciardelli,& Holt, 2005; Schultz & Chase-Carmichael, 2001).

For many older adolescents, especially those who attend college, this can be a time when physical appearances are of utmost importance. The ability to wear the latest fashions and styles, to conform to the social ideal, and to feel approval from peers all play a role in the stressors older adolescents face. The burden of being overweight and the accompanying stressors can make for a particularly difficult set of problems for the overweight older adolescent. Overweight older adolescents may have to cope with peer teasing, conflicting social norms, negative attitudes toward overweight, and feelings of depression relating to weight management issues (Dong, Sanchez, & Price, 2004; Fulkerson, Sherwood, Perry, Neumark-Sztainer, & Story, 2004; Riva, 1996). Overweight older adolescents may also feel dissatisfied with their body shape and at times feel out of control regarding their ability to change their behaviors (Fulkerson et al., 2004; Riva, 1996).

In addition to psychological distress, overweight older adolescents are at increased risk for medical problems such as diabetes, heart disease, and joint problems (Fulkerson et al., 2004). According to the National Institutes of Health (2006), an increase in mortality rate is associated with a BMI $\geq$ 30. Obese individuals have a 50 to 100 percent increased risk of death from all causes, compared with normal-weight individuals, with the majority of this increased risk due to cardiovascular causes.

According to the National Institutes of Health (2006), it is estimated that the life expectancy of a moderately obese person could be shortened by two to five years, and that of individuals with a BMI over 45 could lose up to 20 years, depending on gender and ethnicity.

Overweight older adolescents may struggle with appropriate and effective weight management strategies. Older adolescents looking for a quick fix may resort to medically unsafe medications, fad diets, smoking, and even purging behaviors to lose unwanted pounds (Linde, Jeffrey, Levy, Sherwood, Utter, Pronk, & Boyle, 2004). These behaviors can be an unsafe and unhealthy way of coping with overweight.

Given the implications of overweight for long-term health, investigators have begun to examine a number of correlates that might have implications for the remediation of this problem. Psychosocial correlates, particularly social support, are particularly relevant to the design of non-medical interventions for overweight.

Social Support and Overweight. Evidence is limited, yet growing numbers of people incorporate social support for help in learning about and engaging in healthy eating and nutrition behaviors. Therefore, it is important to determine empirically if social support is a key component of health behavior change in areas of weight, nutrition, and exercise. Researchers have identified several different types of social support in the health behavior literature. These include general support from friends and family (Perri, 1998), support specific to health related behaviors from friends and family (Harvey-Berino, Pintauro, Buzzell & Gold, 2004), and support from outside groups (Burrows, Loader, Pleace & Muncer, 2000).

One effective strategy for maintaining weight loss is social support from friends and family (Perri, 1998). Combining professional guidance, skills training, exercise, and social support specific to health behaviors has been shown to be an effective weight maintenance strategy (Harvey-Berino et al., 2004; Perri., 1998; Wing & Jeffery, 1999). In addition, when current friends or family are insufficient or unavailable, new peer contacts may serve as helpful social support (Helgeson & Gottleib, 2000).

In an investigation of the correlates of physical activity in adolescents, De Bourdeaudhuij and Sallis (2002) reported that a socially supportive environment was correlated with physical activity for male and female adolescents 16-to 24- years-old. Specifically, an environment in which with friends or family members consider physical activity to be important, and in which they provide direct support to adolescents, was positively correlated with increased physical activity (De Bourdeaudhuji & Sallis, 2003).

Social support from peers, family, and individuals sharing similar interests and problems has been shown to be beneficial in promoting healthy behaviors, increasing psychological health and satisfaction (Harvey-Berino et al., 2004), and alleviating depressive symptoms (Xie, Chou, Spruijt-Metz, Liu, Xia, Gong, Li & Johnson, 2005).

A key aspect of social support is communication, and the recent growth of internet support groups has increased the number of relationships individuals have access to, allowing them to offer and receive social support (Wright & Bell, 2003). In addition, the lack of visual cues regarding personal characteristics such as race, social class, and appearance can allow supportive relationships to develop based on shared interests in the absence of other interpersonal variables (Wright & Bell, 2003).

Currently, many commercial weight loss programs tout the positive impact of social support on weight loss outcomes (e.g., Weight Watchers), including in-person and computer mediated forms of interaction, information sharing, and support. Researchers have suggested that social support interventions should be targeted to increase the perception of support, as this perception is correlated with a sense of well-being (Wethington & Kesler, 1986).

A growing number of people use the internet to give and receive social support, which is particularly true for people dealing with various health concerns (Wright & Bell, 2003). Researchers have debated numerous reasons why social support via the internet (e.g., in a chat room or discussion board forum) is beneficial. These reasons include reduced stigma of the health condition due to lack of visual cues or personal information, ability to disclose information at a pace comfortable to the user, and similarity to other group members (Wright & Bell, 2003). Although some may argue that all of these variables may also be present in face-to-face, traditional support groups, the relative anonymity that the internet provides may stimulate a quicker and deeper sharing of information among group members.

Depression. Research has demonstrated relations among health behaviors (e.g., alcohol use, tobacco use, and illegal drug use) and depression (Harvey-Berino et al., 2004). However, more research is needed to investigate the relations among depression and weight-related health behaviors (Fulkerson et al., 2004). As Stunkard, Faith and Allison (2003) state: "the prevalence of depression (10%) and overweight (65%) indicates that there is a probability that they will co-occur" (p.1). Although there has

been a dearth of research aimed specifically at investigating the relation between these variables, there is a steadily growing recognition of the likelihood that understanding the relation will allow researchers and clinicians to improve their ability to treat both overweight and depression.

In an investigation of psychosocial correlates of weight gain and loss, Tiggeman (1994) reported that weight loss was associated with increased happiness, while weight gain was associated with decreased happiness. Research has also been conducted to examine the relations between physical activity and mood. Babyak, Blumenthal, Herman, Khatri, Doraiswamy, Moore, Craighead, Baldewicz, and Krishnan (2000) found that, among individuals with major depressive disorder diagnoses, exercise therapy was associated with significant therapeutic benefit. Participants were randomly assigned to a four month intervention in which received either exercise, medication therapy, or a combination of exercise and medication. Depression was measured at baseline, four months, and six months following the end of treatment. While all three groups reported fewer depressive symptoms at the end of four months, after ten months participants in the exercise groups reported significantly fewer depressive symptoms than individuals who received medication therapy alone. In addition, participants in the exercise groups were significantly less likely to meet diagnostic criteria for major depressive disorder at six month follow-up than were participants in the medication therapy condition.

Heo, Pietrobelli, Fontaine, Sirey and Faith (2006) investigated the association between depressive mood and overweight and obesity. Reporting mood for the month

prior to assessment, young (18-45 years) overweight (BMI 25-30) and obese (BMI > 30) women were significantly more likely to have experienced depressive mood than women who were not overweight or obese. Young (18-45 years) overweight men were significantly more likely to have experienced depressive mood than men who were not overweight or obese. Young obese women were also significantly more likely to have a sustained depressive mood than those women who were not overweight or obese.

To address the research question of the role of depression in overweight, Tuthill, Slawik, O'Rahilly and Finer (2006) assessed psychological co-morbidity in obese individuals seeking treatment. Participants aged 18-47 completed questionnaires about depression symptoms, eating habits, and quality of life. Two hundred fifty three questionnaires were evaluated. Of these, there were elevated scores for depression in 48% of the sample. In addition, approximately one-third of participants reported a significant impaired quality of life. The authors concluded that the results demonstrate the high co-morbidity rate of psychological disorders in obese individuals, and warrant attention in the treatment of this population.

Other obesity-related health behaviors have also been investigated in relation to mood. Fulkerson et al. (2004) found that attitudes such as caring about eating healthy food and exercising were significantly negatively associated with depressive symptoms. In addition, attitudes regarding perceived barriers to healthy eating were significantly positively associated with depressive symptoms (Fulkerson et al., 2004). Based on the results of this line of research, it is reasonable to suggest that individuals who are overweight are likely to report symptoms of depression. Infact, in a recent investigation

of mood, hunger, and attention, Hepworth, Mogg, Brignell and Bradley (2010) found that depressed mood was correlated with feelings of subjective hunger and attentional biases toward food. This finding lends credence to the hypothesis that depressed mood may lead to increased eating in some people, and provides support for its inclusion in the MISSHRB. Learning more about the role depression plays in health behaviors and medical outcomes will allow researchers and clinicians to tailor assessments and interventions to the overweight population.

Web-Based Programs

As use of the internet and computers has grown, so has the use of these media to deliver weight management programs. Some researchers have reported on the effectiveness of web-based interventions aimed at overweight individuals. Harvey-Berino, Pintauro, Buzzell, DiGuilio, Casey-Gold, Moldovan, and Ramirez (2002) found that following a weight loss intervention, participants aged 18-54 assigned to an in-person weight maintenance condition kept off more weight than those assigned to an internet support condition. However, in a later study, Harvey-Berino et al. (2004) found that following an interactive televised weight loss program, participants aged 18-54 randomly assigned to in-person support conditions did not differ from individuals assigned to an internet support condition in weight loss maintenance. The authors concluded that these results provide support for the utility of internet based long-term weight maintenance.

Williamson, Martin, White, Newton, Walden, York-Crowe, Alfonso, Gordon and Ryan (2005) conducted a randomized controlled trial to test the efficacy of an internet-

based program for weight management in African-American girls. Fifty-seven overweight or obese adolescent (ages 11-17) African-American girls were randomly assigned to an interactive behavioral internet program or an internet health education program. The behavioral intervention consisted of a highly interactive online community and internet counseling. The health education program (control condition) was a passive (non-interactive) educational program with no counseling. Williamson et al. (2005) reported that, compared to the control condition, adolescents in the behavioral treatment condition lost more body fat (group difference =1.6% body fat). In addition, adolescents in the behavioral group reported a lower dietary fat intake at six months. The authors concluded that the internet-based behavioral intervention was superior to internet-based health education (Williamson et al., 2005).

Tate et al. (2001) investigated whether a structured internet weight loss program including individualized feedback produced greater weight loss and waist circumference change than a weight loss education web site. Sixty-five overweight adults aged 18- to 60-years-old with a BMI between 25 and 36 completed the six month study. At six months, the behavior therapy group lost significantly more weight than the education group. Additionally, more participants in the behavior therapy group achieved a 5% weight loss goal at the end of 6 months. The behavior therapy group participants also achieved greater reduction in waist circumference than participants in the education group at six months. The authors concluded that internet and e-mail appear to be viable methods for the implementation of structured behavioral weight loss programs (Tate et al., 2001).

In an exploration of the ability of the internet to provide a medium for self-directed behavior change, McCoy, Couch, Duncan, and Lynch (2005) created an online weight loss program emphasizing physical activity and dietary modifications. The program was made available to internet consumers free of charge. Four hundred sixty four participants, ages 18-63, enrolled in the program. Results were obtained from an online questionnaire completed by users. McCoy et al. (2005) reported that fifty six percent of participants agreed that the online program assisted them in achieving their weight loss goals. Additionally, participants viewed the welcome page an average of 29 times each, suggesting that participants found information on the welcome page useful. These preliminary data fail to provide detailed information about the specific characteristics (e.g., weight, physical activity, dietary intake) of users. However, the authors state that these results demonstrate the willingness of the general public to use an internet-based weight loss program (McCoy et al., 2005).

With the increasing use of the internet as a tool for health information, help, and support, it is likely that research will continue to address the quality and efficacy of such interventions. There are few studies that address the use of internet interventions for health and social support that have taken place outside a medical setting (e.g., hospitals and counseling centers), and with college aged (i.e., older adolescent) participants. Research with this age group is important for several reasons. First, college is a time when older adolescents are becoming more independent, often making health and nutrition choices on their own for the first time. Older adolescents are also responsible for making their own exercise choices, and learning to shop and plan for healthy meals

and snacks, making this an ideal opportunity for education and intervention in these areas.

Another reason this age group is of interest is their familiarity with and use of technology. Individuals in the 18-29 year age range are estimated to use the internet and other electronic media more heavily than any other group (Purcell, 2010), making older adolescents an apt audience to target inventions toward. Finally, the literature has documented that with regards to health behaviors, older adolescents are at risk for failing to perceive the long-term risks (e.g., heart problems, type II diabetes) of various health behavior decisions (Teese & Bradley, 2008). This inability to perceive the health threat of being overweight, combined with the unique user characteristics of this technologically savvy age group, make them a prime target for an intervention focusing on healthy behaviors. The present study addressed current gaps in the literature, and the results provide information about the utility of an internet intervention for overweight older adolescents.

To design the intervention, several existing health behavior theories were reviewed, including the Health Belief Model (Rosenstock, 1990), Information-Motivation-Behavioral Skills Model (Fisher & Fisher, 1992), Social Cognitive Theory (Bandura, 2004), Theory of Reasoned Action (Ajzen & Fishbein 1980), and the Theory of Planned Behavior (Ajzen, 1991; Ajzen, 2006). These theories were integrated into a single model, the Model of the Influence of Social Support on Health Related Behaviors (MISSHRB).

Health Behavior Theories

Various applications of health behavior theory have been used to investigate chronic illness, psychosocial outcomes, and adherence to medical regimens. Many of these theories have also been applied to web-based programs for chronically ill individuals. The applicability of these programs to overweight older adolescents can be considered with respect to various health behavior theories.

Health Belief Model. The Health Belief Model (Rosenstock, 1990), as shown in Figure 1, posits that an individual will comply with a preventive health care regimen if he or she has at least a minimum threshold of knowledge about the health behavior and motivation to engage in the behavior and views him- or herself as susceptible to a health threat. In addition, the model states that an individual will comply with a given health care regimen if he or she views the health threat as severe and believes that the given health care regimen will benefit him or her with little difficulty or cost (Bond, Aiken, & Somerville, 1992). Demographic variables, cues to action, and the perceived threat of a given health risk are also assumed to influence perceived benefits and likelihood of taking action. The Health Belief Model has been used to investigate issues such as diabetes medication management, HIV prevention, and birth control use (e.g., Cerkoney, & Hart, 1980; Choi, Yep & Kumekawa, 1998; Eisen, Zellman, & McAllister, 1992). This model is useful in conceptualizing how individuals respond to health situations where individuals perceive a clear health threat (e.g., HIV). However, because older adolescents are unlikely perceive that overweight and obesity are a threat to health (e.g.,

Laffrey, 1986; Teese & Bradley, 2008), this model may not be able to account for all variables of interest in research involving overweight older adolescents.

Information-Motivation-Behavioral Skills Model. The Information-Motivation-Behavioral Skills (IMB; Fisher & Fisher, 1992) Model of health behavior, as depicted in Figure 2, indicates that information about a behavior, motivation to engage in a behavior, and behavioral skills relevant to the behavior all work together to determine whether or not a given health behavior will be performed by an individual. The IMB model (Fisher & Fisher, 1992) has been used to investigate AIDS risk behavior change and to predict breast self examination and has been efficacious in predicting relationships between information, motivation, and behavioral skills in these domains (Fisher, Fisher, Bryan, & Misovich, 2002; Misovich, Martinez, Fisher, Bryan, & Catapano, 2003).

The IMB model states that information is a necessary precursor to both motivation and behavioral skills (Misovich et al., 2003). For example, for an adolescent to consistently adhere to his or her diet or exercise regimen, it is necessary for him or her to know and understand the benefits of healthy eating and regular exercise. In addition, it is necessary to have information about what constitutes healthy food choices, and how to exercise appropriately.

Motivation to engage in a particular health behavior is also necessary for that behavior to occur. According to the IMB model, motivation is comprised of attitudes toward the behavior and social motivation (Misovich et al., 2003). Attitudes toward a given health behavior may include feeling that exercising is time consuming, or that

seeking help for weight management is stigmatizing. Social motivation can include social support for engaging in particular health behaviors, and feeling that significant others believe the individual should engage in those health behaviors. An adolescent whose best friend exercises with her may feel more socially motivated to engage in this type of activity than an adolescent without this type of social support.

The IMB model (Fisher & Fisher, 1992) holds that information and motivation are conveyed through the individual's application of the behavioral skills relevant at any given time. This includes both the initial enactment of the behavior, as well as maintenance of the behavior (Misovich et al., 2003). In the IMB model, the constructs of motivation and information are considered independent, therefore, an adolescent who has information about the reasons for the importance of eating healthy foods may not engage in that health behavior if he or she lacks the motivation to do so. Conversely, an adolescent who wishes to eat healthy foods and exercise regularly, and is motivated to do so, may lack information about proper nutrition or how to exercise effectively. Working within the IMB model, failure of an overweight adolescent to engage in healthy eating and exercise behaviors may be attributed to deficits in information, motivation, behavioral skills, or some combination of these constructs (Misovich et al., 2003).

The IMB model is useful for research questions involving comparisons of groups individuals who may lack either information or motivation to engage in a given health behavior. However, when designing an intervention for health behavior change with older adolescents, this model fails to account for individuals' expectancies about

engaging in health behaviors, something that Social Cognitive Theory (Fisher & Fisher, 1992) addresses.

Social Cognitive Theory. The IMB model (Fisher & Fisher, 1992), considers information and motivation to be necessary for change. Yet Social Cognitive Theory, predicts that behavior is determined by expectancies and incentives (Bandura, 2004). According to Bandura (2004), individuals have expectancies about how events are connected, the consequences of action or inaction, and expectancies about one's competence to perform a given behavior (e.g., Bandura, 2004; Rosenstock, Strecher, & Becker, 1988). Individuals may also have incentives to engage in behavior. These incentives are defined as the value of a given outcome to that individual (Rosenstock et al., 1988).

Applying social cognitive theory to health behavior, an individual engages in health behaviors when she expects: (a) to be competent to perform a given health behavior (e.g., eating healthy foods and exercising), (b) that the health behavior will result in positive outcomes (e.g., being more physically fit), and (c) that not engaging in a given health related behavior will effect outcomes that person values (e.g., gaining weight). These expectancies are an important determinant in decisions about engaging in health behaviors, and were included in the theoretical model proposed for this project. Social Cognitive Theory is helpful in understanding the manner in which individuals' cognitions influence health behavior, yet it fails to account for intentions to engage in, and attitudes toward, health behavior. The Theory of Reasoned Action (Ajzen & Fishbein, 1980) includes these variables.

Theory of Reasoned Action. The Theory of Reasoned Action (TRA; Ajzen & Fishbein, 1980) is outlined in Figure 4 and states that an individual's beliefs predict and influence attitudes. An individual's intentions are comprised of their thoughts about a behavior and the opinions of peers about that behavior. If an individual intends to do something, then that person will likely do it. This theory also states that behavior change is affected through changes in cognitive structure or thinking about that behavior. An adolescent's intentions will predict whether he or she does or does not engage in healthy eating and exercise behaviors. An adolescent who thinks that eating fast food all of the time is an acceptable activity may intend to engage in that activity. Conversely, an adolescent who thinks that eating only fast food is an unhealthy or unacceptable activity may not intend to engage in that activity. Although the TRA (Ajzen & Fishbein, 1980) is useful in conceptualizing how an individual would arrive at a decision about engaging in a health behavior, it does not account for perceptions of how much control a person has over his or her health. The Theory of Planned Behavior (Ajzen, 1991) includes this variable.

Theory of Planned Behavior. The Theory of Planned Behavior (TPB; Ajzen, 1991), as shown in Figure 4, is an extension of the Theory of Reasoned Action (Ajzen & Fishbein, 1980). The primary difference between these two models of behavior is that the TPB model incorporates perceived behavioral control into the TRA model (Ajzen, 1991; Godin & Kok, 1996). The TPB model has been used in research investigating weight reduction, diabetes, breast self-examination, health check ups, and getting a mammogram (e.g., Conner & Newman, 2004; Frenzel, McCaul, Glasgow, & Schafer,

1988; Schifter & Ajzen, 1985). The TPB model allows researchers to take into account the degree to which an individual perceives his or her situation as controllable. This important addition to the TRA model is useful in examining additional variables that influence health care decision-making.

