Development of a Social Support Scale for Health Behaviors in College Students

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Abstract

According to Leahey, LaRose, Fava, and Wing (2011), nearly half of all young adults are considered overweight or obese. Further, on average, young adults gain between 1 and 2 pounds annually, making them more susceptible to yearly weight gain than any other age group. College students in particular may be vulnerable to continual weight gain over the course of their 4-year education; a review by Hellmich (2008) revealed that many students gain between 6 and 9 pounds during their freshman year alone. Despite the increased risk for weight gain during the young adult years, Leahey and colleagues report that this age group is underrepresented in behavioral weight management programs. Therefore, research must determine the psychosocial factors that are likely to influence young people in their efforts to manage their weight and health. Social support may be such a mechanism; a study by Strong and colleagues (2008) demonstrated that social support was influential in college students' decisions to participate in exercise and avoid sedentary behaviors. However, a scale measuring social support has not been developed for use with college students in regard to general health behaviors. In the current study, a 37-item self-report instrument was developed. This social support measure was administered to 466 Virginia Tech undergraduates, along with a battery of questionnaires assessing other health habits. Results revealed three possible types of social support, and indicated that social support – while unrelated to body mass index – is related to healthy eating behaviors, vigorous exercise, and health choices of significant others.

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Introduction

Background: Overweight and Obesity

The issues of overweight and obesity are major public health concerns. Overweight, according to the World Health Organization (2006b), is a body mass index (BMI) of 25 kg/m^2 or more, while obesity is defined as a BMI of 30 kg/m^2 or more. These rates have steadily climbed throughout the past decade among all segments of the population (Weinstein, 2006). At present, more than 97 million American adults – roughly 66% of the U.S. population – qualify as overweight or obese (Concepcion & Watkins, 2008). Research indicates that life expectancy among Americans may level off, or even decline, by 2050, due to the alarming increase in obesity (Olshansky et al., 2005). Obesity is a leading cause of death in the U.S., second only to cardiovascular disease (for which obesity is an independent risk factor). Additionally, Concepcion and Watkins note that poor diet and physical inactivity (both of which are linked to obesity) will soon pass tobacco use as the number one killer of Americans.

Hence, one of the primary objectives of *Healthy People 2020* (USDHHS, 2009) is to reduce the percentages of U.S. children, adolescents, and adults who quality as overweight or obese. *Healthy People* is a document developed by the U.S. Department of Health and Human Services (USDHHS) once per decade to serve as a roadmap of health-related goals for the nation to achieve over the next 10 years. Overweight, obesity, and a sedentary lifestyle are associated with increased risk for type 2 diabetes, heart disease, stroke, various forms of cancer (e.g., colon, breast, esophageal, and renal), as well as the loss of quality and years of life (Winett, Tate, Anderson, Wojcik, & Winett, 2005). Overweight and obesity are also associated with

hypertension, dyslipidemia, gallbladder disease, and osteoarthritis (Concepcion & Watkins, 2008).

Current Status of Obesity Treatments

Americans have responded to the growing obesity epidemic in large numbers (Saperstein, Atkinson, & Gold, 2007). According to Anderson, Young, and Roach (2008) of the Colorado State University Extension, approximately 50 million Americans attempt to lose weight each year with limited success; only 5% of these individuals manage to keep off weight they have lost. Saperstein and colleagues note that, in the year 2000, almost half of American women and about one-third of American men reported attempting to lose weight. However, treating overweight and obesity has been extremely difficult. Present weight loss (WL) treatments have failed to reach many appropriate candidates, and barriers to treatment continue to exist, especially for face-to-face interventions. Behavioral treatments for obesity produce about a 9% loss of body weight over an average of 21 weeks (Harvey-Berino, Pintauro, & Gold, 2002). Such a percentage appears promising at first glance, as an initial WL of 5 to 15% can produce significant health benefits.