According to the TPB model, the behavioral beliefs of an individual link given behaviors (e.g., following a healthy diet) to expected outcomes (e.g., feeling good). A behavioral belief is the perceived probability that the behavior will produce a given outcome (Ajzen, 2006). It is assumed that behavioral beliefs, when combined with the subjective values of the expected outcomes, determine the attitude toward a given behavior. The evaluation of each outcome contributes to the attitude in direct proportion to the person's subjective probability that the behavior produces the outcome in question (Ajzen, 2006).

The TPB model defines subjective norm as the perceived social pressure to engage or not to engage in a behavior, and perceived behavioral control refers to an individual's perceptions of their ability to perform that behavior. To the extent that it is an accurate reflection of behavioral control, perceived behavioral control can, combined with intention, be used to predict behavior (Ajzen, 2006).

The TPB model defines intention as an indication of a person's readiness to perform a given behavior, and it is considered to be an antecedent of behavior. Intention is based on attitude toward the behavior, subjective norm, and perceived behavioral control. Behavior is the observable response in a given situation (Ajzen, 2006).

Individual behavioral observations can be combined across situations and times to create a wide-ranging representative measure of behavior (Ajzen, 2006).

Based upon information provided by the TPB model, overweight individuals would be most likely to benefit from a web-based application if they feel able to use the internet, to understand information on their own, and to affect a desired health outcome. Successful web-based applications should be designed to be used by overweight individuals who are motivated to change their health behaviors, believe that they can change, and who believe that health behavior changes will benefit them. For example, an overweight older adolescent who is motivated to exercise regularly, believes that by doing so she can stay healthy and feel good, and believes that she is capable of doing this will be more likely to stick to an exercise regimen than an adolescent who is lacking in one of these domains. The TPB is a useful model for investigating health behavior change, yet it does not account for social support correlates, which have been demonstrated to be important in health behavior change relating to weight loss (e.g., Harvey-Berino et al., 2004; Helgeson & Gottleib, 2000). The MISSHRB incorporates this social support variable.

Model of Influence of Social Support on Health-Related Behavior. The Model of Influence of Social Support on Health-Related Behavior (MISSHRB), developed for this study, is displayed in Figure 4. The solid boxes are adapted directly from the TPB. The dotted boxes were added based on research demonstrating the connection between expectancies, social support, and psychosocial functioning and health behaviors (e.g., Babyak et al., 2000; Conner & Newman, 2004; Wing & Jeffrey, 1999). Drawing from

earlier research relating to health behavior and cognition (e.g., Ajzen, 1991; Bandura, 2004), the MISSHRB posits that social support directly influences expectancies, attitudes, depression, subjective norm, and perceived behavioral control relating to health related behaviors. Social support, expectancies, depression, perceived behavioral control, and subjective norm were expected to directly influence attitudes toward health related behavior. These variables were theorized to help explain engagement in the health related behaviors of nutrition and exercise when applied in an internet setting with overweight older adolescent university students.

Summary

Adolescents who are overweight must cope with not only with the stressors that accompany typical adolescent development, but also the stressors that accompany being overweight. In the literature pertaining to adolescents, health, and behavior change, social support in the form of peer support has been documented to be related to outcomes such as better psychosocial functioning, and increased health-related behaviors (Kyngas & Rissanen, 2001; La Greca, Auslander, Greco, Spetter, Fisher, & Santiago, 1995).

Computer mediated social support is a growing field of interest. Researchers have applied this concept to individuals diagnosed with various health concerns including cancer, diabetes, and overweight (e.g., Chan, Callahan, Sheets, Moreno, & Malone, 2003; Loader, Muncer, Burrows, Pleace, & Nettleton, 2002; Tate et al., 2001), and there are many reasons why web-based applications offering social support are believed to be an effective and wise choice for the future of health care. These include

increasing accessibility, privacy, and affordability of health care, education, and support. Access to social support, delivered in an on-line environment, has the potential to effect attitude toward and performance of health-related behaviors, and ultimately, medical outcomes. For example, social support provided by peers has been shown to influence psychosocial functioning and expectancies about health related behaviors. Therefore, peer social support, in a web-based application, has the potential to influence attitudes about health-related behaviors.

The work of Ajzen (1991) and the TPB posits that attitudes predict and influence intentions. Attitudes, in turn, are influenced by subjective norm and perceived behavioral control, which can lead to the performance of given health behaviors. This study extended the TPB and proposed that social support plays a role in influencing attitudes, expectancies, perceived behavioral control, and psychosocial functioning. In addition, social support, psychosocial functioning, expectancies, subjective norm, and perceived behavioral control were expected to influence attitudes about health related behaviors, which in turn influence intentions, followed by performance of health-related behaviors. Performance of health related behaviors can lead to better medical outcomes (e.g., following a sound nutritional and exercise plan can lead to achievement and maintenance of a healthy BMI). Research has shown that better medical outcomes are related to better psychosocial functioning, including decreased depressive symptoms, decreased anxiety symptoms, and better health-related quality of life (e.g., Chan et al., 2003; Dew et al., 2004; Gustafson, Wise, & McTavish, 1993).

Web-based programs have the potential to be time and cost effective solutions to one aspect of intervention for overweight adolescents and young adults. Long-term outcomes that could be affected by increased social support include increased longevity, better heart health, and lowered risk of developing Type 2 diabetes and other diseases associated with excessive weight. Therefore, the use of a web-based program to facilitate peer communication and positive modeling of desired health-related behaviors has the potential to become an effective social support intervention for overweight adolescents and young adults.

The internet is a widely accessible part of modern adolescents' daily lives, and a viable alternative to outpatient treatment of mild psychological distress that may occur in adolescents coping with being overweight. Utilizing this medium is a likely way to increase social support for adolescents dealing with health behavior change. Therefore, the present study incorporated the elements of a discussion board community to create an environment of support for overweight adolescents.

This on-line peer social support occurs frequently, and little information exists about how useful these forums, chat rooms, and information pages actually are. If non-moderated (peer-controlled) groups without a health care provider as an active participant can increase overweight adolescents' perceived social support, this can provide another, less costly alternative to face-to-face peer group counseling and support groups.

The Present Study

The present study proposed a new health behavior theory and examined the efficacy of an internet intervention for social support with overweight (BMI >25) older adolescents using a randomized, control group, 2x2 pre- post-test design. The present study consisted of three aims:

Aim 1. The first aim of the present study was to test a new health behavior theory, the model of Influence of Social Support on Health Related Behavior (MISSHRB), in a group of older adolescents. This aim was tested utilizing Time 1 data to determine if the MISSHRB (Figure 4) was applicable to this sample of older adolescents. As sample size precluded an integrated test of the model, this aim was examined using bivariate correlations to test the model paths.

Hypothesis 1a. It was hypothesized that at time one, social support would be positively correlated with: 1. expectancies about health related behaviors; 2. attitudes toward health related behaviors; 3. perceived behavioral control (i.e., the perception that a person is in control of his/her behaviors) and 4. subjective norm (i.e., perceptions that peers also value the behavior), and negatively correlated with 5. depressive symptoms.

Hypothesis 1b. In addition to being correlated with social support (Hypothesis 1a), expectancies about engaging in health related behaviors were hypothesized to be significantly positively correlated with 1. attitudes toward health related behaviors and 2. subjective norm.

Hypothesis 1c. In addition to being correlated with social support (Hypothesis 1a) and expectancies (Hypothesis 1b), attitudes toward health-related behaviors were

hypothesized to be positively correlated with: 1. subjective norm 2. perceived behavioral control; and 3. intentions to perform health-related behaviors.

Hypothesis 1d. In addition to being correlated with social support (Hypothesis 1a), expectancies (Hypothesis 1b), and attitudes (Hypothesis 1c), higher subjective norm ratings (perceiving that peers find a given behavior normative) for engagement in health related behavior would be positively correlated with 1. intentions to engage in health related behaviors, and 2. perceived behavioral control.

Hypothesis 1e. In addition to being correlated with social support (Hypothesis 1a), attitudes (Hypothesis 1c), and subjective norm (Hypothesis 1d), it was expected that increased perceived behavioral control would be positively correlated with: 1. intentions to engage in health related behaviors; and 2.engagement in health related behaviors.

Hypothesis 1f. In addition to being correlated with attitudes (Hypothesis 1c), subjective norm (Hypothesis 1d), and perceived behavioral control (Hypothesis 1d), it was expected that higher intentions would be positively correlated with engagement in health related behaviors.

Hypothesis 1g. In addition to being correlated with intentions (Hypothesis 1f), greater frequency of self-reported health-related behaviors was hypothesized to be negatively correlated with BMI.

Hypothesis 1h. In addition to being correlated with health-related behaviors (Hypothesis 1g), BMI was hypothesized to be negatively correlated with 1. attitudes, and 2. perceived behavioral control, and 3. positively correlated with depressive symptoms.

Aim 2. The second aim of the present study was to determine the feasibility and clinical utility of an internet intervention for social support for overweight older adolescents. Aim 2 was examined utilizing participant data, as well as information on their patterns of use.

Hypothesis 2. It was expected that participants would be able to utilize the internet as a medium for receiving both information and support pertaining to healthy behaviors, such that: 1. little to no moderator intervention would be necessary, 2. participants in both groups would meet the required amount of logins and postings, and 3. participants would report positive perceptions of internet groups as a medium for providing social support.

Aim 3. The third and final aim of the present study was to examine the impact of the intervention on the ISSHB variables. This final aim was tested by examining the study variables for group and time differences using repeated measures ANOVA and pairwise comparisons for significant interactions.

Hypothesis 3. It was hypothesized that at time two, participants in both conditions would report: 1. increases in social support; 2. more positive expectancies and 3. attitudes about health behaviors; 4. lower ratings of depressive symptoms; 5. greater perceived behavioral control; 6. greater intentions to engage in health-related behaviors; 7. greater frequency of engagement in health related behaviors; and 8. better medical outcomes and that participants in the Information plus Discussion group would report greater improvements than participants in the Information condition.

METHOD

Participants

Seventy one older adolescents were enrolled for the duration of the study, and were included in the analyses. The sample was 70.4% female and 29.6% male. The mean age of participants was 19, with ages ranging from 18 to 22 years of age. The sample consisted of primarily Caucasian students (71.8%), with remaining students self-identifying as Hispanic (14.1%), Asian American (2.8%), African American or Black (2.8%), and Other (2.5%). Participants were primarily freshmen (71.8%), with remaining participants in their sophomore (19.7%), junior (7.0%), or senior year (1.4%). Participants were measured for Body Mass Index at the beginning of the study. The majority of participants (66.2%) had a BMI in the range of 25.0-28.4. The remaining participants (33.8%) had BMIs in the range of 28.5-51.62. Table 1 shows the demographic characteristics of all participants.

Design

The present study utilized a two group, pre-test, post-test, randomized experimental design. One group was designated as Information only, and served as the control group. The other group was designated as Information plus Discussion, and served as the treatment, or experimental, group. Participants were randomly assigned to one of the two conditions. In the Information only group (n=32), participants had access to online information modules. The information modules contained information relating to proper nutrition and exercise, and tips and tools for healthy living gathered from online resources such as www.cdc.org and www.nih.gov. In the Information and

Discussion group (n=39), participants had access to the same information modules, with the addition of an online health and nutrition discussion board group provided for communication and support.

Procedures

One hundred thirty five older adolescents between the ages of 18 and 24 years of age, enrolled in Psychology 107, Introductory Psychology, at Texas A&M University, responded to the initial psychology subject pool call for participation. Participants self-identified as overweight and interested in learning about the roles that nutrition and exercise play in healthy behaviors. Those selected for further screening had a self-reported BMI of 25 or higher, and had access to a computer with an internet connection with Windows 2001 or later as a computer operating system. Individuals who were not appropriate for the study based on low BMI (below 25), current enrollment in a commercial weight loss program, or diagnosis of an eating disorder, were excluded from further participation, leading to the exclusion of 32 interested individuals. Informed consent was obtained for the remaining 103 eligible individuals, who were randomly assigned to one of the two conditions. Following initial screening, all participants met directly with the researcher to verify their BMI. Height was measured using a wall-mounted measuring tape, and weight was recorded using a digital scale. All participants removed their shoes for both height and weight measurements. At this stage, 16 participants were excluded from further participation due to not meeting the requirements for BMI above 25. Of the remaining 87 participants, 6 dropped out of the study before completing baseline questionnaires and 10 started, but did not complete the

intervention. Seventy one participants (Information n=32; Information plus Discussion n=39) remained enrolled for the eight week duration. Figure 5 shows the flow of participation.

Participants were provided both oral and written instructions on how to access the computer discussion board using a unique study identification code. This code was then used to link their responses with their demographic information for analysis purposes. Participants were also provided with a paper handout with these instructions and information about the study.

In the first condition, Information only, information in the form of online modules pertinent to health, nutrition, and healthy behaviors was offered. In the second condition, Information plus Discussion, participants had access to those same information modules, with the addition of a discussion board. WebCT, a web-based application currently in use at Texas A&M University, was used to host the discussion board and the information modules. The discussion board required participants to log in with their password. At initial log in, all participants were linked to Survey Monkey, an online secure database system, to complete the measures for this study. Participants logged in to Survey Monkey to complete measures at the conclusion of the study as well.

In both conditions, there was a topic of the week. Participants in both groups were required to log in a minimum of four times each week, to read about the topic and explore the links provided. In the Information plus Discussion group, participants were required to post to the discussion board four times per week. If participants did not meet this requirement, the plan was to send them an email message prompting them to post

their comments. Topics were chosen from relevant literature, and included attitudes toward healthy food choices, information pertaining to healthy BMI, information about engaging in health related behaviors, and healthy food and exercise choices. (See Appendix E for a list of topics). The topics were posted once each week, and participants were allowed to respond to any topic once the topic was posted.

Links to past topics were provided, so that participants were able to read strings of information of interest to them and could continue to respond to them. Participants in both treatment conditions also had access, via live weblinks, to health websites such as WebMD and Weight Control Information Network (National Institutes of Health, 2010) for assistance in accessing information pertaining to healthy living choices. All participants were asked to remain in the online discussion board for eight weeks.

*Measure*s

Screening and Demographic. A brief screening measure was used to collect information about participant height, weight, access to a computer and an internet connection, current medical diagnoses, and interest in online support for healthy living (i.e., changing aspects of their behavior relevant to eating and exercise habits). In addition, participants were screened for self-report of eating disorders, major medical conditions, and current participation in an organized weight loss program. A demographic questionnaire was used to collect information about gender, ethnicity, height, weight, eating habits, exercise habits (including participation in organized sports), weight management strategies, and medications (see Appendix C for the Demographic Questionnaire).

Participation Data. WebCT automatically recorded participant participation in the programs, including a) number of logins and b) number of postings (Information plus Discussion group only). In addition, the investigator recorded the number of times it was necessary to moderate the discussion board due to inappropriate or off-topic postings. The extent to which participants perceived an internet discussion forum as useful and supportive was evaluated by asking participants directly. Participants responded to this four item measure on a 5- point Likert-type scale ranging from (1= strongly disagree) to (5=strongly agree). Total scores ranged from 4-15 (*M*=10.60, *SD*=2.07), Cronbach's alpha = .410. This procedure has been used to evaluate the effectiveness of online interventions in similar research (e.g., Wing & Jeffrey, 1999). Frequency of contact with other group members outside of required log in times was also recorded as an additional measure of support. However, there were no instances of participants contacting other group members outside of required login times or outside the discussion board forum. Please see Appendix D for the questionnaires used in this study.

Body Mass Index. Body Mass Index (BMI) is a formula that used to assess health status with regard to height and weight (Garrow & Webster, 1985). BMI is calculated by dividing weight in pounds into height in inches squared, then multiplying the result by 703. The resulting number provides information about health status. For older adolescents and adults, the Centers for Disease Control (2008) categorize BMI as underweight (BMI < 18.5), normal (BMI =18.5-24.9), overweight (BMI = 25.0-29.9), or obese (BMI $\geq$30), (Centers for Disease Control, 2008). In the literature pertaining to

weight loss and weight management, a BMI of 25 or greater has been used to identify overweight individuals (Blanchard, McGannon, Spence, Rhodes, Nehl, Baker, & Bostwick, 2005; Tate, Wing, & Winnett, 2001). BMI scores at time one for the present sample ranged from 25.0- 51.62 (*M*= 29.04, *SD*= 5.33).

Social Support. Participants were administered measures of general and weight management-specific social support. To measure general support, the Perceived Social Support from Family and Perceived Social Support from Friends instruments were used (Procidano & Heller, 1983), as shown in Appendix D. These two 20-item questionnaires were designed to assess the extent to which individuals perceive that their general needs for support, information and feedback are fulfilled (Procidano & Heller, 1983). Higher scores reflect greater perceived support. Total scores in the present sample ranged from 34-60 for family general support (*M*= 52.54, *SD*=7.62), Cronbach's alpha=.87. For friend general support, scores ranged from 36-60 (*M*= 51.37, *SD*=5.89), Cronbach's alpha =.813.

Social support specific to exercise, nutrition, and other health behaviors was assessed by adapting extant support measures (Wing & Jeffrey, 1999). These 23 item questionnaires were designed to assess the extent to which participants felt that their efforts to engage in more healthy behaviors (e.g., engaging in an exercise program) were supported by friends and family. Total scores for family specific support ranged from 5-82 (*M*=50.76, *SD*=15.71), Cronbach's alpha=.87. Scores for friend specific support ranged from 0-87 (*M*=57.14, *SD*=16.96), Cronbach's alpha= .86.

Depression. The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) was used to assess depressive symptoms. The BDI-II is a 21-item instrument designed to assess depression in adults and adolescents. Scores are derived summing response scores to arrive at a total depression score. Scores in the present sample ranged from 0 to 47 (*M*=8.82 *SD*=7.83) with lower scores indicating fewer depressive symptoms. Due to high kurtosis values, this variable was transformed logarithmically, as suggested by Tabachnik and Fidell (2001) . Following the transformation, scores ranged from 0-3.85 (*M*= 1.80 *SD*=.98), and were normally distributed. The BDI-II has been shown to have good reliability, and Cronbach's alpha for the present sample = .87. Due to copyright laws, the BDI-II cannot be included in this document.

Expectancies. Expectancies about health behaviors were assessed by asking participants to respond to questions such as; "I expect that if I eat healthy foods, I will stay healthy." Participants responded on a 5- point Likert-type scale ranging from (1= strongly disagree) to (5=strongly agree). Total scores ranged from 20-50 (*M*=40.45, *SD*=6.88), Cronbach's alpha = .92. The questionnaire used in this study is shown in Appendix D.

Subjective Norm. Subjective norm regarding health related behaviors were assessed by asking participants to describe what they think peers in their position would do. Questions were targeted at specific health behaviors relevant to maintaining a healthy BMI (e.g., "I believe that most of my peers exercise regularly;" "I believe that most of my peers eat healthy foods in moderation"). Participants responded on a 5- point Likert-type scale, ranging from (1= strongly disagree) to (5=strongly agree). Total scores

for the subjective norm scale ranged from 5-25 (*M*=16.18, *SD*=3.57), Cronbach's alpha=.82. The questionnaire used in this study is shown in Appendix D.

Attitudes. Attitudes toward health related behaviors were assessed by asking what participants think about performing given health-related behaviors. Participants were asked whether they like to engage in these behaviors, dislike engaging in the behaviors, think that these behaviors are worthwhile, or think that these behaviors are not worthwhile. Participants responded on a 5- point Likert-type scale ranging from (1= strongly disagree) to (5=strongly agree). Total scores ranged from 6-20 (*M*=15.61, *SD*=3.07). Cronbach's alpha= .69. The questionnaire used in this study is shown in Appendix D.

Perceived Behavioral Control. Perceived behavioral control was assessed by asking participants how much control they feel they have over whether or not they engage in given health-related behaviors. Participants were asked to indicate to what extent they agreed or disagreed with statements pertaining to control and health related behaviors. Statements included: "I feel that I can control my weight;" "I have no control over what foods I eat;" "I have control over what foods I eat." Participants responded on a 5-point Likert-type scale, ranging from (1= strongly disagree) to (5=strongly agree). Total scores ranged from 5-25 (*M*=19.20, *SD*=3.67). Cronbach's alpha was .82. The questionnaire used in this study is shown in Appendix D.

Intentions. Intentions to perform given health-related behaviors were be assessed by asking participants whether or not they intended to engage in that behavior. Participants were be asked to respond using a 5-point Likert-type scale ranging from (1=

do not intend to do) to (5= definitely will do) about specific behaviors (e.g., "I intend to continue to eat a healthy and nutritionally balanced diet"). Total scores ranged from 6-15 (*M*=11.70, *SD*=1.84). Cronbach's alpha = .62. The intentions questions used in this study are shown in Appendix D.

Health-Related Behaviors. Health related behaviors were measured by participant answers to a questionnaire designed for this study. The questionnaire included questions adapted from Kyngas and Rissanen (2001) such as: "I follow a diet that is healthy and includes foods from all food groups;" "I take responsibility for my own eating habits;" "I exercise regularly," "I try fad diets to lose weight." Participants responded on a 5- point Likert-type scale ranging from (1= strongly disagree) to (5=strongly agree). Total scores ranged from 14-33 (*M*=24.01, *SD*=4.11). Cronbach's alpha was .68. The health behavior questionnaire used in this study is shown in Appendix D.

Data Analysis Procedures

Analyses were conducted using SPSS 16.0 (SPSS Inc., 2008). Aim 1 was tested using correlational analyses and Aim 3 using repeated measures ANOVA (Aim 2 was descriptive). All data were screened for missing data and assumptions of repeated measures ANOVA. All of the assumptions of ANOVA were met, save for that of sphericity. For the assumption of sphericity to be met, the variances for each set of difference scores must be equal. For the ANOVA tests that violated the assumption of sphericity (i.e., Mauchly's test was significant at $p<.05$), the Greenhouse-Geisser correction was used to correct for this violation, as has been done in similar research

(e.g., Harvey-Berino et al., 2004; Wing & Jeffries, 1999). There were no missing values, likely due to the online assessment tools used, and the settings that required responses to all questions. There was a high kurtosis value for the depression measure pre- and post-test. High kurtosis values indicate one or few extreme scores in a distribution, rather than many moderately different scores (Tabachnick & Fidell, 2001). The data for that variable was transformed logarithmically, recommended for instances where there are high kurtosis values (Tabachnik & Fidell, 2001). Upon transformation, the variable met all assumptions for repeated measures ANOVA.

To check the integrity of the study randomization, a one-way ANOVA was performed on all Time 1 variables. Results indicated that there were no significant differences between groups at time one. There were no statistically significant differences between the ages, BMIs, or years in college of those participants who dropped out and those that remained in the study.

For correlation analysis, r is the effect size indicator. According to Cohen (1988), r values of about .10 are considered small effects, above .30 medium effects, and above .50 large effects. Partial eta squared was used as a measure of effect size for the repeated measures ANOVAs. Partial eta squared has been defined as the proportion of total variation that is attributable to a factor, while excluding other factors for the total of the (non error) variation (Pierce, Block & Alguinas, 2004). Partial eta squared is often used in studies that measure the same participants more than once, as was the case in the present study (Pierce et al., 2004). Values of partial eta squared range from 0 to 1, and are interpreted as a percentage, with larger values accounting for more variance of the

independent variable explained. In the social sciences, partial eta squared values of .01 are considered small, .06 medium, and .14 large effects (Kittler, Menard & Phillips, 2007).

Repeated measures Analyses of Variance (ANOVAs) were conducted to evaluate the effect of group membership (Information or Information plus Discussion) and time of assessment (pre, post) on the dependent variables social support (i.e., friend support specific, family support specific, friend support general, family support general), psychosocial, expectancies, subjective norm, attitudes, perceived behavioral control, intentions, health behaviors, and BMI. Statistical significance was defined as $p<.05$. For analyses where a significant time by group interactions was found, post-hoc pairwise comparisons were examined for additional information about the nature and direction of significant differences.

RESULTS

Aim 1

The first aim of the study was to test a new health behavior theory, the Model of Influence of Social Support on Health Related Behavior (MISSHRB), in a group of older adolescents.

Hypothesis 1a. Social Support. At time one, it was hypothesized that greater satisfaction with social support would be associated with; 1. higher expectancies about positive health behaviors; 2. more positive attitudes toward health-related behavior; 3. greater perceived behavioral control and 4. subjective norm and 5. negatively correlated with depressive symptoms.

Social support was represented as an aggregate variable for purposes of the proposed model (social support), yet analyses reflect type of social support (i.e., family support general, family support specific, friend support general, and friend support specific). Results are presented by support sub-type to provide a better understanding of the nature of the relation of social support to the variables presented in the proposed model.

Results of correlation analyses showed that:

1. Family specific support was significantly positively correlated with expectancies (r=.264, p<.05), as was family general support (r=.386, p<.01), and friend general support (r=.456, p<.01). According to Cohen (1988), these results represent small to medium effects. Friend specific support was the only support measure that did

not correlate significantly with expectancies, although this correlation (*r*=.133) did exceed Cohen's cutoffs for a small effect.

2. Friend general support (*r*=.355, *p*=<.01) was significantly positively correlated with more positive attitudes toward health-related behaviors, and represent medium effects. Friend specific support, family specific support, and family general support were not significantly correlated with attitudes. However, all of these support variable correlations did exceed Cohen's (1988) cutoff for a small effect.

3. Family general support was significantly correlated with greater perceived behavioral control (*r*=.405, *p*<.01), a medium to large effect. Family specific support, friend specific support, and friend general support, were not significantly correlated with perceived behavioral control, but did exceed the cutoff for small effects.

4. Additionally, family general support(*r*=.319, *p*<.01) and friend general support were significantly positively correlated with subjective norm (*r*=.269, *p*<.05). These correlations represent medium and small effects, respectively. Family specific support, and family general support were not significantly correlated with subjective norm, although the correlations between the support measures and subjective norm did represent small effects.

5. Friend general support was significantly negatively correlated with depressive symptoms (*r*=-.262, *p*<.05), a small effect, providing support for that hypothesis. The hypotheses that friend specific support, family general support, family specific support, and perceptions would be significantly negatively correlated with depression were not

supported. The results of these correlations analyses were not significant, and did not exceed the cutoff for a small effect.

Hypothesis 1.b. Expectancies. It was expected that in addition to relations to social support (see hypothesis 1a.1.), that expectancies about engaging in health related behaviors would be significantly positively correlated with 1. attitudes and 2. subjective norm. Results provided supported for these hypotheses, and showed that expectancies were significantly positively correlated with both attitudes (r=.235, p<.05) and subjective norm (r=.555, p<.01). These results represent small and large effects, respectively.

Hypothesis 1c. Attitudes. More positive attitudes toward health-related behaviors were expected to be associated with: 1. higher ratings of subjective norm relevant to health behaviors, 2. higher perceived behavioral control, and 3. higher intentions to perform health related behaviors. The hypothesis that attitudes would be positively correlated with subjective norm was not supported, as results were not significant, and did not exceed the cutoff for a small effect. However, attitudes toward health-related behaviors were significantly positively correlated with perceived behavioral control (r=.357, p<.01), and intentions to perform health-related behaviors (r=.522, p<.01), providing support for those hypotheses. These correlation sizes are considered to be medium and large, respectively.

Hypothesis 1d. Subjective Norm. It was expected that higher subjective norm ratings (with regard to engagement in health related behaviors) for normative engagement in health related behavior would be positively correlated with 1. intentions

to engage in health related behaviors, and 2. perceived behavioral control. The correlation for intentions was in the hypothesized direction (positive), yet were not significant, and did not exceed the threshold for a small effect size. The correlation for perceived behavioral control (r=.194) failed to reach significance, yet did exceed the cutoff for a small effect size.

Hypothesis 1e. Perceived Behavioral Control. It was also expected that increased perceived behavioral control would be positively correlated with: 1. intentions to engage in health related behaviors; and 2.engagement in health related behaviors. Results provided support for both of these hypotheses, with greater perceived behavioral control significantly correlated with intentions (r=.424, p<.01) and engagement in health related behaviors (r=.446, p<.01). According to Cohen (1988), these correlations represent medium effects.

Hypothesis 1f. Intentions. Greater intentions to perform health-related behaviors were hypothesized to be positively correlated with self-report of engaging in health-related behaviors. This hypothesis was supported, as intentions to perform health-related behaviors were significantly positively correlated with self-report of engaging in Health-Related Behaviors (r=.804, p<.01), a large effect according to Cohen (1988).

Hypothesis 1g. Health Related Behaviors. Greater frequency of engagement in health-related behaviors was hypothesized to be negatively correlated with BMI. This hypothesis was not supported, as the correlation failed to reach significance (r=-.118), although it did surpass the cutoff for a small effect size.

Hypothesis 1h. Medical Outcomes. Medical outcomes, operationalized as BMI, was hypothesized to be negatively correlated with 1. attitudes and 2. perceived behavioral control, and 3. positively correlated with depression . Lower BMI scores were significantly negatively correlated with attitudes (r=-.260, p<.01), representing a small effect. For perceived behavioral control, results were not significant, and did not exceed the cutoff for a small effect. Although the correlation between BMI and perceived behavioral control failed to reach significance (r=-.12), results exceeded the cutoff for a small effect size. BMI and depressive symptoms were correlated in the hypothesized positive direction (r=-.15), but results did not reach significance. However, results exceeded the cutoff for a small effect size.

Aim 2

The second aim of the study was to determine the feasibility and clinical utility of an internet intervention for social support for overweight older adolescents by evaluating the ability of participants to complete study requirements.

Hypothesis 2.The number of logins and number of postings were recorded to monitor adherence to study guidelines. It was not necessary for the researcher to moderate participant activity due to inappropriate or off topic comments. Additionally, participants in both conditions were able to meet study requirement of four weekly logins, with the total number of logins over the course of the study ranging from 32-50, (M=39.16, SD=4.97). Participants enrolled in the Information plus Discussion group were also required to post comments to the discussion board a minimum of four times each week. The number of discussion board postings in the Information plus Discussion

group ranged from 30-47 (*M*= 37.74, *SD*=4.51), with 94.9% of participants able to meet requirements for the discussion board as well.

Aim 3

The final aim of the study was to examine variables for group and time differences at time two, with the expectation that the Information plus Discussion (treatment) group would evidence greater improvement than the Information only (comparison) group. Table 3 presents the means, standard deviations, and *F* statistics for both treatment groups.

Hypothesis 3. It was hypothesized that at time two, participants in both conditions would report: 1. increases in social support; 2. more positive expectancies and 3. attitudes about health behaviors; 4. lower ratings of depressive symptoms; 5. greater perceived behavioral control; 6. greater intentions to engage in health-related behaviors; 7. greater frequency of engagement in health related behaviors; and 7. better medical outcomes, and that participants in the Information plus Discussion group would report greater improvements than participants in the Information condition.

A repeated measures ANOVA was performed on the dependent variable family general support. Results failed to reach significance for time, but did exceed the cutoff for a small effect size (partial eta squared = .052) for the time by group interaction [$F(1,69)= 3.771$, $p=.056$], with participants in the Information plus Discussion group reporting greater improvements in family general support by time two than participants in the Information only condition. For family support specific to healthy behaviors (e.g., exercise and eating a nutritionally sound diet), results were significant for time [$F(1,69)=$

24.107, $p<.01$], partial eta squared =.259, a large effect, with participants in both groups reporting increased family support specific to health behaviors at post-test. Results were also significant for the group by time interaction [$F(1,69)=3.977$, $p<.05$], partial eta squared =.054, a small effect, with participants in the Information plus Discussion group reporting significantly more improvements in family support specific to health behaviors than their counterparts in the Information only group by post-test.

For the dependent variable health behaviors, the results were significant for time [$F(1,69)=5.89$, $p<.05$)], partial eta squared=.079, a medium effect, indicating that both groups reported engaging more frequently in healthy behaviors (e.g., exercising, choosing healthy foods) at post- than at pre-test. The results for the time by group interaction were not significant, and did not exceed the cutoff for a small effect.

For the dependent variable medical outcomes (BMI), results failed to reach significance for time [$F(1,69)=3.23$, $p=.077$] , but did exceed the cutoff for a small effect (partial eta squared=.045), indicating that both groups evidenced a trend toward lowered BMIs at post-test. The time by group interaction also failed to reach significance [$F(1,69)=3.93$, $p=.052$], but did exceed the cutoff for a small effect (partial eta squared =.054), indicating that the Information plus Discussion group showed some evidence of a greater decrease in BMI than the Information group by post-test.

For the dependent variable attitudes, there was a significant main effect for time [$F(1,69)=35.123$, $p<.001$], partial eta squared = .337, a large effect size. There was also a significant effect for the time by group interaction [$F(1,69)=4.17$, $p<.05$], partial eta squared= .057, a small effect. However, these results demonstrated a *decrease*, rather

than the hypothesized increase, in positive attitudes toward engaging in healthy behaviors. In other words, both groups reported less positive attitudes toward engaging in healthy behaviors at post-test, with the Information plus Discussion group reporting significantly a greater decrease in attitudes than the Information only group.

Several variables did not reach significance for time, yet did exceed the cutoff for a small effect, including friend support specific to healthy behaviors (partial eta squared=.017), friend general support (partial eta squared=.027), depression (.015), expectancies (partial eta squared=.010), perceived behavioral control (partial eta squared=.030), intentions (partial eta squared=.027), and BMI (.045). For the time by group interaction, the variables family general support (partial eta squared=.052), friend general support (partial eta squared=.010), and BMI (partial eta squared=.045) did not reach significance, yet exceeded the cutoff for a small effect.

DISCUSSION AND SUMMARY

The aims of this project were to examine the applicability of the MISSHRB to a sample of older adolescents, to determine the clinical utility of an internet intervention for social support; and to investigate the effect of an internet based discussion board as a means to improve and provide social support for overweight older adolescents interested in making positive changes to their health routine.

Support for the MISSHRB

We began by examining the relation of the variables to each other in the Model of Influence of Social Support on Health-Related behavior (MISSHRB; Figure 4). Correlation analyses provided partial support for the MISSHRB. Notably, the variables in the model that did not correlated significantly with each other were the variables attitudes, subjective norm, and perceived behavioral control, which were adapted from the Theory of Planned Behavior (Ajzen, 1991). These same variables have failed to correlate significantly with each other in other tests of this theory (Anjejo, Modeste, Lee & Wilson, 2007).

Social Support. The most important difference between the MISSHRB and the TPB was the incorporation of social support. Results of the present study generally support that modification, suggesting that social support, in the context of health behavior change, plays a complex role in expectancies, attitudes, normative beliefs, perceived behavioral control, and ultimately, in engagement in health related behaviors and medical outcomes. All social support measures, with the exception of friend support

specific to healthy behaviors, were significantly correlated with expectancies, as hypothesized. These results suggest that support from friends and family in the general sense (the idea that a person's friends and family are supportive of him or her in general), can influence a person's expectations that he or she can effect change by engaging in health behaviors. This is in concert with research in the areas of support and expectation of results in relation to health change (Rosenstock, 1990). These results also provide support for the hypothesis that individuals who find internet groups a source of support are more likely to also have positive expectations about their own ability to effect health behavior change.

Friend general support was the only support variable significantly correlated with attitudes toward health related behaviors. This may mean that friends have a greater capacity for influencing attitudes toward health behaviors than family does. It could be that older adolescents who are overweight are more likely to talk about their weight, efforts to engage in healthy behaviors, and the benefits of doing so.

Family general support was the only support variable to be significantly correlated with perceived behavioral control, or the amount of control participants felt they had over given situations pertaining to healthy eating and exercise. As to why the other support variables were not significantly correlated with perceived behavioral control, it may be the case that, in relation to health behavior change for overweight older adolescents, social support becomes more relevant not in the perception of controllability of events, but in how people cope with events, regardless of whether or not those events are perceived of as controllable.

Family general and friend general support were the only two support variables significantly correlated with subjective norm, indicating that general support plays a role in how older adolescents perceive their peers' health related behavior. It may be the case that perceived social pressure to perform or not perform a behavior is influenced by the how supported in general they feel. It could be the case that older adolescents who feel supported in general may feel more comfortable thinking about peer behavior (engagement in healthy behaviors) that makes them feel uncomfortable, out of a sense of either guilt or embarrassment. General social support may give older overweight adolescents the support scaffold they need to be able to look at and critically evaluate their own health behaviors, something that may ordinarily be perceived as too threatening.

Depressive symptoms were significantly correlated with family general support only, such that as family support increased, fewer depressive symptoms were reported. This result was probably the most surprising, as it was expected that all of the support measures would be significantly correlated with self-report of depressive symptoms. Social support has been found to be significantly negatively related to depressive symptoms in other studies (Gazmararian et al., 2000) investigating health related behaviors. However, our measure of depressive symptoms was limited to one assessment measure, the BDI-II, which has low base rate scores in the general population, as well as in our sample. A more specific measure of average psychosocial functioning may yield more accurate information about the nature of the relationship between depressive symptoms and overweight in non-clinical samples of overweight older adolescents.

The failure of friend support specific to healthy behaviors to correlate significantly with Expectancies was an unanticipated finding, as this is an aspect of social support that has been consistently touted in the weight loss and health improvement literature as a vital variable in successful weight loss and health behavior change (Harvey-Berino et al., 2004). There are several possibilities for this finding. The first is that individuals participating in the current study had few or no friends with whom they were able or willing to share their struggles and concerns regarding BMI and healthy nutrition. In studies that have examined this facet of social support (e.g., Harvey-Berino et al., 2004; Wing & Jeffrey, 1999) participants identified friends who were in a similar position regarding health as the participant (e.g., overweight, diagnosed with diabetes). These data suggest that it may take more than simply friendship to increase the amount of social support overweight older adolescents perceive. There likely needs to be a similarity, real or perceived, between the person seeking to change his or her behavior and friends in order for friend support to influence expectancies about health behavior change. Friend support specific to health behaviors and attitudes were not significantly correlated in the current study. This was an unanticipated finding, and is in opposition to findings by Wing and Jeffrey (1999), who found that friend support in the context of a weight loss study positively impacted amount of weight lost.

In sum, general social support, or feeling supported in general, by family and friends, was the most relevant type of social support for our model. These results suggest that our model may be best understood in terms of type of social support, rather than social support as an aggregate, because general support from friends and family

were more influential in the model than support specific to health behaviors. It may be that individuals do not talk to families and friends about specific weight loss and healthy behaviors, providing fewer opportunities for family and friends to be supportive of these behaviors and efforts.

Expectancies. The variable expectancies was significantly correlated with subjective norm as well as with attitudes, providing evidence that positive expectations about engaging in health related behaviors can influence perceptions of peer normative behaviors, as well as attitudes toward those behaviors. This result is in concert with the MISSHRB (Figure 5), and suggests that individuals' attitudes are influenced by the expectations those individuals have about the benefit of engaging in those behaviors (e.g., an expectation of improved physical health will lead to more positive attitudes toward a given health behavior).

Attitudes. A surprising result in the present study was that attitudes toward health behaviors was not significantly correlated with subjective norm, or the perceived normative response toward those same behaviors. Past research has demonstrated that in the areas of BMI, healthy nutrition, and exercise, the subjective norm plays a significant role in the attitudes toward behavior of older adolescents (Armitage & Conner, 2001). There could be several reasons for this seeming disconnect between attitudes and subjective norm. First, it could be that subjective norm, in relation to healthy behaviors, is a different construct than originally hypothesized. Much research in the area of subjective norm and older adolescents has been in relation to negative health behaviors such as smoking, unprotected sex, alcohol and illegal drug use (Armitage & Conner,

2001). It is possible that the construct of subjective norm is different in healthy behaviors than unhealthy or risky behaviors, and this could account for the failure of our these variables to correlated significantly in our study.