Nonetheless, the majority of participants in WL programs continue to be overweight or obese after treatment ends (Winett et al., 2005). Even if participants in such programs do successfully manage to lose weight, weight regain is a major problem. Participants in behavioral treatment for WL, on average, gain back 37% of the weight they lost during the intervention (Harvey-Berino et al., 2002), although weight regain can sometimes exceed 60% (Cussler et al., 2008). Most dieters who participate in WL programs are back to their baseline weight within 3 to 5 years (Wing, Tate, Gorin, Raynor, & Fava, 2006).

Social Support

Conceptualization. Social support might be one mechanism by which weight control interventions exert their effects to facilitate WL and prevent further weight gain. Social support has the potential to serve as a powerful motivator for WL and related behaviors. There continues to be a lack of consensus among researchers regarding a clear definition of social support (Williams, Barclay, & Schmied, 2004), despite that the term "social support" was introduced into the research literature in the 1970s. Too often, investigators have relied on generic definitions of social support in studies that have attempted to assess the impact of this concept. Such "one-size-fits-all" definitions do not contain contextual sensitivity, and as a result, comparability and validity of empirical work on social support is limited.

Williams and colleagues identified 30 separate definitions of social support in the research literature (25 of which were being used in current studies). Definitions of social support seemed to emphasize a number of categories, including time frame (short- or long-term), timing (when support is offered), relationships and social ties (e.g., type of relationship, strength of relationship), supportive resources offered (e.g., emotional, material, time, skill), intentionality of support, impact of support (positive or negative), recognition of support need, actual behaviors versus perceived social support, satisfaction with support, characteristics of the support recipient, and characteristics of the support provider. Many definitions emphasized interpersonal relationships, which were characterized by size, structure, reciprocity, and accessibility. Definitions also emphasized *intention* – that is, an act of support provided for a well-intended purpose.

In the domain of weight management, Parham (1993) and Hwang and colleagues (2011) assert that social support is loosely defined as resources provided by other individuals via an

interpersonal transaction. These resources typically take the form of: 1) tangible or instrumental aid, 2) emotional support and encouragement, 3) provision of information, and 4) appraisal or provision of feedback. Parham notes that the fourth component – appraisal – is most often the focus of weight management treatment programs.

Relationship Between Social Support and Health Behaviors. In regard to health behavior outcomes, social support is a key determinant of success in adopting healthy habits and changing maladaptive ones (Sallis, Grossman, Pinski, Patterson, & Nader, 1987). According to Wolfe (2004), social support has come to occupy an increasingly large and important role in health research. This is primarily because of the growing awareness of the relative inability of individuals to modify their behavior by themselves; indeed, other people are often crucial in enabling individuals to change their health behaviors. Wolfe notes that this need for support is particularly applicable to WL and WL maintenance because of the genetic, biological, and environmental variables that contribute to overweight and obesity.

The smoking cessation literature has shown that electronic social support elements, when added to a behavioral treatment program, can facilitate improvement. One study (Schneider & Tooley, 1986) showed that when a behavioral therapy program also incorporated an electronic bulletin board to facilitate participant interaction, many participants successfully quit smoking. A later study (Schneider, Walter, & O'Donnell, 1990) added a control group; two behavioral smoking cessation interventions were compared. One intervention consisted of behavioral therapy alone, while the second intervention added a social support discussion group to the behavioral treatment. Results indicated that participants who were able to use the discussion group were more successful in stopping their cigarette use, as compared to those who did not receive access to social support. Additionally, online support groups for other health conditions,

such as Huntington's disease (Coulson, Buchanan, & Aubeeluck, 2007) and breast cancer (Winzelberg et al., 2003) have led to positive outcomes among members, including reductions in depressive symptoms and stress, as well as educational benefits (e.g., exchanging disease-related information) and increased emotional support.

Social Support in Weight Management. According to a news release from the Society of Behavioral Medicine (SBM, 2010), the role of social support has long been regarded as an important component of behavioral WL programs. Indeed, previous research has shown that social support is a critical factor in WL success (Parham, 1993; Wing & Jeffrey, 1999). Parham cites an inverse relationship between social relationships and mortality over a period of 9 to 13 years, as demonstrated in a study by House et al. (1988). Moreover, a lack of social support may have far-reaching implications in terms of one's cardiovascular health. A study conducted by Aggarwal, Liao, Allegrante, and Mosca (2010) examined the relationship between low social support and adherence to diet in a cardiovascular disease lifestyle intervention trial. The authors found that, among individuals enrolled in the program, one significant predictor of non-adherence to dietary guidelines was low social support.

However, the SBM news release (2010) also points out that, particularly for women beginning a WL program, family and friend support for lifestyle change are often lacking. Because existing support seems to be rare for those entering WL programs (women in particular), there is clearly a need for the inclusion of innovative support strategies into the curriculum of structured WL interventions. Interestingly, little research to date has been conducted evaluating the success of social support tactics included in weight management programs. SBM (2010) maintains that, to address this gap in the existing weight management

and social support literature, one crucial step that must be achieved is the development of psychometrically sound measures of social support.

In one study examining the impact of supportive relationships on weight management, Wing and Jeffrey (1999) recruited participants either alone or with three significant others (friends or family members). Participants were then randomly assigned to an in-person behavioral treatment for WL, or the same behavioral treatment with social support strategies and intra-group activities built into the intervention (e.g., participants completed homework assignments in small groups and were responsible for telephoning group members to provide social support).

Both recruitment strategy (i.e., whether the participant was recruited alone or with friends) and treatment manipulation affected participant completion rates and posttreatment WL. Ninety-five percent of participants recruited with significant others and given the social support treatment completed the 10-month study (4 months of treatment and a follow-up visit at month 10), and 66% of these participants maintained their WL in full at follow-up. Further, individuals recruited with significant others – regardless of treatment assignment – achieved a 33% greater WL than participants recruited alone. Notably, the lowest attendance rates and smallest percentage of participants who maintained their WL at follow-up were found among those individuals who were recruited alone and *not* assigned to the social support manipulation. In summary, the study suggested that participants who were provided with social support – via existing friends, other participants whom they did not know prior to treatment, or both – achieved greater success in terms of WL outcomes than those individuals recruited without social support and randomized to the behavioral intervention that did not include support.

Parham (1993) asserts that social support helps people to sustain their WL behavior long-term. A study by Kayman, Bruvold, and Stern (1990) illustrates this claim. The researchers interviewed three groups of women: 1) obese women who regained the weight they had lost in the past, 2) formerly obese women who had maintained their WL, and 3) a control group of women who had never been overweight. In comparison to the group of women who had relapsed, the formerly obese and never obese women used available social support (70% and 80% of each group, respectively). In contrast, only 38% of obese women used such strategies to manage their weight. Furthermore, the formerly obese and never obese women were more likely than the relapse group to seek support from family, friends, and professionals in their weight management efforts. Women in the relapse group, on the other hand, reported that they had fewer people available for support, as compared to the other two groups of participants. Additionally, a study by Morisky et al. (1983) as cited in Wolfe (2004) suggested that adequate social support could be an effective strategy for long-term weight maintenance. African-American women who were provided with more systematic social support had a significantly greater decrease in their body mass index at 5-year follow-up, as compared to those who did not receive social support.

Another study by Rigsby, Gropper, and Gropper (2009) demonstrated that social support played a critical role in WL. The authors note that worksite WL programs have become increasingly popular due to social support that individuals receive from coworkers. Participants (hospital and nursing home employees) self-enrolled in an 8-week behavioral WL program either individually or as part of a group. The program emphasized "peer support and 'healthy' competition to pursue weight loss objectives" (p. 128). A total of 42 individuals participated in groups, while 30 individuals participated on their own. Those who signed up as a group could

choose the other participants in their group; a total of 10 groups participated with three to five members each.

As compared to group participants, individual participants had significantly higher body fat percentages at the outset; by the end of treatment, mean percent body fat, body weight, and BMI had decreased significantly in both groups. On average, group participants lost significantly more weight at 8 weeks, as compared to individual participants: 7.6 (*SD* = 1.1) vs. 4.2 (*SD* = 6.4) pounds. Further, percent body fat reduction was significantly greater in those who participated in groups, as compared to individual participants. The study found that group participants more frequently used a meal plan, dined out less, and exercised more than those participating as individuals. Additionally, when the two groups were compared, the authors found that engaging in more frequent physical activity was significantly correlated with WL in group participants. In contrast, following a written diet plan was more predictive of WL in individual participants.