It is also possible that overweight or otherwise unhealthy older adolescents view engaging in healthy behaviors as an onerous and unpleasant task, regardless of how they understand their peers to perceive this behavior. For individuals who are overweight (BMI >25) or obese (BMI >30), activities such as working out, going to the gym, and changing eating habits can be embarrassing and difficult, and negatively influence attitudes toward those activities (Xie, Chou, Sprijit-Metz, Liu, Xia, Gong, Li & Johnson, 2005). Therefore, although individuals could very well perceive that a given behavior is normative for their peer group, that understanding does not necessarily lead to positive attitudes toward that behavior.

As was hypothesized, attitudes toward healthy behaviors were significantly positively correlated with the perception of how much control participants indicated they had over whether or not they engaged in those behaviors. This finding was expected, as it is reasonable to expect that one's perception of controllability of their health status would be closely linked to attitudes toward improving that health status. The degree to which individuals believe they are in control of events has also been demonstrated to be associated with positive attitudes toward those events or activities in other research (Scihfter & Ajzen, 1985).

As was hypothesized, individuals who endorsed more positive attitudes toward engaging in health related behaviors were more likely to indicate that they had higher

intentions to participate in those behaviors. This result was expected, as it is reasonable to assume that intentions to engage in a behavior is closely linked to one's attitude toward, that behavior. Conversely, if a person does not enjoy exercising because it is embarrassing, difficult, or physically or emotionally painful because one is obese, then that person will be less likely to have positive attitudes toward, or plan to engage in, that behavior.

Subjective Norm. Subjective norm was not significantly correlated with the variables intentions or perceived behavioral control. Although these variables (along with attitudes) were proposed to influence each other according to the MISSHRB, results did not provide support for these hypotheses. Similarly, subjective norm was not significantly correlated with the variable intentions. Other researchers have had similar results when attempting to test the TPB model (Godin & Kok, 1996), from which these variables were drawn. It may be that the MISSHRB suffers from a misapplication of these variables to health behavior theory. It is also possible that although these variables have been demonstrated to influence each other in when measuring risky (e.g., smoking, unprotected sex) behaviors (e.g., Armitage & Connor, 2001; Teese & Bradley, 2008), they do not do so in the same way when healthy behaviors are investigated.

Results did not support the hypothesis that depressive symptoms would be significantly negatively correlated with subjective norm. This finding fails to support other health behavior and weight loss research that has demonstrated a significant correlation between depressive symptoms and perceived normative behaviors (Armitage & Connor, 2001). This may be because individuals recruited for this study did so with an

understanding that others in the group were also overweight, and therefore had a different understanding of perceived normative behaviors.

Perceived Behavioral Control. The amount of behavioral control individuals perceived that they had over their health and nutrition status was significantly positively correlated with their intentions to engage in healthy behaviors, and in reported engagement in health related behaviors. This result provides support for the hypothesis that to the extent that individuals perceive that they can control their health behaviors, they will be more likely to engage in those behaviors. It is worth noting here that this sense of control, or lack thereof, has the potential to present problems for both healthy weight and overweight older adolescents. Healthy weight adolescents may be more likely to aspire to a lower BMI than is healthy, and may engage in unhealthy behaviors (e.g., drugs, extreme diets, caloric restriction, purging behaviors, excessive exercise) in order to meet this goal (Ackard, Croll & Kearney-Cooke, 2002). Older overweight adolescents may also experience additional stress over their inability to conform to an unrealistic ideal, leading to feelings of loss of control. This, in turn, could lead to a decrease in engagement in health behaviors such as regular exercise, thereby creating a cycle of overweight, loss of control, and failure to do anything to address the problem. This cycle may contribute to a perceived difficulty in losing weight and living a healthier lifestyle, and has implications for treatment of overweight, as health care providers can target feelings of loss of control with interventions.

Intentions. It has been demonstrated within the health and nutrition literature that intentions to perform a given health behavior are positively correlated with engaging in

said behaviors (Schifter & Ajzen, 1985). This was also the case in the present study, as intentions were highly significantly correlated with engaging in health related behaviors. This result was expected, as intentions have repeatedly been demonstrated to predict both long and short-term behavior (Ajzen, 1991). In our study, participants rated their intentions to perform health behaviors in the near future. This ability to rate intentions of behaviors they expected to perform soon may have also played a role in the very large effect size we obtained, as research has shown more immediate behaviors having a higher likelihood of being accurately predicted by self-reported intentions (Ajzen 1991).

Health-Related Behaviors. Although greater frequency of engagement in health related behaviors was negatively correlated with BMI, the result was not significant. It is likely that the low number of participants in the present study was a factor in preventing these results from reaching significance. This result is promising, however, as results exceeded the cutoff for a small effect size. It is possible that in future studies, the inclusion of larger numbers of participants, over greater periods of time, will demonstrate a significant relation between these variables.

Medical Outcomes. In the literature pertaining to health and nutrition, medical outcomes have been included in the examination of the effect of behavior change on physical health. Variables examined have included cholesterol readings, blood pressure, BMI, waist circumference, and body fat composition (e.g., Gardner & Hausenblas, 2004). In the present study, medical outcomes was operationalized as BMI. Lower BMI scores were significantly correlated in the hypothesized direction, negatively, for attitudes. The higher the BMI score, the less likely participants were to report positive

attitudes toward health related behaviors. Higher BMI scores were not significantly correlated with higher depression scores, although they were correlated I the hypothesized positive direction. Decreased BMI was not significantly correlated with increased feelings of perceived behavioral control.

Summary

Overall, the model was well supported by the relations of several variables. The inclusion of social support, an addition of the MISSHRB, was supported, with at least one type of social support correlating in the hypothesized direction for each variable. It may be that the task, then, is to determine which types of social support are relevant to which variables, and modify the model in that way. For example, the hypothesized relations of family and friend general support were supported for the majority of variables.

Additionally, the removal of the variable depression, or measuring it in a different way, might improve the model. Although it has been demonstrated to be a correlate in health behavior change in the past, it is not so in the present study.

The model may also be improved by eliminating several paths between variables, including the correlation between subjective norm and attitudes, subjective norm and perceived behavioral control, and subjective norm and intentions, as these were not supported. Although the variable for medical outcomes, BMI, failed to correlate with health related behaviors, it did correlate significantly in the hypothesized direction with attitudes and perceived behavioral control.

Feasibility of the Intervention

The second aim of this study was to determine the feasibility of using an internet intervention for social support with older overweight adolescents. Because no participants committed any "infractions," (e.g., inappropriate or off-topic posts) and it was not necessary to moderate disruptive communications, there was little management of the discussion group required. Although disruptive and inappropriate activity and comments are not infrequent occurrences in online discussion groups, they did not occur in the present study. This may have been due in part to the everyday use of similar groups by our participants, combined with the fact that all participants were participating for course credit, something they would presumably not wish to forfeit by behaving inappropriately. All participants met requirements for number of logins per week required, and 95% of participants (all but two people) in the Information plus Discussion condition. The two participants who did not meet posting requirements failed to login during the final week of the study. The ability of participants to meet study requirements without moderator intervention was likely due to the ease and familiarity with this medium of information and support.

Participants in our study perceived both Information and Information plus Discussion groups as a source of support, indicating that participants viewed these groups as additional sources of support in their efforts to maintain a healthy lifestyle and engage in healthy behaviors, and providing support for this form of service delivery. The fact that the Information group evidenced an improvement in perceptions of support

groups following the intervention suggests that online information alone is capable of providing some support for overweight older adolescents.

Efficacy of the Intervention

The final aim of the study was to examine the effects of treatment on the variables social support, expectancies, depression, subjective norm, attitudes, perceived behavioral control, health related behaviors, and medical outcomes. Analyses examined whether both groups of participants improved and whether the Information plus Discussion group improved more than the Information only condition. These questions were tested via repeated measures ANOVA, in which a main effect of time was interpreted as improvement across conditions and an interaction between group and time was used to examine group differences in improvements.

In terms of main effects of time, both groups evidenced improvements on family support specific to health behaviors, and health behaviors. This provides support for the idea that an internet intervention can be useful not only by providing a link to other individuals who are overweight, but in the provision of information alone. The finding that family social support improved for both groups over time is interesting, given that this variable was not targeted by the intervention. It is possible that simply by engaging in this study process, individuals became more aware of this type of support. This awareness, in turn, may have led to increases in ratings of this support. Participants in the Information condition were exposed to various types of information about different topics relevant to health behaviors. This exposure, in and of itself, may have been enough to increase participants awareness of this type of support from family members.

Health behaviors increased over time for both groups, yet there was no group difference. This results also suggests that merely exposing individuals to information about healthy behaviors has the potential to increase these behaviors.

The fact that both information and information plus discussion are useful in effecting change holds promise, as that indicates that individuals who seek online information seeking are likely to receive similar benefits as those seeking social support. This allows for more people with differing motivations to benefit from internet and computer technology.

Contrary to study hypotheses, the main effect of time was not significant for friend support specific, friend general support, family support general, depression, expectancies, subjective norm, perceived behavioral control, intentions, and medical outcomes. The social support variables may not have evidenced change because they are a more stable construct and not likely to change rapidly. The one social support variable that did improve, family specific support, may differ from these other variables in that older adolescents may not be as in close contact with their families as they are with their peers. With infrequent contact, any increases in the amount of time participants spend communicating with their families about health behaviors might have been more salient than any small changes that might have occurred on the other support variables.

Regarding depression, this variable evidenced very little change, and may be more appropriately measured by another measure than the one we used in this study (BDI-II). It is also possible that our intervention is not effective for depressive

symptoms in older overweight adolescents. It is possible that the relation between overweight and depression is mediated by variables other than social support (e.g., ethnic background, sex). Including these variables in future research might provide a greater understanding of the role of depressive symptoms in overweight older adolescents.

Finally, one finding was significant, but in the opposite direction of what was hypothesized. There was an effect of time for the variable attitudes, with participants in both groups reporting a worsening in attitudes toward health behaviors at time two. This result suggests that exposure to information and discussion about engaging in healthy behaviors may actually negatively impact attitudes toward those behaviors. There may be several factors at play here, including the role of the discussion group. The discussion group provided commentary on health and nutrition information, and participants were required to log in and post at least four times per week. It is possible that participants became overwhelmed or overloaded with the very specific health information that was provided. For people that have not been exposed to this information before, this could be perceived as an onerous and unpleasant task. This result calls into question the ability of an internet discussion board to positively influence attitudes.

Some support for differential efficacy across conditions was also found. As hypothesized, there was a time by group effect for the variables family support specific to health related behaviors, with participants in the Information plus Discussion group evidencing a greater increase in scores than those participants in the Information only condition at time two. This may be due to participants in the Information and

Discussion condition discussing health related behaviors with their families as a function of their participation in the study. There may have been a type of carry over effect, where participants, logging in and posting comments about health related behaviors and topics, also began discussing those topics in real life, providing more opportunity for family to be supportive of that behavior.

Contrary to study hypotheses, the time by treatment interactions were not significant for family specific support, friend general support, friend specific support, depression, expectancies, subjective norm, perceived behavioral control, intentions, health behaviors, and medical outcomes. The failure of these variables to evidence a significant time by treatment effect indicate that these variables may be more resistant to change, and may be better evaluated over a longer period of intervention.

Finally, similar to the main effects of time, the time by group interaction findings for attitudes were in the opposite direction from what was hypothesized. Both groups deteriorated over time, with the Information plus Discussion group reporting greater declines in positive attitudes toward health related behaviors than their counterparts in the Information only group. This impact of the discussion group is interesting, particularly because there were no documented instances of inappropriate, aggressive, or negative comments in the Discussion group that could have explained a deterioration in attitudes. It may be that the same "overload of information" effect is at play here as it is in the information condition, amplified due to the amount of time spent online. Participants in the Information condition may have been overwhelmed or bored by repeatedly logging in to read about the same type of information. If so, then it would

follow that participants in the Information plus Discussion group, who were required to post comments in addition to logging in, would be even more so.

It could also be that the measure of attitudes was not comprehensive enough for the purposes of the present study. Recall that engagement in health related behaviors increased for all participants at time two, while attitudes toward these same behaviors decreased. This result raises the possibility that the decrease in attitudes was an effect of participants engaging in more health related behaviors, thus giving them more opportunity to have poor attitudes toward those behaviors. In other words, if prior to the study a person was not exercising, then he or she may have had neutral or positive feelings about exercising. Then, if that person began to exercise during the course of the study, he or she may have decided that it was not an enjoyable activity, resulting in decreased attitudes.

Despite these findings, attitude is an important variable to study in this population. College students are unique in many ways, and the participants in our study were freshman college students. These participants were arguably in a developmental time period where they were beginning to evaluate and modify their attitudes toward many things in their lives, including how they view activities such as eating healthy foods and exercising. This is yet another reason to continue to investigate health behavior change in overweight older adolescent college students.

Strengths

The current study has several strengths of note. First, the potential for applications of internet social support with individuals dealing with potentially

stigmatizing health conditions, due in part to the absence of visual cues (Wright & Bell, 2003). In the present study, overweight could be considered a stigmatizing and embarrassing condition. The online format of the groups may have allowed participants to participate more freely and openly than they might have in an in-person group. Overweight individuals are frequently blamed for their condition, and often do not receive messages of empathy and support from people who may otherwise be considered sources of social support (e.g., friends and family). This marginalization may lead to an even greater amount of empathic identification and communication amongst overweight group members (Wright & Bell, 2003).

This is also the first study of its kind conducted with overweight older adolescents, a group that is in prime position for a health behavior intervention related to their emerging independence and role in making decisions about health and nutrition behaviors. An intervention at this juncture has the potential to have life long positive health benefits, an is another strength of our study.

The asynchronous communication format of the present study may also be considered a strength. This format allowed participants to read, digest, and respond in a thoughtful manner to the information provided, as well as to other participants. It also allowed multiple participants to respond to any given post (Wright and Bell, 2003). All participants in this study were able to post comments at any time, and to make multiple posts to one topic, thus allowing for online "conversations." Research (Walther and Boyd, 2002) has suggested that the relatively weak interpersonal ties that online communication fosters are easier to navigate due to the reduced expectations of social

norms and niceties. In other words, individuals in an online environment are more likely to seek information without feeling the need to engage in conversations and pleasantries that are irrelevant to their question, and that they would be expected to engage in an in-person interaction. Many participants were surprisingly thorough and thoughtful in their posts, and posted more than the required four times per week.

The lack of an active participant-moderator was also a strength. Although the discussion board group was moderated in the sense that posts were monitored for adherence to group guidelines, participation, and tone, there was no active participation in the discussions by the moderator. Many computer mediated support groups are moderated in this way, with the moderator acting as a referee rather than a confidant. This approach is cost effective, and less time consuming for the moderators. According to Wright and Bell (2003), many individuals who choose to participate in online discussion groups are not doing so for the benefit of interaction and consultation with health care providers. Rather, they are seeking other individuals who will be empathic in listening and responding to their everyday concerns and questions.

A common problem in internet investigations of health related behaviors is a high dropout rate. This was not the case with our study, as we had good retention. Additionally, of the participants who did drop out, there were no systematic differences between groups, and no common characteristics of dropouts compared to those who remained enrolled in the study.

Another strength of the present study was the relative ease with which participants engaged in the discussion board process. Participants were required to log in

a minimum of four times per week, with those in the Information plus Discussion group also required to post comments to the discussion board four times per week. Participants were able to meet these requirements with no prompting from the researcher. Additionally, no participants engaged in inappropriate behavior or disruptive communications. Although these are not infrequent occurrences in online discussion groups, they did not occur in our group. One reason for this may be that participants were using a web based application, Web CT, that they use in other courses, and have been familiarized with the rules of interaction in this environment. Additionally, although participants were informed that their online participation was confidential, they may have continued to operate as they do in their other courses (i.e., as though the moderator was a teacher, aware of their identity, and able to assign a course grade). These factors may have made for more thoughtful and appropriate interactions by participants. Another possibility for this respectful communication was the overweight status of all participants. This common factor, of which all participants were aware, may have fostered a sense of community, empathy, and respect for their peers. This may have been made even more likely due to the stigmatizing effect of being overweight in a college environment.

The measures used in this study had good reliability, evidenced by their Cronbach's alpha values. Additionally, we were able to gather and evaluate objective data on participation, allowing us to evaluate the feasibility of using this type of intervention with overweight older adolescent college students.

Limitations

Likely the most noteworthy limitation of the present study was the sample size. This is not uncommon in overweight and internet research and has been encountered by other researchers (e.g., Heshka, Anderson, Atkinson, Greenway, Hill, Phinney, Kolotkin, Miller-Kovach & Pi-Sunyer, 2003). There were several results that approached significance with associated small effect sizes, which suggests that future investigations with larger sample sizes might more fully support the study hypotheses.

Although the present study had a moderate number of participants, an examination of the effect sizes for our hypothesized, significant results revealed a range of partial eta squared coefficients from .054 to .259, which can be understood in terms of percent of variance explained by the independent variable. According to Cohen (1988), interpretation of partial eta squared is as follows: small = .01, medium = .06, and large = .14. It is promising that even with our small sample, several of the change hypotheses were supported with significant results.

Sample size difficulties seemed to be due more to recruitment difficulties rather than attrition from the study, as relatively few participants (8.7%) who qualified for the study did not complete it. Recruitment was somewhat hindered by the nature of the psychology subject pool, and the rules governing advertisement of studies. The prohibition against providing specific study information to interested students may have made our study less attractive at first glance, and prohibited some qualified students from filling out initial screening measures. Additionally, although overweight is estimated to occur in 37.9 % of college age older adolescents (Schoenborn et al., 2004),

our recruitment occurred within the confines of the the psychology subject pool, leaving the percentage of eligible participants smaller than it might have been if we had had unfettered access to the entire student body. Future studies would benefit from developing proposals to recruit from the entire student body, with gift certificates, monetary compensation, or gym membership as an incentive to participate. Targeted recruitment efforts in student health and counseling center and gyms may also be beneficial. Future studies should include a larger number participants in order to determine if the trends apparent in the present study emerge as statistically significant findings when tested in a larger sample. Larger numbers of participants will also allow for more complete tests of the MISSHRB (e.g., path analysis), as the present study was limited to correlation analyses.

Another limitation of the present study had to do with the variable depression. Although there is a great deal of research linking overweight and depression (e.g., Berlin & Lavergne, 2003; Dong et al., 2004; Stunkard et al., 2003), the variable failed to correlated significantly with the majority of the variables in the MISSHRB, and did not demonstrate a change over time. There may be several reasons for this. First, it may be that the measure we used (the BDI-II) was not likely to produce a large range of scores in a non-clinical population such as this. A more average or general measure of depressive symptoms may yield more accurate information about this variable in a sample such as ours. It is also possible that the variable that belongs in that part of the model is more akin to mood or stress, than depression. Both mood and stress are fairly

broad constructs that may be more likely to capture to variability that exists at any given time in a sample of college students.

Participants had the opportunity to choose from many psychology experiments in order to receive their needed credits for an introductory psychology course. There was likely a self-selection bias at work when students chose to sign up for this study initially. An interest in health and nutrition (which was advertised in the study selection process) in and of itself may have made communication more likely for participants who were particularly interested in the study. This self-selection bias may be construed as a weakness due to the limitations of generalizability of the results. It is also possible that individuals who are overweight, yet fail to recognize this as a health threat, and thus did not participate, may benefit from this type of online intervention. Future recruitment efforts that provide monetary compensation may facilitate the engagement of these individuals in future research.

Another limitation was the inability to tailor recruitment efforts solely to individuals identifying as overweight. The structure of the Subject Pool presented some constraints on both the recruitment and retention of participants, including a prohibition against advertising specifically for overweight participants. Future studies would benefit from recruitment targeted at overweight individuals interested in learning about health and nutrition outside of participant pools such as those in the university setting.