Therefore, the results of this investigation show that, while factors such as following a well-balanced diet and exercise plan are associated with WL, social support also plays a major role. The authors reasoned that social support provided by members of one's small group influenced participants' decisions related to exercise and healthful eating (including eating away from home). Limitations of the study included lack of random assignment to conditions. Therefore, it is possible that those who elected to participate in the study with group members possessed different characteristics or motivational factors than those who participated as individuals, which may have influenced the results. Moreover, the types of social support that were provided among group members were not assessed. As a result, the specific social support variables that led to an increased WL in group participants, as opposed to individual participants,

are unknown. That is, it cannot be ascertained whether group members provided one another with continuous encouragement and positive feedback, resulting in more successful WL, or whether group members experienced greater WL than individual participants due to a fear of being criticized by other members (or a desire not to let others down). Due to the lack of random assignment, the factors responsible for greater WL in the group participants cannot be pinpointed, nor can the authors claim that the social support *caused* WL.

Other research has shown that social support provided by one's partner or family members can also be effective in the weight management process. In a meta-analysis of weight loss programs conducted by Black, Gleser, and Kooyers (1990), couples' programs were shown to be significantly more effective than participant-alone programs at posttreatment. Further, a nearly significant effect in favor of couples' programs was obtained at 2- to 3-month follow-up, but not thereafter. Black and colleagues assert that almost anyone can provide encouragement and motivation to an individual attempting to lose weight, but this support may be more meaningful coming from a person of importance to the dieter (e.g., a spouse or partner). However, the authors also note that if the spouse is not attempting to lose weight himself or herself (or has never dealt with weight issues), his or her utility and helpfulness as a socially supportive partner may be minimal. In this respect, employing a spouse or partner as a source of social support may backfire for individuals attempting to lose weight.

However, the role of spouses and family members in individuals' WL efforts appears to be inconclusive. Marcoux, Trenkner, and Rosenstock (1990) conducted a study using a social networks approach. The authors define social networks as "the presence and nature of social ties among people," while social support "refers to some of the functions that may or may not be provided by [one's social network]" (p. 230). The goal of the study was to integrate these two

concepts in an attempt to discover their interplay in the weight management process. The investigation included 26 individuals (90% female) who had completed a behavioral WL program. Subsequently, participants were enrolled in a 6-week program designed to prevent relapse (i.e., weight regain). One session of the relapse prevention phase focused on developing diet partnerships and identifying characteristics of a helpful weight management partner.

The authors collected measurements of social support at baseline, as well as 3-month follow-up. Results indicated that scores on the social support measures at baseline were correlated with weight change from baseline to 3-month follow-up. In order to conduct a more detailed analysis of participants' social networks and the role these networks play in weight maintenance, participants were asked to identify up to five people with whom they were very close, to the extent they could not imagine life without them. Participants then rated the amount of emotional, appraisal, and instrumental support provided by these significant others. Additionally, participants were asked to identify up to five people who were important in their efforts to lose weight specifically. Participants rated these individuals on the same three types of support, but the ratings were specific to the context of weight management (e.g., how much significant others interfered with participants' WL efforts).

Regarding general social support, the appraisal type was most strongly correlated with WL. This was also true for weight management-specific appraisal support (e.g., "How often does each of these people praise you for following your diet?" [p. 233]). The study further revealed that the best sources of social support for weight management were neighbors and friends, rather than family members or spouses. Spousal support for weight management revealed mixed findings; some participants rated their spouse as helpful to their weight management efforts, while other participants rated their spouse as detrimental. Nonetheless, the

study shed additional light on the role of individuals' social networks in their ability to lose and maintain weight.

Instead of relying on family and friends for support, individuals may benefit from interventions in which they interact with other dieters, as in the Rigsby et al. (2009) worksite study. In social support communities for WL, for example, all users are trying to lose weight, and can therefore provide mutual assistance and encouragement to one another. Overall, qualitative differences may exist between dyads or groups of people in which unidirectional support is offered (i.e., from partner to subject), versus dyads or groups in which each member desires to lose weight. In such cases, mutual social support is required, and multiple sources of support may be more beneficial to each individual dieter.

An article that appeared several years ago in the *APA Monitor* (Huff, 2004) further elucidated the role of groups in weight management. Numerous studies have shown that group treatments for WL are generally more effective than individual dieting efforts, presumably due to the added factor of mutual social support among group members. A study by Renjilian and colleagues (2001) demonstrated that groups may be a more effective treatment modality for WL than individual efforts. Group therapy produced significantly greater reductions in body weight and BMI at posttreatment, as compared to individual therapy. In the group treatment setting, individuals lost an average of 11% of their body weight, compared to 9% for those enrolled in individual treatment. Further, even those participants who expressed a preference for individual therapy lost more weight in group treatment.

A study by Heshka et al. (2003) evaluated one popular commercial group program for weight management: Weight Watchers. The effectiveness of Weight Watchers was compared with a self-help approach in which participants received printed materials on WL and met with a

dietician twice for 20 minutes each time. In this investigation of 423 overweight and obese individuals, those who were randomized to the Weight Watchers program lost more weight after both 1 year and 2 years, as compared to participants who were randomly assigned to the self-help approach. The commercial WL group also achieved greater decreases in other outcome variables, including waist circumference and BMI. At year 1, those who were assigned to Weight Watchers lost an average of 9.5 pounds, as compared to 3 pounds in the self-help group. At year 2, Weight Watchers participants had regained some weight, maintaining a 6.4-pound overall loss. However, the majority of self-help participants had regressed to their pre-study weight at the end of the 2-year mark. Lastly, attendance at group meetings among Weight Watchers participants was important; individuals who attended at least 78% of the meetings had sustained greater weight losses at the end of 5 years. The primary difference between the two treatment groups – Weight Watchers vs. self-help – is the fact that participants have more sources of social support in a group-based treatment. While those assigned to the individual intervention can rely on existing supportive contacts outside of treatment, they do not benefit from the support, advice, feedback, and information offered by other group members who are working to achieve the same goal: sustained WL.

A study by Elakkary, Elhorr, Aziz, Gazayerli, and Silva (2006) assessed social support provided by individuals who had experienced laparoscopic adjustable gastric banding (LAGB) surgery to lose weight; the authors note that this intervention represents the only treatment for WL that has demonstrated long-term efficacy. Thirty-eight individuals who had undergone LAGB were studied retrospectively. The authors divided participants into two groups: one group of 28 individuals did not attend support group meetings following surgery, while the second group of 10 patients did attend support group meetings. The researchers compared WL totals

between the two groups over a period of 1 year, and found that patients who attended support group meetings achieved greater WL on average than those individuals who did not attend meetings. This study provides evidence that social support is needed not just while a person is attempting to lose weight; such support is also critical for WL *maintenance*. However, only 10 individuals attended the support group meetings (while 28 did not); therefore, additional research with more participants is warranted to increase the explanatory power of WL support groups in both the WL and WL maintenance processes.

Consistent with the claim of Williams et al. (2004) that social support definitions in research investigations should be context-specific, Rieder and Ruderman (2007) developed a self-report instrument to assess socially supportive behaviors provided to individuals attempting to lose weight. The authors present social support as a broad, multifaceted construct generally defined as "resources provided by one's social network" (p. 40). Rieder and Ruderman note that social support is a frequently prescribed component of behavioral WL programs, and numerous empirical investigations have found a significant relationship between social support and WL. The authors assert that social support is especially germane to weight management because two major behaviors involved in weight control – healthy eating and physical activity – are often social activities. In addition, WL and WL maintenance usually involve long-term behavioral modifications and lifestyle changes that individuals may struggle to maintain using only their own personal resources.

Rieder and Ruderman claim that, while a positive correlation between WL and social support generally exists, the nature of the relationship between the two has been difficult to pinpoint, for several reasons. First, as previously noted (Williams et al., 2004), there is extreme variability in the operational definition of social support across studies; further, social support

may be measured in a general or task-specific way. Additionally, Rieder and Ruderman argue that there has been insufficient focus on individual differences; rather, conceptualizations of social support assume that all people provide and desire the same type of support. Finally, the authors point out that, in many studies, a lack of verification exists that social support interventions were in fact responsible for any observed change in social support or body weight.