The ethnic and gender break down of participants was also a limitation of the present study. Participants were overwhelmingly Caucasian (71.8%), freshmen (71.8%), and female (70.4%). The ethnic breakdown of the sample is similar to that of the

university, where the majority of the undergraduate population identifies as Caucasian (Texas A&M, 2008). Although women and men are similarly represented in the general population regarding overweight, women are historically overrepresented in online support groups. Some researchers have found that the ratio of females to males in support groups have influenced empathic communication, with more heavily female populated groups have demonstrating empathic communications (Preece and Ghozati, 2001). Although there is a paucity of research aimed specifically at the investigation of ethnicity and online participation in support groups, researchers would benefit from efforts to include more ethnically diverse individuals in future projects. Recruitment efforts tailored specifically to men and minorities may include recruitment at sports clubs and fraternities, as well as with groups that have primarily minority group members. Replication of this study at a school with a large minority student body population would also be beneficial.

The use of BMI as a measurement could also be considered a limitation in this study. Body Mass Index, a mathematical ratio of height to weight, is not a number that changes rapidly. Although the National Institutes of Health (2006) suggests that BMI is the best measure of overall health, it does have limitations. For one, individuals that are above the norm in terms of muscle mass (e.g., elite athletes, body builders), will have misleadingly high BMIs. Additionally, it takes approximately eight pounds of weight loss to change a BMI of 26 to 25, a one digit difference, for a person who is 5’11”. Therefore, in the relatively short period of time of this study (eight weeks), it is not surprising that we did not observe a significant change in participant BMI.

In other support group research, participants have reported stronger feelings of support in a more immediate environment, where communication was not asynchronous (Wright and Bell, 2003). For the present study, if a participant were interested in talking to and receiving support from another individual, they were not necessarily able to find that person online when they were. This made it less likely for participants to develop close ties to other individuals in that group, and could be considered a limitation of the ability of participants to find immediate support.

Future Directions

This study provided partial support for relations between variables of the proposed model of the Influence of Social Support on Health Related Behaviors. It also provided evidence that online information and support can effect change and be of use with overweight older adolescents interested in engaging in more healthy behaviors.

Participants in the current study were college age adolescents who have grown up with technology and the internet as an integral part of their daily lives, and thus it was not likely a formidable or scary medium with unknowns. This may not be the case with individuals who are older (40+) or come from cultural or socioeconomic backgrounds where computers and the internet are not readily accessible. Depending on their knowledge of computers, this medium may not be one with which they are comfortable. However, it would benefit individuals whom are interested in using social support to help them engage in more healthy behaviors, to familiarize themselves with this technology. Individuals without access to the internet are obviously not able to participate in groups that provide online social support. This is problematic, as

individuals in lower socioeconomic strata are at risk for overweight and the accompanying medical complications (Flegal, Caroll, Ogden, & Curtin, 2010).

Additionally, individuals who lack the resources to access a reliable internet connection are also likely to lack resources to address the problems of inadequate nutrition and exercise, information about healthy behaviors, and medical and social support. Therefore, it would be beneficial for research and intervention efforts to address these issues in health disparity. This could be accomplished by seeking out funding to work with disadvantaged groups (e.g., inner city low SES individuals, individuals on public assistance) and collaborating with the organizations that serve these groups (e.g., hospitals and community centers).

Future research should also include larger sample sizes, broader age ranges, more men, more ethnically and socioeconomically diverse participants, and individuals with greater amounts of weight to lose. The generalizability of results will be greatly improved in future studies by recruiting individuals who participate solely based on an interest in health and nutrition, and not for course credit.

Other possibilities for future research in this area include the use of technology such as texting, social networking websites, and hand held personal data assistants. These technologies are used by many older adolescents for social purposes, and are familiar tools that could conceivably be incorporated into a health improvement regimen with relative ease. In fact, it may soon be the case that these are our only tools available for effective service and information delivery to this age group. Therefore, it behooves

researchers to remain abreast of new and emerging technologies, and explore ways in which to use them to deliver services.

There are several implications for future research worth noting here. Several variables demonstrated an improvement over time regardless of group membership, specifically family support and engagement in health related behaviors. These findings suggest that online information groups may actually provide sufficient support for older overweight adolescents, with very little to no interaction with other people, or participation of an expert.

The finding that attitudes toward engaging in healthy behaviors became less positive over time, and were more pronounced in the Information plus Discussion group, may serve as a caution against overloading people with too much exposure to health and nutrition topics. It may have been the case that the required participation in and engagement with, the topic area, was tiresome for participants, and that they responded by becoming less positive toward the topic area. Future research and interventions should consider this finding and moderate exposure to information and participation accordingly, perhaps by allowing participants to engage in the subject matter at their own pace.

It would also be useful to include more information about the nature of those attitudes, and what factors may have influenced them throughout the course of the study. This could be accomplished by asking participants directly, and by examining the content of discussion board posts for themes related to attitudes toward engaging in health behavior. It is also possible that as participants in the present study discussed

engagement in healthy behaviors, there was an effect of commiseration, or focusing on the negatives (e.g., not enjoying the taste of some foods, feeling out of shape or embarrassed to exercise). This is clearly an unintended effect of the Discussion group, and could be avoided in future research with the addition of an active participant-moderator.

Overweight, unhealthy eating and exercise habits, and their associated health concerns are a growing problem in the United States. Understanding the key variables in improving the health of older adolescents can have far ranging benefits and allow us to address the problem of overweight using internet and computers technology. The question then becomes, is the internet a viable sources of support for all people seeking to maintain a healthy BMI, or only for a select few? The internet is clearly a medium that will be used more frequently in the future for information and social support, and research targeted at the myriad ways in which this occurs will be beneficial for many health conditions, including overweight older adolescents. The present study demonstrated that not only is social support an important variable to study, but that it is important in the realm of health behavior change. Specifically, social support is an important variable to include when examining the variables related to overweight in a sample of older adolescent college students. Social support is frequently conceptualized in terms of either being present or absent, yet the present study was able to demonstrate not only the presence of social support, but also provided information about the nature and types of social support. Additionally, we were able to glean information about how social support interacts with other variables in a proposed health behavior model, thus

supporting its inclusion in future studies of health behavior change in relation to overweight, older adolescents.

The broader implications of the findings of this study support the implementation of similar interventions due to ease of administration, low cost, and ease of accessibility to treatment. The results of this study also provide support for the utility of social support and condition specific groups that currently exist online. It is possible that simply being exposed to information about health and nutrition, people will begin to make more informed and healthier choices, without the necessity of costly interventions.

REFERENCES

Ackard, D.M., Croll, J.K., & Kearney-Cooke, A. (2002). Dieting frequency among college females: Association with disordered eating, body image, and related psychological problems. *Journal of Psychosomatic Research, 52, 3,* 129-136.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50,* 179-211.

Ajzen, I. (2006). *The theory of planned behavior*. Retrieved May 3, 2006 from University of Massachusetts, Icek Ajzen Web site: http://www-unix.oit.umass.edu/~aizen/tpb.diag.html.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.

Anjejo, D., Modeste, N.N., Lee, J.W., & Wilson, C.M. (2007). Factors associated with sexual intercourse among African-born adolescents in southern California. *Californian Journal of Health Promotion, 5, 4,* 97-112.

Armitage, C.J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology, 40, 4,* 471-499.

Babyak, M., Blumenthal, J.A., Herman, S., Khatri, P., Doraiswamy, M., Moore, K., Craighead, W.E., Baldewicz, T.T., & Krishnan, K.R. (2000). Exercise treatment for major depression: Maintenance of therapeutic benefit at 10 months. *Psychosomatic Medicine, 62, 5,* 633-638.

Baker, L., Wagner, T.H., Singer, S., & Bundorf, M.K. (2003). Use of the internet and email for health care information. *Journal of the American Medical Association, 289, 18*, 2400-2406.

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior, 31, 2*, 143-164.

Bass, M.A., Enochs, W.K., & DiBrezzo, R. (2002). Comparison of two exercise programs on general well-being of college students. *Psychological Reports, 91*, 1195-1201.

Beck, A.T., Steer, R.A., & Brown, G.K. (1996) Manual for the Beck depression inventory-II". San Antonio, TX: Psychological Corporation

Berlin, I., & Lavergne, F. (2003). Relationship between body-mass index and depressive symptoms in patients with major depression. *European Psychiatry, 18,* 85-88.

Blanchard, C. M., McGannon, K. R., Spence, J. C., Rhodes, R. E., Nehl, E., Baker, F., & Bostwick, J. (2005). Social ecological correlates of physical activity in normal weight, overweight, and obese individuals. *International Journal of Obesity, 29,* 720-726.

Bond, G.G., Aiken, L.S., & Somerville, S.C. (1992). The health belief model and adolescents with insulin-dependent diabetes mellitus. *Health Psychology, 11, 3,* 190-198.

Bowie, J.V. (2004). The theory of planned behavior and intention to repeat mammography among African American women. *Journal of Psychosocial Oncology, 21, 4*, 23-42.

Bull, S.S., McFarlane, M., & King, D. (2001). Barriers to STD/HIV prevention on the Internet. *Health Education Research, 16, 6,* 661-670.

Burrows, R., Loader, B.D., Pleace, N., & Muncer, S. (2000). Virtual community care? Social policy and the emergence of computer mediated support. *Information, Communication and Society, 3, 1,* 95-121.

Centers for *Disease Control* (2008). *Healthy weight. It's not a diet, it's a lifestyle*. Retrieved July 17, 2007 from http://www.cdc.gov/healthyweight/index.html.

Cerkoney, K.A., & Hart, L.K. (1980). The relationship between the health belief model and compliance of persons with diabetes mellitus. *Diabetes Care, 3, 5,* 594-598.

Chan, D.S., Callahan, C.W., Sheets, S., Moreno, C.N., & Malone, F. J. (2003). An internet-based store-and-forward video home telehealth system for improving asthma outcomes in children. *American Journal of Health-System Pharmacy, 60,* 1976-1981.

Choi, K.H., Yep, G.A., & Kumekawa, E. (1998). HIV prevention among Asian and Pacific Islander American men who have sex with men: A critical review of theoretical models and directions for future research. *AIDS Education and Prevention, 10, 3,* 19-30.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

De Bourdeaudhuij, I. & Sallis, J. (2002) Relative contribution of psychological determinants to the prediction of physical activity in three population based samples. *Preventive Medicine, 34*, 279–288.

Dew, M.A., Goycoolea, J.M., Harris, R.C., Lee, A., Zomack, R., Dunbar-Jacob, J., Rotondi, A., Griffith, B.P. & Kormos, R.L. (2004). An internet-based intervention to improve quality psychosocial outcomes in heart transplant recipients and family caregivers: Development and evaluation. *The Journal of Heart and Lung Transplantation, 23*, 745-758.

Dong, C., Sanchez, L.E., & Price, R.A. (2004). Relationship of obesity to depression: A family based study. *Nature, 28, 6,* 790-795.

Eisen, M.A., Zellman, G.L., & McAllister, A.L. (1992) A health belief model-social learning theory approach to adolescents' fertility control: Findings from a controlled field trial. *Health Education Quarterly, 19, 2*, 249-262.

Eysenbach, G. (2004). Health-related virtual communities and electronic support groups. *British Medical Journal, 328,* 1166-1170.

Eysenbach, G., Powell, J., Kuss, O., & Sa, E. (2002). Empirical studies assessing the quality of health information for consumers on the world wide web: A systematic review. *Journal of the American Medical Association, 287, 20*, 2691-2700.

Fisher, J.D., Fisher, W.A., Bryan, A. D., & Misovich, S.J. (2002). Information-motivation-behavioral skills model-based HIV risk behavior change intervention for inner-city high school youth. *Health Psychology, 21, 2*, 177-186.

Fisher, W.A., & Fisher, J.D. (1992) Understanding and promoting AIDS preventive behaviour: A conceptual model and education tools. *Canadian Journal of Human Sexuality, 1, 3*, 99-106.

Flegal, K.M., Caroll, M.D., Ogden, C.L., & Curtin, L.R. (2010). Prevalence and obesity among US adults, 1999-2008. *Journal of the American Medical Association, 303, 3,* 235-241.

Fox, S. (2008) The engaged e-patient population. Pew internet and American life project, online report. Pew Internet and American Life Project. URL: http://www.pewinternet.org/Reports/2008/The-Engaged-e-patient-population. Accessed April 28, 2010.

Fox, S. & Jones, S. 2009. The social life of health information. Pew Internet and American Life Project. Retrieved April 28, 2010 from http://www.pew internet.org/Reports/2009/8-The-Social-Life-of-Health-Information/9-How-to-lose-weight-or-control-weight.aspx?r=1.

Frenzel, M.P., McCaul, K.D., Glasgow, R.E., & Schafer, L.C. (1988) The relationship of stress and coping to regimen adherence and glycemic control of diabetes. J*ournal of Social & Clinical Psychology, 6, 1,* 77-87.

Fulkerson, J.A., Sherwood, N.E., Perry, C.L., Neumark-Sztainer, D., & Story, M. (2004). Depressive symptoms and adolescent eating and health behaviors: A multifaceted view in a population-sample. *Preventive Medicine, 38,* 865-875.

Gardner, R.E., & Hausenblas, H.A. (2004). Understanding exercise and diet motivation in overweight women enrolled in a weight loss program: A prospective study using the theory of planned behavior. *Journal of Applied Social Psychology, 34, 7,*1353-1370.

Gerrard, M., Gibbons, F.X., Benthen, A.C. & Hessling, R.M. (1996). A longitudinal study of the reciprocal nature of risk behaviors and cognitions in adolescents: What you do shapes what you think, and vice versa. *Social Psychology of Health 15, 5,* 344-354.

Godin, G., & Kok, G. (1996). The theory of planned behavior: A review of its applications to health-related behaviors. *American Journal of Health Promotion, 11, 2,* 87-98.

Gross, E.F. (2004) Adolescent Internet use: What we expect, what teens report. *Journal of Applied Developmental Psychology. Special Issue: Developing Children, Developing Media: Research from Television to the Internet from the Children's Digital Media Center, 25, 6,* 633-649.

Gustafson, D.H., Robinson, T.N., Ansley, D., Adler, L., & Brennan, P.F. (1999). Consumers and evaluation of interactive health communication applications. The Science Panel on Interactive Communication and Health. *American Journal of Preventive Medicine, 16,* 23-90.

Gustafson, D.H., Wise, M., & Mc Tavish, F. (1993). Development and pilot evaluation of a computer-based support system for women with breast cancer. *Journal of Psychosocial Oncology, 11,* 69-93.

Harvey-Berino, J., Pintauro, S., Buzzell, P., DiGuilio, M., Casey-Gold, B., Moldovan, C., & Ramirez, E. (2002). Does using the Internet facilitate the maintenance of weight loss? *International Journal of Obesity, 26, 9,* 1254-1260.

Harvey-Berino, J., Pintauro, S., Buzzell, P., & Gold, C. (2004). Effect of internet support on long-term maintenance of weight loss. *Obesity Research, 12, 2,* 320-329.

Hepworth, R., Mogg, K., Brignell, C., & Bradley, B.P. (2010). Negative mood increases selective attention to food cues and subjective appetite. *Appetite, 54,* 134-142.

Helgeson, V. S., & Gottleib, B.H. (2000) Support groups. In S. Cohen, L. Underwood, & B.H. Gottlieb (Eds). *Social support measurement and intervention: A guide for health and social scientists* (pp. 221-245). New York, Oxford University Press.

Heo, M., Pietrobelli, A., Fontaine, K.R., Sirey, J.A., Faith, M.S. (2006) Depressive mood and obesity in US adults: Comparison and moderation by sex, age, and race. *International Journal of Obesity, 30, 3,* 513-519.

Heshka, S., Anderson, J.W., Atkinson, R.L., Greenway, F.L., Hill, J.O., Phinney, S.D., Kolotkin, R.N., Miller-Kovach, K., & Pi-Sunyer, F.X. (2003). Weight loss with self-help compared with a structured program: A randomized trial. *Journal of the American Medical Association, 289, 14,* 1792-1798.

Johnson, M.F., Nichols, J.F., Sallis, J.F., Calfas, K.J., & Hovell, M. (1998). Interrelationships between physical activity and other health behaviors among university women and men. *Preventive Medicine, 27,* 536–544.

Kittler, J.E., Menard, W., & Phillips, K.A. (2007). Weight concerns in individuals with body dysmorphic disorder. *Eating Behaviors, 8,* 115-120.

Kyngas, H., & Rissanen, M. (2001). Support as a crucial predictor of good compliance of adolescents with a chronic disease. *Journal of Clinical Nursing, 10,* 767-774.

La Greca, A. M., Auslander, W.F., Greco, P., Spetter, D., Fisher, E.B., & Santiago, J. V. (1995). I get by with a little help from my family and friends: Adolescents' support for diabetes care. *Journal of Pediatric Psychology, 20,* 449-476.

Laffrey, S.C. (1986). Normal and overweight adults: Perceived weight and health behavior characteristics. *Nursing Research, 35, 3*, 173-177.

Linde, J.A., Jeffrey, R.W., Levy, R.L., Sherwood, N.E., Utter, J., Pronk, N.P., & Boyle, R.G. (2004). Binge eating disorder, weight control self-efficacy, and depression in overweight men and women. *International Journal of Obesity, 28, 3,* 418-425.

Loader, B.D., Muncer, S., Burrows, R., Pleace, N., & Nettleton, S. (2002). Medicine on the line? Computer-mediated social support and advice for people with diabetes. *International Journal of Social Welfare, 11*, 33-65.

McCabe, M.P., Ricciardelli, L.A., & Holt, K. (2005) A longitudinal study to explain strategies to change weight and muscles among normal weight and overweight children. *Appetite, 45, 3,* 225-234.

McCoy, M. R., Couch, D., Duncan, N.D., & Lynch, G.S. (2005). Evaluating an internet weight loss program for diabetes prevention. Health Promotion International, *20, 3*, 221-228.

Misovich, S.J., Martinez, T., Fisher, J.D., Bryan, A., & Catapano, N. (2003). Predicting breast self-examination: A test of the information-motivation-behavioral skills model. *Journal of Applied Psychology, 33, 4,* 775-790.

Morahan-Martin, J. (2004). How internet users find, evaluate, and use online health information: A cross-cultural review. *Cyberpsychology and Behavior, 7, 5*, 497-510.

National Institutes of Health. (2006). *BMI and obesity statistics*. Retrieved July 31, 2006 from http://win.niddk.nih.gov/ statistics/index.htm#howare.

National Institutes of Health. (2010). *Overweight and obesity prevalence estimates 2007-2008.* Retrieved March 11, 2010 from http://win.niddk.nih.gov/ statistics/index.htm#overweight.

Perri , M.G. (1998). The maintenance of treatment effects in the long-term management of obesity. *Clinical Psychology: Science and Practice, 5, 4*, 526-543.

Pierce, C.A., Block, R.A., & Aguinas, H. (2004). Cautionary note on reporting eta-squared values on multifactor ANOVA designs. *Educational and Psychological Measurement, 64, 6,* 916-924.

Procidano, M., & Heller, K. (1983). Measures of perceived social support from friends and from family: Three validation studies. *American Journal of Community Psychology, 11*, 1-24.

Purcell, K. (2010). *Teens and the internet: The future of digital diversity*. Washington, DC: Pew Internet & American Life Project. URL:http://www.pewinternet.org/ Presentations/2010/Mar/Fred-Forward.aspx.

Rice, R.E., Peterson, M. & Christine, R. (2001). A comparative features analysis of publicly available commercial and government health database websites. In R.

Rice, & J.E. Katz (Eds.). *The internet and health communication: Experiences and expectations* (pp. 213-232). Thousand Oaks, CA: Sage.

Riva, G. (1996). The role of emotional and socio-cognitive patterns in obesity: Eating attitudes in obese adolescents before and after a dietary-behavioural therapy. *Psychological Reports, 79, 1*, 35-46.

Rosenstock, I.M. (1990). The health belief model: Explaining health behavior through expectancies. In K. Glanz, F.M. Lewis, & B.K. Rimer (Eds.). *Health behavior and health education: Theory, research, and practice* (pp. 39-62). San Francisco: Jossey-Bass.

Rosenstock, I.M., Strecher, V.M., & Becker, M.H. (1988). Social learning theory and the health belief model. *Health Education Quarterly, 15, 2*, 175-183.