For these reasons, Rieder and Ruderman (2007) developed the Weight Management Support Inventory (WMSI), which differs from other researchers' attempts to measure social support as it relates to weight management. The inventory focuses on supportive behaviors, rather than perceived social support. Further, all behaviors assessed are *positive* social support behaviors. The WMSI is based on the four-component model of social support proposed by House (1981), which Rieder and Ruderman claim are amenable to intervention. The four components are: 1) emotional support (i.e., expressions of encouragement and concern), 2) instrumental support (i.e. provision of goods or services), 3) informational support, and 4) appraisal support. Both the frequency and perceived helpfulness of the behaviors are assessed on the WMSI.

In their investigation, Rieder and Ruderman (2007) were able to demonstrate that the measure was highly reliable (in terms of internal consistency and test-retest reliability). Construct, convergent, and discriminant validity were also demonstrated. In a confirmatory factor analysis, the hypothesized four-factor model was supported. This model was also retained due to Rieder and Ruderman's belief that the four factors assessed would yield the most insight into specific clinical applications of the WMSI. That is, if an individual scores low on a specific domain, a weight management intervention could be tailored to the person which emphasizes that domain.

Contrary to the Rieder and Ruderman (2007) study, Hwang and colleagues (2010) investigated recurring themes of social support in an *online* context, rather than within the context of face-to-face relationships. Specifically, Hwang et al. examined messages posted to a weight management community (SparkPeople.com). Rieder and Ruderman were more interested in the social support that dieters received from significant others already in their lives and those whom they knew well (e.g., friends, family members). In contrast, Hwang and colleagues explored whether the type of social support provided or desired changes when that social support is offered in the context of an online community for WL, in which the vast majority of participants have never met face-to-face, and do not know one another outside the confines of SparkPeople.com.

The authors administered a semi-structured interview to 13 volunteer users of SparkPeople. In addition, individuals were administered a quantitative survey regarding their use of SparkPeople. An item on this survey asked, "What kinds of things have SparkPeople members said or done to help with your weight loss efforts in the past 4 weeks?" In response to this survey question, individuals could enter up to 10 different answers.

In their interviews and survey responses, participants endorsed three major social support themes: 1) information, 2) encouragement and motivation, and 3) shared experiences. Subthemes included testimony (i.e., success stories from other members which provide encouragement and motivation), recognition for success (e.g., "Lots of congratulations for losing 5 pounds," p. 9), accountability, friendly competition (i.e., individual or team-based challenges to reach certain short-term WL goals), humor, and face-to-face interactions (a subset of users got together in person to walk or exercise with one another).

When asked to describe the characteristics of their SparkPeople interactions, members cited anonymity, the non-judgmental nature of the interactions, the convenience of using the Web site and being able to post or receive responses at any time, and the differences between their SparkPeople interactions and interactions with others in their lives. Specifically, individuals reported that the non-judgmental, supportive, and empathetic nature of their communications with other members would not occur with individuals in their offline, face-to-face social networks (e.g., spouse/partner, family, friends). Moreover, some users noted the reciprocal nature of their SparkPeople interactions as another benefit of using the network.

In summary, Hwang and colleagues (2010) were able to obtain detailed information on the types of social support offered on an online social support network for weight management, and were able to obtain a sense of how such support is offered, used, and interpreted. Nonetheless, Hwang et al. note a limitation of their study: they did not measure the effect of online social support on body weight itself, or any other objective measures of weight management success or health behavior improvement. Hence, a crucial question remains: Did the individuals who provided or endorsed higher levels of support actually lose more weight, as compared to individuals who were not as active or participatory within the WL community or who did not perceive the postings to be helpful?

Young Adults: An At-Risk Population

One group that may be especially vulnerable to weight gain is young adults. Obesity rates among young adults have continued to climb during the past two decades (Gow, Trace, & Mazzeo, 2010). The obesity rates among those aged 18 to 29 increased from 7.1% in 1991 to 12.1% in 1999, and more recent data indicate that this trend continues to be on the rise.

According to recent research by Leahey, LaRose, Fava, and Wing (2011), 40% of young adults aged 18 to 25 are overweight or obese. Moreover, young adults experience a higher rate of weight gain than any other age group: 1 to 2 pounds per year. In spite of this risk, the authors note that young adults are significantly underrepresented in behavioral WL treatment programs. When young adults do participate in such programs, they tend to lose less weight than their older counterparts.

Weight Gain in College Students. Specifically, young adults making the transition to college are especially vulnerable to weight gain. Research has indicated that the transition from high school to college – a time of newly acquired independence – puts many students at risk for weight gain (Hivert, Langlois, Berard, Cuerrier, & Carpentier, 2007; Levitsky, Garay, Nausbaum, Neighbors, & DellaValle, 2006). A 2008 article appearing in *USA Today* by Hellmich highlighted the severity of the overweight and obesity epidemic as it impacts college students. Although most students do not gain the stereotypical "freshman 15," research indicates that students do gain about 6 to 9 pounds on average during their first year of college.

The article provided the findings of a joint investigation between Indiana University and Tufts University in which 272 female students and 149 male students were surveyed about their health behaviors and lifestyle habits. Results indicated that 60% of students indicated they had gained weight from the beginning of their freshman year to the beginning of their sophomore year. Specifically, female students gained an average of 7.5 pounds, while male students gained nearly 9 pounds during that time span. Furthermore, two-thirds of respondents reported they gained weight from the beginning of their freshman year to the beginning of their senior year; on average, the weight gain was 10 pounds, although many male students had gained significantly more than this (86% of college men gained an average of 14 pounds).

In terms of reasons behind this drastic and widespread weight gain, several findings emerge. First, 76% of female students and 33% of male students used eating as a coping mechanism for stress. Alcohol consumption – particularly beer intake – had also increased dramatically during college. Female students reported that they had doubled or tripled their beer intake during college, as compared to high school; male students reported drinking two to four times the amount of beer they drank in high school. Not only did these students report drinking more, but they also indicated that they exercised less in college than they did in high school. Participants who indicated they engaged in physical activity an average of four times per week during their senior year of high school reported that, during their college years, their exercise frequency had dropped to only two to three times per week. Thus, the present study indicates that the primary reasons behind college weight gain appear to be increased alcohol consumption and decreased physical activity, as well as increased stress and a potential lack of healthy coping strategies to manage it.

The role of the college environment in facilitating weight gain is particularly noteworthy, as research has shown that students attending college are more at risk for weight gain than their same-age counterparts who do not leave home to pursue higher education (Butler, Black, Blue, & Gretebeck, 2004). Specifically, a study by Hovell and colleagues (1985) revealed that first-year college women were 2.6 to 5.2 times more likely to gain more than 15% above their ideal body weight, as compared to their same-age peers who did not leave home. Also, Hovell et al. showed that female college freshman gained a mean of 0.73 pounds per month, which represented a weight gain that was 36 times faster than that of their peers who did not attend college.

Moreover, Strong et al. (2008) claim that most obese individuals develop the condition during early adulthood, and evidence suggests that college students gain weight more rapidly than the average individual. Hill, Wyatt, Reed, and Peters (2003) assert that, on average, adults in the U.S. gain about 2 pounds each year, but Strong and colleagues point out that average weight gain in college students has been estimated at 4 to 9 pounds per year – a significant increase undeniably supported by the research cited in Hellmich (2008). Weight gain during young adulthood might be particularly dangerous from a chronic disease perspective, given that compensatory weight losses typically do not occur later in life.

A study by Anderson, Shapiro, and Lundgren (2003) showed that the first semester of college was associated with modest weight gains in many participants. However, the percentage of overweight and obese college freshman increased considerably from the beginning to end of the first semester (21% to 32%). According to Gow and colleagues (2010), the college environment promotes weight gain by giving students access to all-you-can-eat commercially prepared foods. Specific forms of media advertising aimed at college students also promote unhealthy eating. Additionally, many college meal plans feature unhealthy food choices and a lack of more nutritious options at on-campus dining facilities (Strong et al., 2008). Furthermore, the college environment promotes snacking, lack of sleep, physical inactivity, and excessive alcohol consumption, which are all associated with weight gain.