Schifter, D.E., & Ajzen, I. (1985). Intention, perceived control, and weight loss: An application of the theory of planned behavior. *Journal of Personality and Social Psychology, 49, 3*, 843-851.

Schoenborn, C. A., Adams, P. F., Barnes, P. M., Vickerie, J. L., & Schiller, J. S. (2004). Health behaviors of adults: United States, 1999-2001. *National Center for Health Statistics, 10*, 63-219.

Schultz, J.R., & Chase-Carmichael, C. (2001). Assessment of chronically ill children. In R. Simeonsson & S. Rosenthal (Eds.). *Psychological and developmental assessment: Children with disabilities and chronic conditions*. New York: Guilford.

SPSS Inc. (2008). *SPSS for Windows.* Chicago, IL. SPSS, Inc.

Street, R.L., Jr., & Piziak, V.K. (2001). Using telecomputing technology to improve diabetes care. In R.E. Rice, & J. Katz (Eds.). *The Internet and health communication: Experiences and expectations* (pp. 287-308). Thousand Oaks, CA: Sage.

Stunkard, A.J., Faith, M.S., & Allison, K.C. (2003). Depression and obesity. *Biological Psychiatry, 54*, 330-337.

Tabachnik, B.G., & Fidell, L.S. (2001). *Using Multivariate Statistics*. (4th ed.).Needham Heights, MA: Allyn & Bacon.

Tate, D.F., Wing, R.R., & Winett, R.A. (2001). Using Internet technology to deliver a behavioral weight loss program. *Journal of the American Medical Association, 285, 9*, 1172-1177.

Teese, R., & Bradley, G. (2008). Predicting recklessness in emerging adults: A test of a psychosocial model. *The Journal of Social Psychology, 48, 1,* 105-126.

Texas A&M University (2008). *Enrollment profile:2008*. Retrieved January 26. 2010 from http://www.tamu.edu/oisp/student-reports/enrollment-profile-fall-2008-certified.pdf.

Tuthill, A., Slawik, H., O'Rahilly, S., & Finer, N. (2006). Psychiatric co-morbidities in patients attending specialist obesity services in the UK. *Quarterly Journal of Medicine, 99, 5,* 317-325.

Wethington, E., & Kesler, R.C. (1986) Perceived support, received support, and adjustment to stressful life events. *Journal of Health and Social Behavior, 27, 1*, 78-89.

Williamson, D.A., Martin, P.D., White, M.A., Newton, R., Walden, H., York-Crowe, E., Alfonso, A., Gordon, S., & Ryan, D. (2005). Efficacy of an internet-based behavioral weight loss program for overweight adolescent African-American girls. *Eating and Weight Disorders, 10, 3,* 193-203.

Wing, R.R., & Jeffery, R.W. (1999). Benefits of recruiting participants with friends and increasing social support for weight loss and maintenance. *Journal of Consulting and Clinical Psychology, 67, 1,* 132-138.

Wright, K.B., & Bell, S.B. (2003). Health-related support groups on the internet: Linking empirical findings to social support and computer-mediated communication theory. *Journal of Health Psychology, 8, 1,* 39-54.

Xie, B., Chou, C., Spruijt-Metz, D., Liu, C., Xia, J., Gong, J., Li, Y., & Johnson, C.A. (2005). Effects of perceived peer isolation and social support availability on the relationship between body mass index and depressive symptoms. *International Journal of Obesity, 29,* 1137-1143.

APPENDIX A

TABLES

Table 1

Demographic Characteristics

Characteristic	n	%
Gender	71	100.0
Male	21	29.6
Female	50	70.4
Age (years)		
18	10	14.1
19	35	49.3
20	18	25.4
21	5	7.0
22	3	4.2
Ethnicity		
Caucasian	51	71.8
African American/Black	2	2.8
Hispanic	10	14.1
Asian	2	2.8
Other	6	8.5
Classification		
Freshman	51	71.8
Sophomore	14	19.7
Junior	5	7.0
Senior	1	1.4
Group		
Information (comparison)	32	46.5
Information and Discussion (intervention)	39	53.5
Body Mass Index		
25.0-29.4 (overweight	51	69.0
29.5 and above (obese)	20	31.0

Table 2
Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Family Specific Support	1.0	.247*	.480**	.252*	.059	-.005	.173	.264*	.204	.207	.145	.106	.204
2. Family General Support		1.0	.123	.256*	-.190	-.036	.182	.386**	.319**	.227	.405**	.412**	.435**
3. Friend Specific Support			1.0	.678**	-.043	-.120	.181	.133	.231	.178	.113	.088	.132
4. Friend General Support				1.0	-.262*	-.144	.280*	.456**	.269*	.355**	.194	.306**	.260*
5. Log Depression+					1.0	.153	-.147	-.109	-.057	-.155	-.292*	-.162	-.260*
6. Body Mass Index						1.0	-.071	-.038	-.030	-.260*	-.120	-.109	-.118
7. Perceptions							1.0	.462**	.073	.338**	.061	.262*	.172
8. Expectancies								1.0	.235*	.555**	.519**	.427**	.278*
9. Subjective Norm									1.0	.058	.076	.194	.222
10. Attitudes										1.0	.357**	.522**	.541**
11. Perceived Behavioral Control											1.0	.424**	.446**
12. Intentions												1.0	.804**
13. Health Related Behaviors													1.0

* $p<.05$, ** $p<.01$

+ Depression was log transformed.

Table 3

Results by Treatment Group

			Time		Group ×Time	
Measure/condition	Pre M(SD)	Post M(SD)	*F*(1,69)	partial eta^2	*F*(1,69)	partial eta^2
Family SupportSpec			24.107**	.259	3.977*	.054
Info	52.74(16.75)	56.33(14.16)				
Info Discuss	48.34(14.23)	56.84(12.16)				
Friend SupportSpec			1.213	.017	.062	.001
Info	58.09(15.12)	59.41(10.82)				
Info Discuss	56.36(18.50)	58.44(17.05)				
FamGen Support			.158	.002	3.771	.052
Info	53.41(7.12)	52.13(8.60)				
Info Discuss	51.82(8.03)	52.67(9.12)				
FriendGen Support			1.934	.027	.674	.010
Info	53.13(4.99)	54.72(6.22)				
Info Discuss	49.92(6.23)	50.33(9.34)				
Perceptions/Support			27.646**	.286	1.798	.025
Info	7.82 (1.92)	8.69(2.03)				
Info Discuss	7.87 (1.68)	9.34 (2.55)				
LogDepression			1.048	.015	.009	.000
Info	1.65(.911)	1.56(.95)				
InfoDiscuss	1.92(1.03)	1.82(1.01)				
Expectancies			.704	.010	.303	.004
Info	41.69 (6.95)	41.94(8.38)				
Info Discuss	39.44 (6.74)	40.64(5.59)				
Subjective Norm			.006	.000	.056	.001
Info	16.41(3.57)	16.25(4.392)				
Info Discuss	16.00(3.59)	16.08(4.06)				
Attitudes			35.120**	.337	4.17*	.057
Info	15.21(3.22)	12.62(4.33)				
Info Discuss	16.09(2.84)	10.78(4.97)				
Perc Beh Ctr			2.13	.030	.563	.008
Info	19.28(3.10)	19.51(3.58)				
Info Discuss	19.09(4.32)	19.81(3.51)				
Intentions			1.94	.027	.021	.000
Info	11.49(1.64)	11.79(1.88)				
Info Discuss	11.78(2.77)	12.03(2.81)				
Health Behaviors			5.89*	.079	.334	.005
Info	22.31(4.94)	23.94(6.23)				
Info Discuss	22.69 (3.79)	23.69(3.53)				

Table 3 cont'd

Measure/condition	Pre M(SD)		Post M(SD)		Time *F*(1,69)	Time partial eta^2	Group ×Time *F*(1,69)	Group ×Time partial eta^2
BMI					3.23	.045	3.93	.045
Info	29.31(5.40)		29.33(5.57)					
Info Discuss	28.82(5.33)		28.48(5.13)					
Logins								
Info	+	+	36.09	3.50	+	+	+	+
Info Discuss	+	+	41.69	4.57	+	+	+	+
Postings								
Info	+	+	++	++	+	+	+	+
InfoDiscuss	+	+	37.74	4.51	+	+	+	+

*Note: Info n=32, Info Discuss n=39. *Significant at the p<.05, **p<.01 level. Depression was log transformed. Fam Supp Spec (Family Support Specific to Health Behaviors), Fr Supp Spec (Friend Support Specific to Health Behaviors), Fam Supp Gen (Family Support General), Fr Gen Supp (Friend General Support), Perc Beh Control (Perceived Behavioral Control), Health Rel Beh (Health Related Behaviors), BMI (Body Mass Index), Info (Information group), InfoDis (Information plus Discussion group). + Logins and Postings were recorded for both groups only at post-test. ++ Only the Information plus Discussion group was required to post.*

APPENDIX B

FIGURES

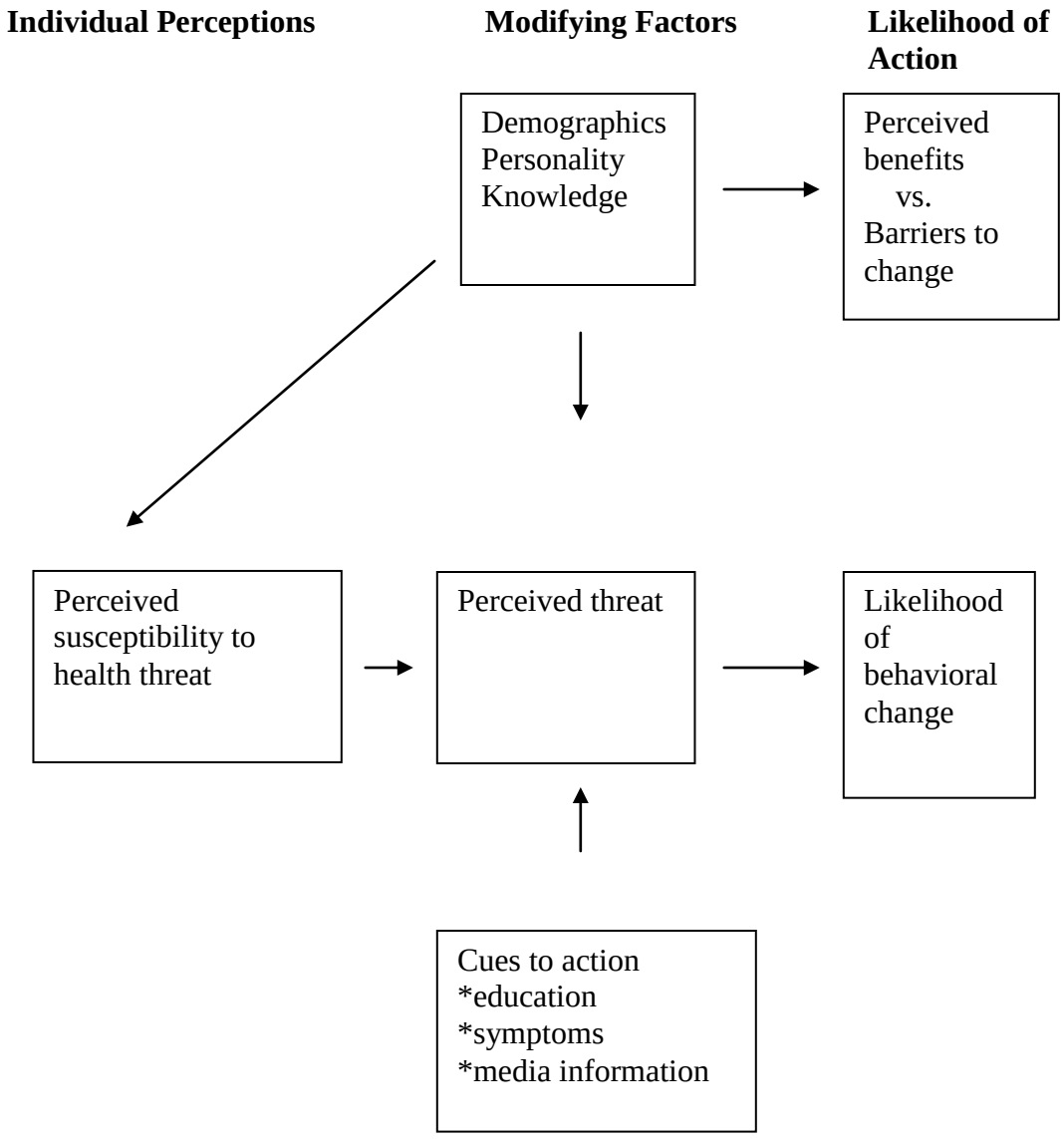

Figure 1. The Health Belief Model (Rosenstock, 1990)

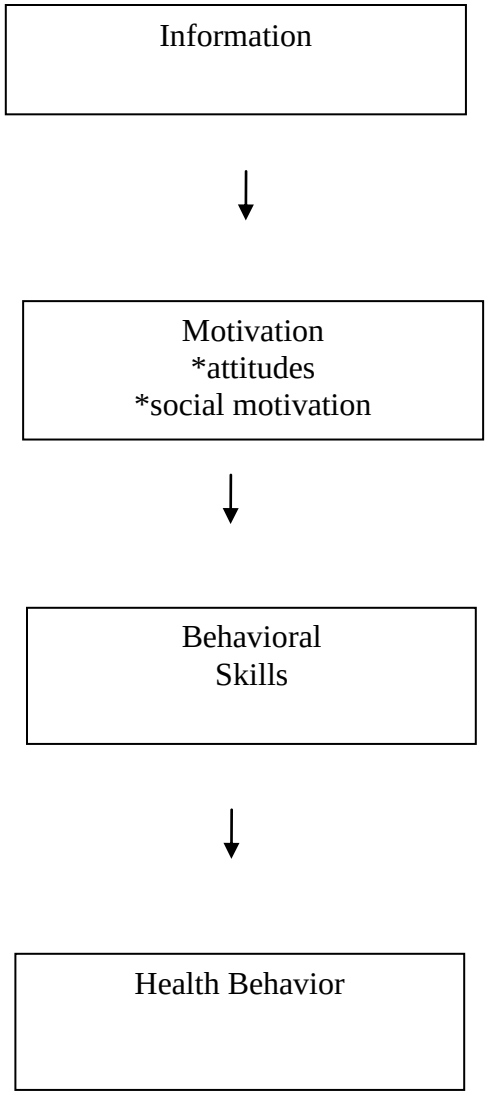

Figure 2. Information-Motivation-Behavioral Skills Model

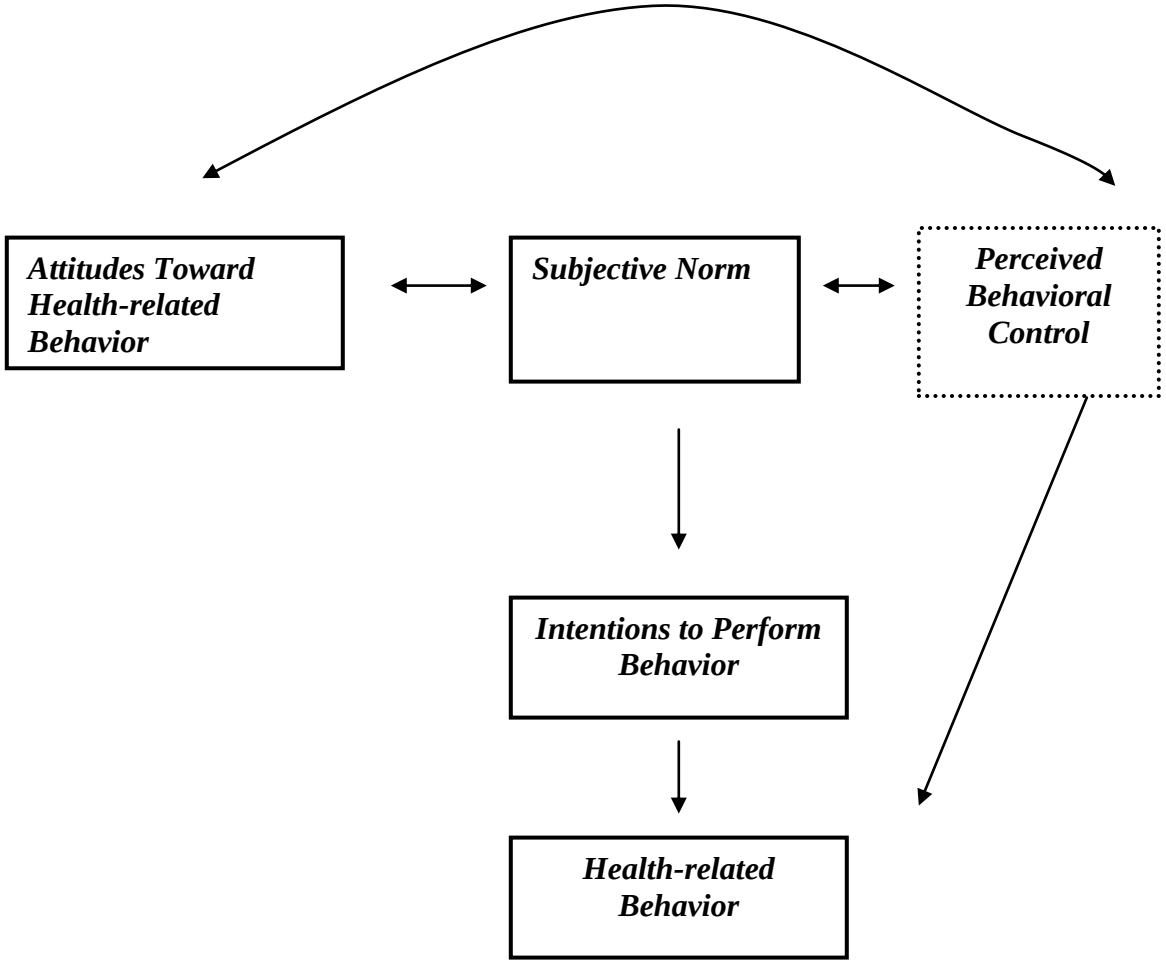

Figure 3. Theory of Reasoned Action/ Planned Behavior (Ajzen & Fishbein, 1980; Ajzen, 1991)

*Note: Perceived behavioral control is an addition of the Theory of Planned Behavior

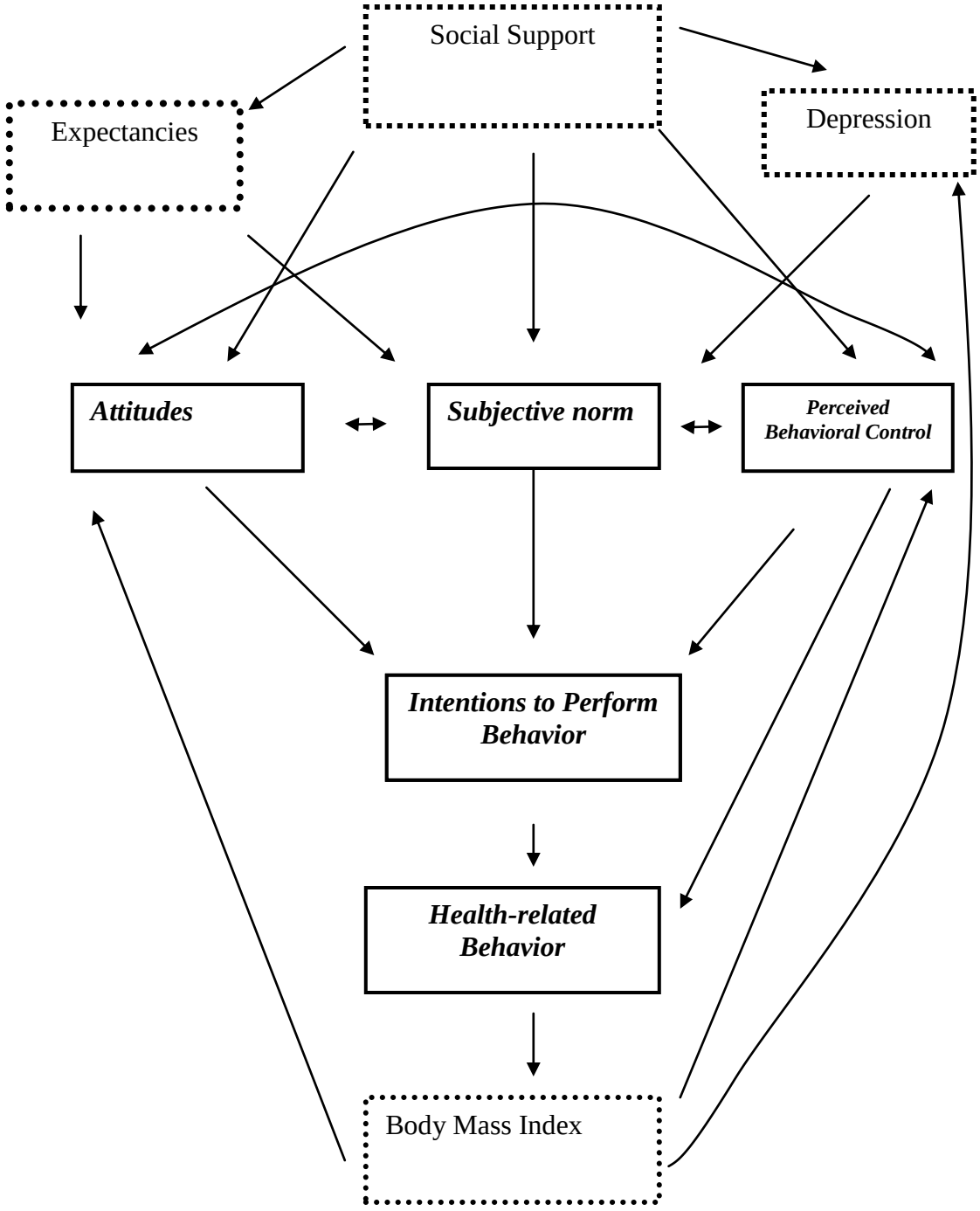

Figure 4. Model of Influence of Social Support on Health-Related Behavior (Adapted from the Theory of Planned Behavior; Ajzen, 1991)

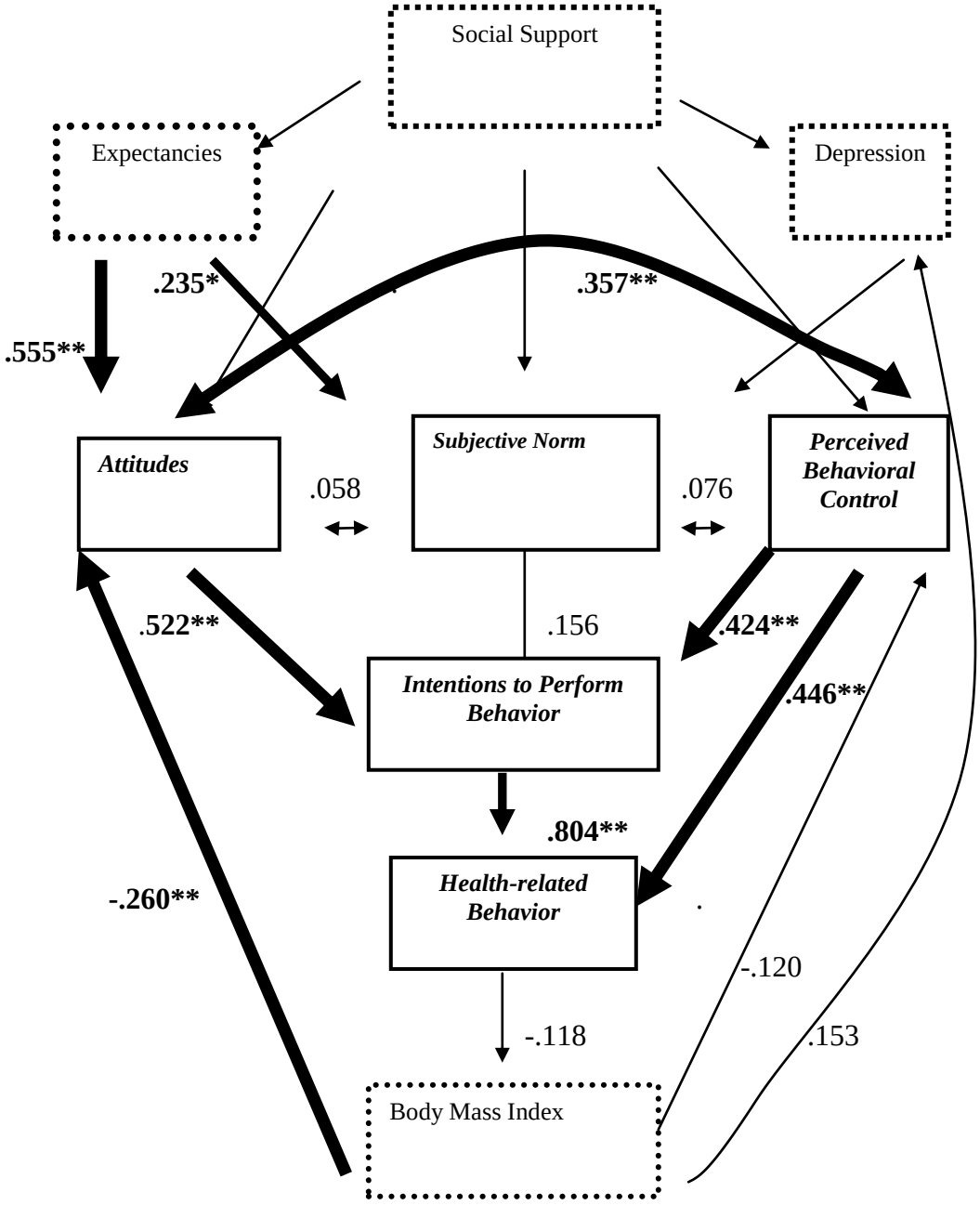

Figure 5. Model of Influence of Social Support on Health-Related Behaviors with Correlations

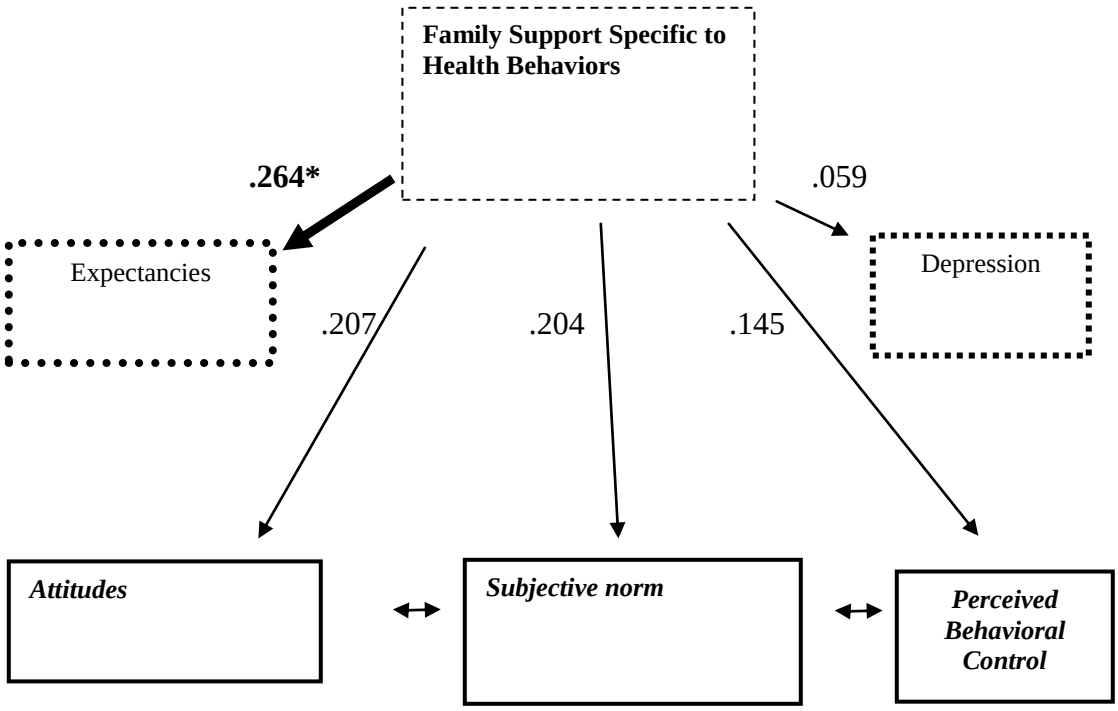

Figure 6. Correlations of Family Support Specific to Health Behaviors

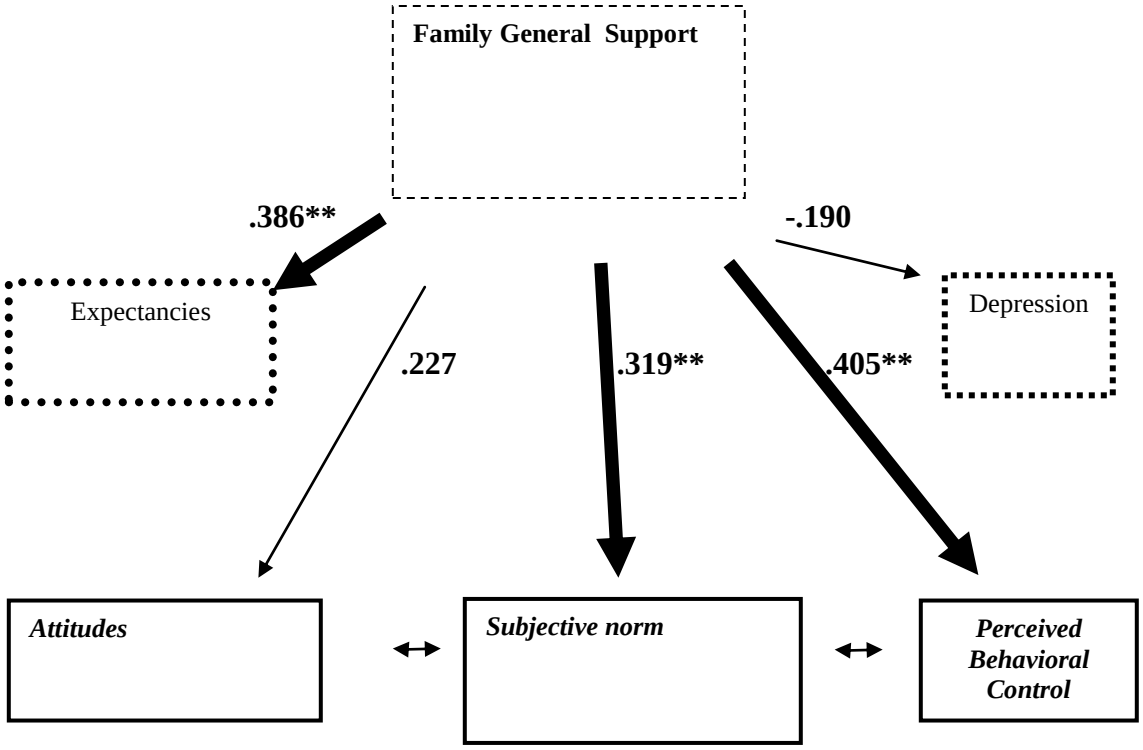

Figure 7. Correlations of General Family Support

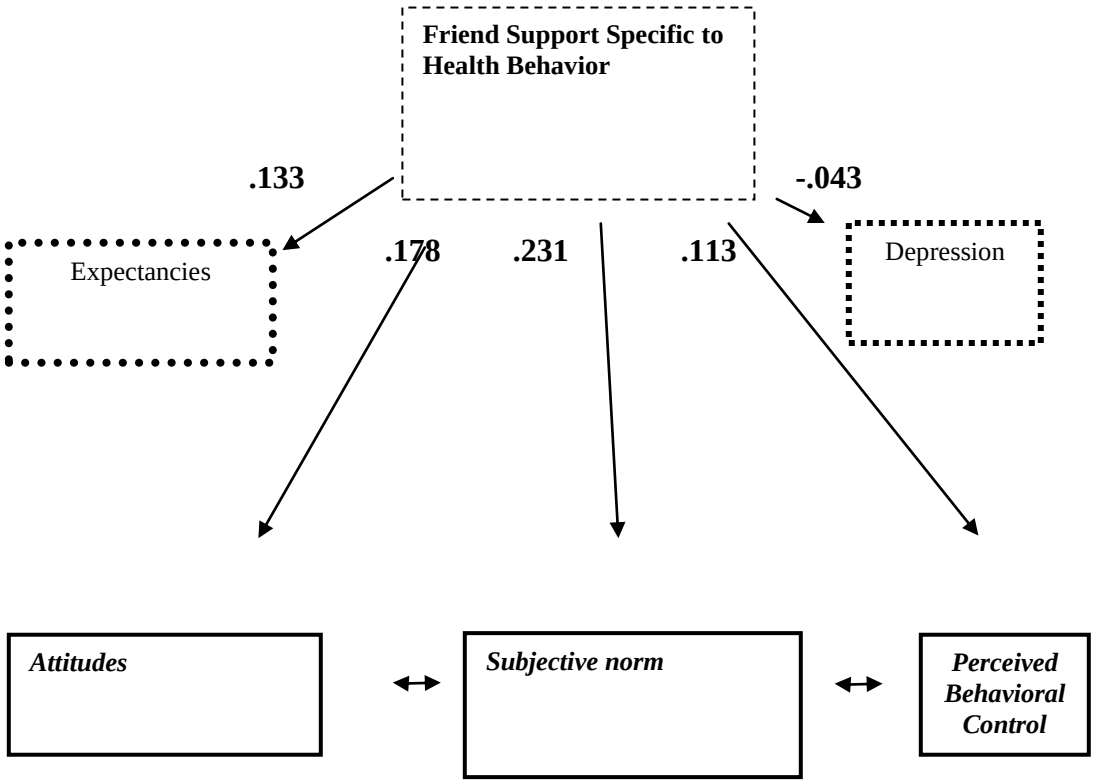

Figure 8. Correlations of Friend Support Specific to Health Behaviors

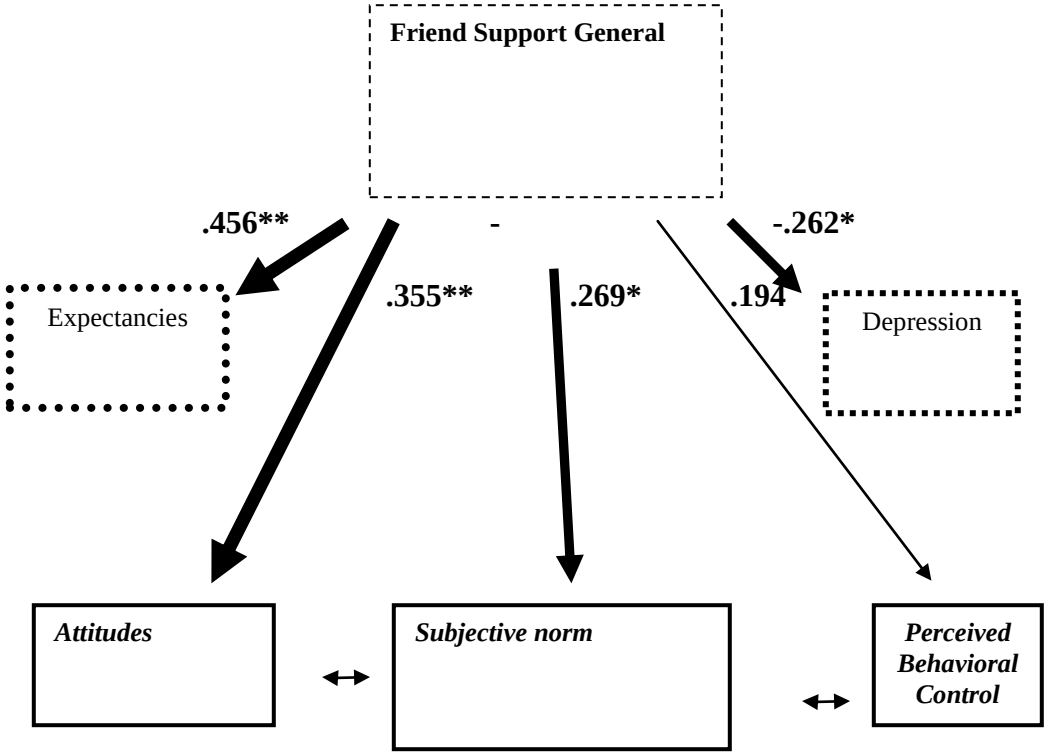

Figure 9. Correlations of General Friend Support

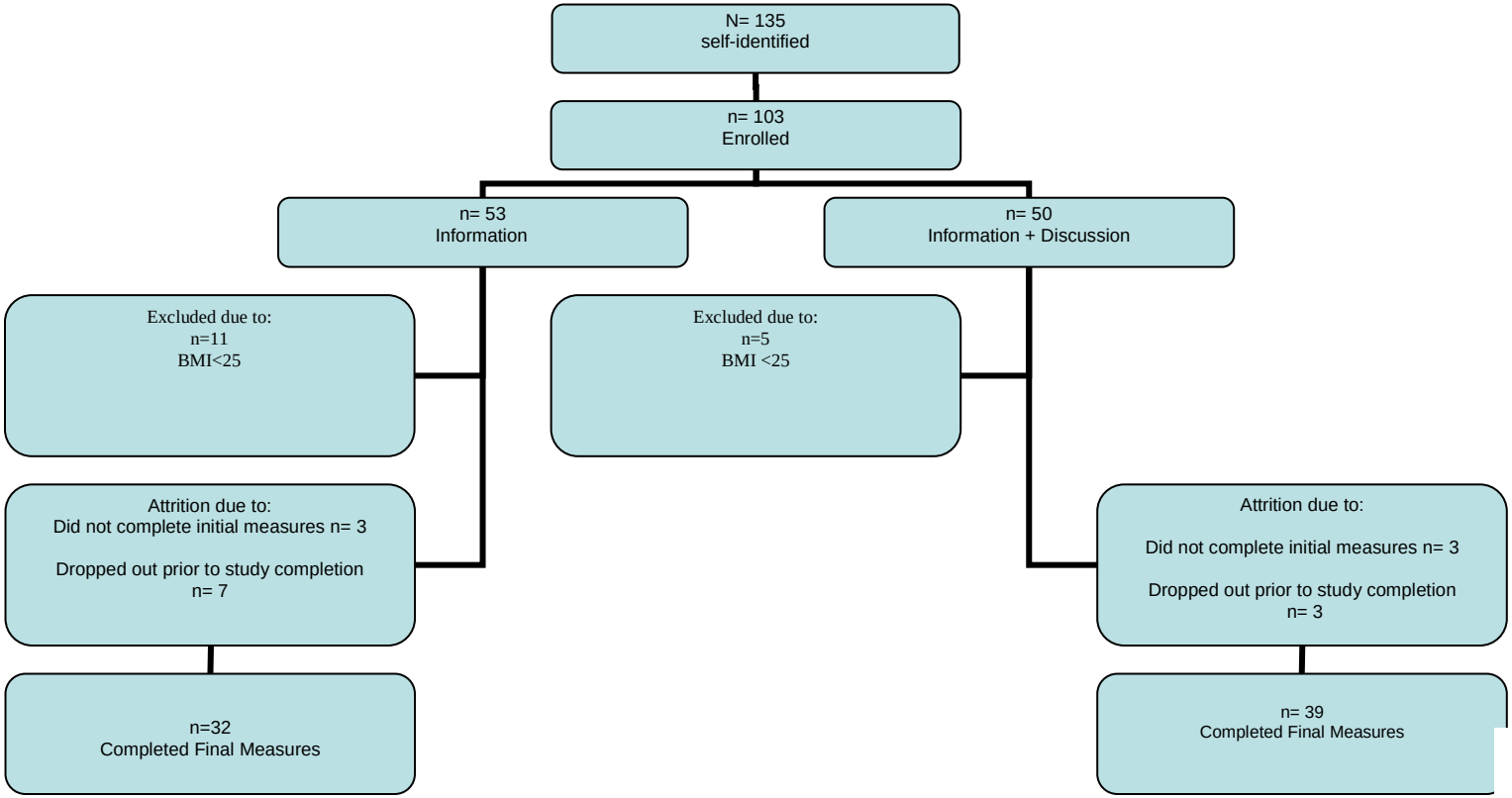

Figure 10. Flow of Participation

APPENDIX C

Screening Questionnaire

Thank you for your interest in this project. Your answers to the following questions will be used to determine your eligibility for further participation in this study. You will receive one research credit hour for your participation in this stage of the screening process, regardless of your eligibility or desire for further participation. If you are eligible for participation in the study, you will be notified via email. Please note: If you wish to be considered for further participation, you must provide your email address on this form so that we are able to contact you. Again, thank you for your time.

1. Date of Birth: _____

2. What is your height?_____

3. What is your weight? _____

4. Are you interested in learning about healthy nutrition and exercise habits? Yes/ No

5. Have you ever been diagnosed or treated for an eating disorder? Yes/ No

6. If you have been diagnosed or treated with an eating disorder, what was it? Binge Eating Disorder/ Anorexia Nervosa/ Bulimia Nervosa/ Eating Disorder NOS/ Don't Know

7. Do you have access to a computer with an internet connection? Yes/ No

8. Are you currently under a physician's care for treatment of a medical condition? Yes/No

9. If you are under a physician's care for treatment of a medical condition, what is it?

10. Are you currently participating in a commercial weight loss program (e.g., Weight Watchers, ediets.com)? Yes/No

11. Are you willing to participate in online activities focused on improving diet and exercise?

12. email address (to be used for contact purposes). _____

Demographics

1. Date of Birth: _____

2. Sex: Male Female

3. What is your ethnicity? White/Caucasian; Black/African heritage; Hispanic; Asian; Pacific Islander; Native American; Other

4. What is your height?_____

5. What is your weight? _____

6. Year in School (Freshman, Sophomore, Junior, Senior)

7. Are you interested in learning about healthy nutrition and exercise habits? Yes/ No

8. Do you have access to a computer with an internet connection? Yes/ No

9. Have you ever used WebCT before? Yes/ No

10. Have you ever participated in an online support group? Yes/No

11. If you have participated in an online support group, what was the topic? _____

12. Have you ever been diagnosed or treated for an eating disorder? Yes/ No

13. (Completed by researcher) Height _____ Weight_____

Date_____

APPENDIX D

Social support

Adapted from the Social Support and Eating Habits Survey (Sallis, 1987).

Below is a list of things people might do or say to someone who is trying to improve their eating and exercise habits. Please read and give an answer to every question. Please rate each question *twice.* Under *family,* rate how often anyone living in your household has said or done what is described during the last three months. Under *friends,* rate how often your friends, acquaintances, or coworkers have said or done what is described during the last three months.

Please write *one* number from the following rating scale in each space:

1.None 2.Rarely 3.A few times 4.Often 5.Very often

SAMPLE: A. If my family *rarely makes fun of the foods I eat, and my friends very often* do,

	Family	Friends
I would answer like this: A. Made fun of the foods I eat	A. ___*2*___	A. ___*5*____

During the past three months, my family (or members of my household) or friends:

1. Encouraged me not to eat "unhealthy foods" (cake, salted chips) when I'm tempted to do so. Family ___ Friends ____

2. Discussed my eating habits with me (asked me how I'm doing with my eating habits). Family ___ Friends ____

3. Reminded me not to eat high fat foods. Family ___ Friends ____

4. Complimented me on my eating habits ("Keep it up", "We are proud of you ").

Family ___ Friends ___

5. Commented if I made unhealthy (e.g., higher fat, poor nutritional value) food choices.

Family ___ Friends ___

6. Ate high fat or poor nutritional value foods in front of me. Family ___ Friends ____

7. Refused to eat the same foods I eat. Family ___ Friends ____

8. Brought home foods I'm trying not to eat. Family ___ Friends ____

9. Got angry when I encouraged them to eat healthy, low fat foods. Family ___ Friends ____

10. Offered me food I'm trying not to eat. Family ___ Friends ____

11. Exercised with me. Family ___ Friends ____

12. Offered to exercise with me. Family ___ Friends ____

13. Gave me helpful reminders to exercise (Are you going to exercise tonight?)

Family ___ Friends ____

14. Gave me encouragement to stick with my exercise program. Family ___ Friends ____

15. Changed their schedule so we could exercise together. Family ___ Friends ____

16. Discussed exercise with me. Family ___ Friends ____

17. Complained about the time I spend exercising. Family ___ Friends ____

18. Criticized me or made fun of me for exercising. Family ___ Friends ____

19. Gave me rewards for exercising (bought me something or gave me something I like).

Family ___ Friends ____

20. Planned for exercise on recreational outings. Family ___ Friends ____

21. Helped plan activities around my exercise. Family ___ Friends ____

22. Asked me for ideas on how they can get more exercise. Family ___ Friends ____

23. Talked about how much they like to exercise. Family ___ Friends ____

Total Score Family: _____ Total Score Friends: _____

General Support (Procidano & Heller, 1983)

Friends

Directions: The statements which follow refer to feelings and experiences which occur to most people at one time or another in their relationships with friends. For each statement there are three possible answers: Yes, No, Don't Know. Please select an answer for each item.

1. My friends give me the moral support I need. Yes/No/Don't Know

2. Most other people are closer to their friends than I am. Yes/No/Don't Know

3. My friends enjoy hearing about what I think. Yes/No/Don't Know

4. Certain friends come to me when they have problems or need advice. Yes/No/Don't Know

5. I rely on my friends for emotional support. Yes/No/Don't Know

6. If I felt that that one or more of my friends were upset with me, I'd just keep it to myself. Yes/No/Don't Know

7. I feel that I'm on the fringe in my circle of friends. Yes/No/Don't Know

8. There is a friend I could go to if I were just feeling down, without feeling funny about it later. Yes/No/Don't Know

9. My friends and I are very open about what we think about things. Yes/No/Don't Know

10. My friends are sensitive to my personal needs. Yes/No/Don't Know

11. My friends come to me for emotional support. Yes/No/Don't Know

12. My friends are good at helping me solve problems. Yes/No/Don't Know

13. I have a deep sharing relationship with a number of friends. Yes/No/Don't Know

14. My friends get good ideas about how to do things or make things from me. Yes/No/Don't Know

15. When I confide in friends, it makes me feel uncomfortable. Yes/No/Don't Know

16. My friends seek me out for companionship. Yes/No/Don't Know

17. I think that my friends feel that I'm good at helping them solve problems. Yes/No/Don't Know

18. I don't have a relationship with a friend that is as intimate as other people's relationships with friends. Yes/No/Don't Know

19. I've recently gotten an idea about how to do something from a friend. Yes/No/Don't Know

20. I wish my friends were much different. Yes/No/Don't Know

Family

Directions: The statements which follow refer to feelings and experiences which occur to most people at one time or another in their relationships with <u>families</u>. For each statement there are three possible answers: Yes, No, Don't Know. Please select an answer for each item.

1. My family gives me the moral support I need. Yes/No/Don't Know

2. I get good ideas about how to do things or make things from my family. Yes/No/Don't Know

3. Most other people are closer to their family than I am. Yes/No/Don't Know

4. When I confide in members of my family who are closest to me, I get the idea that it makes them uncomfortable. Yes/No/Don't Know

5. My family enjoys hearing about what I think. Yes/No/Don't Know

6. Members of my family share many of my interests, Yes/No/Don't Know

7. Certain members of my family come to me when they have problems or need advice. Yes/No/Don't Know

8. I rely on my family for emotional support Yes/No/Don't Know

9. There is a member of my family I could go to if I were just feeling down, without feeling funny about it later. Yes/No/Don't Know

10. My family and I are very open about what we think about things. Yes/No/Don't Know

11. My family is sensitive to my personal needs. Yes/No/Don't Know

12. Members of my family come to me for emotional support. Yes/No/Don't Know

13. Members of my family are good at helping me solve problems. Yes/No/Don't Know

14. I have a deep sharing relationship with a number of members of my family. Yes/No/Don't Know

15. Members of my family get good ideas about how to do things or make things from me. Yes/No/Don't Know

16. When I confide in members of my family, it makes me uncomfortable.

Yes/No/Don't Know

17. Members of my family seek me out for companionship. Yes/No/Don't Know

18. I think that my family feels that I'm good at helping them solve problems.

Yes/No/Don't Know

19. I don't have a relationship with a member of my family that is as close as other people's relationships with family members. Yes/No/Don't Know

20. I wish my family were much different. Yes/No/Don't Know

Support Group Perceptions

For the following items, please indicate the extent to which you agree or disagree with the following statements.

1. Support groups are a good way to get help and support for a problem or concern.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

2. I have used internet support groups

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

3. I believe that internet support groups can be helpful

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

4. I believe that information from trusted online resources can be helpful.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

Expectancies

For the following items, please indicate the extent to which you agree or disagree with the following statements.

1. I expect that if I eat healthy foods, I will stay healthy.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

2. I expect that exercising regularly will positively influence my health.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

3. I expect that if I eat healthy foods, I will feel better physically.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

4. I expect that if I eat healthy foods, I will feel better emotionally.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

5. I expect that f I exercise regularly, I will feel better physically.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

6. I expect that if I exercise regularly, I will feel better emotionally.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

7. I expect that if I exercise regularly, I will experience changes in my appearance (e.g., weight loss, improved muscle tone, improved fit of clothing).

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

8. I expect that if I eat healthy foods, I will experience changes in my appearance (e.g., weight loss, improved muscle tone, improved fit of clothing).

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

9. I expect that participating in a support group will help me improve my diet.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

10. I expect that participating in a support group will help me improve my exercise habits.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

Subjective norm

For the following items, please indicate the extent to which you agree or disagree with the following statements.

1. I believe that most of my peers exercise regularly.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

2. I believe that most of my peers eat healthy foods in moderation.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

3. I believe that maintaining a healthy weight is important to my peers.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

4. I believe that eating healthy foods is important to my peers.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

5. I believe exercising on a regular basis is important to my peers.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

Attitudes

For the following items, please indicate the extent to which you agree or disagree with the following statements.

1. I like to eat a healthy a well balanced diet

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

2. I dislike eating nutritionally balanced foods, snacks, and meals

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

3. I like to exercise. strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

4. I dislike exercising. strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

5. I believe that eating a healthy diet is worthwhile.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

6. I believe that exercising is worthwhile.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

7. I believe that eating a healthy diet is a waste of my time.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

8. I believe that exercising is a waste of my time.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

Perceived Behavioral Control

For the following items, please indicate the extent to which you agree or disagree with the following statements.

1. I feel that I can control my weight.

strongly disagree:1__:___2__:___3__:___4__:___5__: strongly agree

2. I feel I can control my health by eating healthy foods.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

3. I feel I can control my health by engaging in exercise on a regular basis.

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

4. Whether or not I eat a healthy diet on a regular basis is completely up to me

strongly disagree :1__:___2__:___3__:___4__:___5__strongly agree

5. Whether or not I exercise on a regular basis is completely up to me

strongly disagree :1__:___2__:___3__:___4__:___5__ strongly agree

Intentions

For the following items, please indicate the extent to which you agree or disagree with the following statements.

1. I plan to eat a healthy diet on a regular basis

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

2. I plan to exercise on a regular basis

strongly disagree 1__:___2__:___3__:___4__:___5___: strongly agree

3. I plan to make some overall positive changes to my health behaviors in the near future

strongly disagree: 1__:___2__:___3__:___4__:___5__: strongly agree

Health-Related Behaviors

For the following items, please indicate the extent to which you agree or disagree with the following statements.

1. I follow a diet that is healthy and includes foods from all food groups.

strongly disagree: 1___2___3___4___5__strongly agree

2. I do not follow a diet that is healthy, or I eat only foods from selected food groups.

strongly disagree: 1___2___3___4___5__strongly agree

3. I take responsibility for my own eating habits.

strongly disagree: 1___2___3___4___5__strongly agree

4. I talk to my doctor or health care professional if I wish to modify my diet.

strongly disagree: 1___2___3___4___5__strongly agree

5. I exercise regularly.

strongly disagree: 1___2___3___4___5__strongly agree

6. I do not exercise regularly.

strongly disagree: 1___2___3___4___5__strongly agree

7. I try fad diets to lose weight.

strongly disagree: 1___2___3___4___5__strongly agree

8. I do not follow fad diets to lose weight.

strongly disagree: 1___2___3___4___5__strongly agree

For the following, please indicate how often you engage in these behaviors:

9. In the course of the past month, how often have you engaged in a cardiovascular exercise activity (e.g., walking, running, using an elliptical machine, swimming, biking) for at least 30 minutes?

Never1___2___3___4___5__every day

10. In the course of the past month, how often have you consumed nutritious meals and snacks (e.g., nutritionally balanced foods such as whole grains, vegetables, fruits, lean proteins)?

Never1___2___3___4___5__ every day

COMPUTER MEDIATED SOCIAL SUPPORT
Information Form

Thank you for your participation. If you meet study requirements, you may be asked to continue to participate in this research project. If you are invited for continued participation, you will have the opportunity to earn an additional 8 credits for research participation. You will be notified within the next week if you are eligible, and asked to continue.

Your participation in this study was confidential. All participants were given a unique study code at the beginning of the study. All identifying information will be stored separately from this code. The records of this study will be kept private. No identifiers linking your information to the study will be included in any sort of report that might be published. Research records will be stored securely and only Wendy A. Olson, Dr. Robert W. Heffer, and Dr. Amanda Jensen-Doss will have access to these.

You can contact Wendy Olson, M.S. Department of Psychology, Texas A&M University, (979) 324-8991anniewend@yahoo.com), for questions relating to your participation in this study.

COMPUTER MEDIATED SOCIAL SUPPORT IN A SAMPLE OF OVERWEIGHT OLDER ADOLESCENTS

Informed Consent

You are invited to participate in a project designed to investigate the relationships between social support, overweight, health behaviors and affective correlates. This project relates to the researcher's interests in the areas of health behaviors, social support, and outcomes in an overweight population.

You are invited to participate in this study because you are an older adolescent between 18 and 24 years of age, self-identified as having a Body Mass Index (BMI) of 25 or higher. If you participate, you will be one of 100 men and women scheduled for one online orientation session that will last approximately 15 minutes, followed by 8 weeks of participation in an online community focusing on healthy nutrition and physical exercise.

If you agree to this study, you will be asked to participate in an online community designed for older adolescents who are overweight and wish to improve their health habits and behaviors. You will be asked to log on to a discussion board forum a minimum of once daily for the 8 weeks, and to interact with other individuals in this online forum. You may log in more often if you desire. You will also be asked to complete questionnaires assessing social support and any current feelings of anxiety or sadness. You may also be asked to respond to questions about the usefulness of the website, and to provide feedback regarding suggestions for improvement of the website.

You will be randomly assigned to one of three different groups, and may have the opportunity to access information specific to healthy eating, nutrition, and exercise, to communicate with others through the use of the discussion board forum, or some combination of these two conditions. This study will take 8 weeks, and questionnaires will be administered at week one and week eight.

The risks associated with this study are minimal, and may include some feelings of psychological discomfort associated with being identified as overweight. It is expected that these risks will be minimal. The benefits of participation are feelings of increased social support and a sense of community where other overweight older adolescents are coping with problems and concerns similar to you own. In addition, you may learn new information about healthy eating and exercise habits, and new coping skills from other members of the group.

You will receive 10 credit hours participation credit for this study to be applied to your course following completion of questionnaires at the conclusion of the study. If you choose to drop out of this study, you may do so at any time. You will earn 1 research credit for every week of participation in the study (e.g., if you drop out at 3 weeks, you

will have earned 3 credits). You will receive no other compensation for your participation.

This study is confidential. All participants will be given a unique study code at the beginning of the study. All identifying information will be stored separately from this code. The records of this study will be kept private. No identifiers linking your information to the study will be included in any sort of report that may be published. Research records will be stored securely and only Wendy A. Olson, M.S., Dr. Robert W. Heffer, and Dr. Amanda Jensen-Doss will have access to these.

Following completion of this study, the website will be taken down and all data will be transferred to a secure server.

Your decision whether or not to participate will not affect your current status or relations with Texas A&M University. If you decide to participate, you are free to refuse to answer any questions that may make you uncomfortable. You can withdraw at any time without your relations with the University or your instructor being affected. You can contact Wendy Olson, M.S. Department of Psychology, Texas A&M University, (979) 845-8017, (anniewend@yahoo.com), Robert W. Heffer, Ph.D., Department of Psychology, Texas A&M University, (979) 845-8017, (rob_heffer@psych.tamu.edu), or Amanda Jensen Doss, Department of Education Psychology, Texas A&M University, (979) 845-8017, (ajensendoss@coe.tamu.edu) for questions relating to your participation in this study.

This research has been reviewed by the Institutional Review Board-Human Subjects in Research, Texas A&M University. For research-related problems or questions regarding subjects' rights, you can contact the Institutional Review Board through Ms. Melissa McIlhaney, IRB Program Coordinator, at (979) 458-4067 (mcilhaney@tamu.edu). Should you feel any discomfort or distress during or following your participation in this study, you may call the Texas A&M Psychology Clinic at (979) 845-8017. The Clinic offers assessment and therapy services to students and members of the community on a sliding fee scale basis.

By signing this document, you indicate that you have read the above information, have had the opportunity to ask questions, and have received answers to your satisfaction. By signing this form, you also indicate that you have been given a copy of this consent document for your records, and consent to participate in this study.

_____

Participant's Signature Date

_____

Signature of Principal Investigator/Authorized Representative Date

COMPUTER MEDIATED SOCIAL SUPPORT IN A SAMPLE OF OVERWEIGHT OLDER ADOLESCENT
Debriefing Form

You participated in a project designed to investigate the relationships between social support, overweight, health behaviors and affective correlates. The project you participated in relates to the researcher's interests in the areas of health behaviors, social support, and outcomes in an overweight population. There was *no deception* in this study.

You were invited to participate in this study because you are an older adolescent between 18 and 24 years of age, self-identified as having a Body Mass Index (BMI) of 30 or higher. You were one of 100 men and women who participated in an online community focusing on healthy nutrition and physical exercise.

You were randomly assigned to one of three different groups, and may have had the opportunity to access information specific to healthy eating, nutrition, and exercise, to communicate with others through the use of the discussion board forum, or some combination of those two conditions. The risks associated with this study were minimal, and may have included some feelings of psychological discomfort associated with being identified as overweight.

Your participation in this study was confidential. All participants were given a unique study code at the beginning of the study. All identifying information will be stored separately from this code. The records of this study will be kept private. No identifiers linking your information to the study will be included in any sort of report that might be published. Research records will be stored securely and only Wendy A. Olson, Dr. Robert W. Heffer, and Dr. Amanda Jensen-Doss will have access to these.

You can contact Wendy Olson, M.S. Department of Psychology, Texas A&M University, (979) 845-8017, (wendyo@tamu.edu), Robert W. Heffer, Ph.D., Department of Psychology, Texas A&M University, (979) 845-8017, (rob_heffer@psych.tamu.edu), or Amanda Jensen Doss, Department of Education Psychology, Texas A&M University, (979) 845-8017, (ajensendoss@coe.tamu.edu) for questions relating to your participation in this study.

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APPENDIX E

TOPICS

Week 1. Food Myths

Week 2. Physical Activity

Week 3. Healthy Eating for Healthy Living

Week 4. Body Mass Index- How much do you know?

Week 5. Health Effects of Overweight and Obesity

Week 6. Healthy Weight Loss

Week 7. Balancing Nutrition, Calories, and Exercise

Week 8. Nutrition Information and Menu Planner

VITA

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