Role of the Social Environment in Weight Gain. According to Leahey and colleagues (2011), social relationships have a strong impact on health behaviors, and younger individuals are even more affected than older adults by the health habits of their relationship partners. In this way, the authors reasoned that the influence of social relationships could promote obesity, in addition to serving as a support mechanism for losing weight. Researchers surveyed a total of

288 young adults between the ages of 18 and 25; 151 participants were of normal weight, while 137 individuals had a BMI in the overweight or obese range. The investigation revealed that overweight and obese young adults were more likely to have romantic partners, best friends, casual friends, and family members who were also overweight, as compared to young adults of normal weight. At the same time, overweight and obese young adults who indicated they had relationship partners trying to lose weight had greater WL intentions themselves. Authors speculated that social norms for obesity and weight management accounted for this finding; that is, the encouragement and support from social contacts for WL may encourage young adults to attempt to lose weight themselves.

When examined collectively, results suggest that overweight and obesity "cluster in packs" in the young adult population to a greater extent than other age groups. Notably, both overweight young adults in the present sample, as well as their normal weight peers, reported similarly low levels of physical activity and healthy eating. This finding implies that a wide range of young adults, despite weight status per se, lack the knowledge of or intention to engage in healthy behaviors.

Despite the well-documented need for weight management interventions targeting college students, Gow et al. (2010) assert that few obesity prevention programs have been developed for this age group. Additionally, of the programs that have been developed, very few are theoretically-based. In their study of weight gain in first-year college students, Gow et al. randomly assigned 159 participants to one of four conditions: 1) no treatment; 2) a 6-week online intervention based in social-cognitive theory that emphasized healthy eating, physical activity, media literacy, and positive body image; 3) body weight and caloric feedback via email; or 4) weight and caloric feedback within the context of the 6-week Internet intervention (i.e.,

combined group). The study found that the combined group had significantly lower BMIs at posttest, as compared to the three remaining groups. However, no between-group differences existed on related health behaviors (fruit and vegetable intake, fat intake, and physical activity).

While the findings of Gow et al.'s investigation are encouraging, some limitations must be noted. The Internet component of the intervention was only 6 weeks in duration, and very few participants attended the 3-month follow-up session (analyses on the follow-up data for those students who did return were not conducted). Secondly, the intervention was solely psychoeducational; it did not provide social support elements, such as therapist-led chats or message and discussion boards. Hence, the development of Web-based interventions for weight management in young adults (particularly college students) is in its infancy, but the results of preliminary investigations suggest that such interventions can effectively reduce weight gain during vulnerable life periods.

A study by Strong and colleagues (2008) conducted with a sample of Virginia Tech undergraduates found that students are not immune from the "'toxic college environment" (Gow et al., 2010) that makes weight gain during the college years so common. First- and second-year Virginia Tech students living on campus reported participating in fewer organized sports, exercising less, and eating more, as compared to when they were in high school. Most students were somewhat active and physically fit, but did not meet U.S. government recommendations for physical activity to prevent weight gain (i.e., 60 minutes of moderately intense activity on most days of the week).

Still, because some experts have observed that a lower percentage of Virginia Tech students are overweight, as compared to the young adult population at large (B. Davy, personal communication, July 2010), the possibility exists that few Virginia Tech students may be

actively seeking to lose weight. More likely, students may be simply trying to maintain their current weight by engaging in health-promoting behaviors generally. The quality and perception of social support from one's social network (i.e., face-to-face relationships) could be important determinants of not only body weight, but also associated behaviors (e.g., eating a healthy diet and exercising). In fact, Strong and colleagues (2008) found that, among their sample of Virginia Tech students, social networks played a large role when students did choose to exercise. Students with greater social support from friends were more physically active, and reported that their exercise experiences with friends were rewarding. Moreover, social support from friends was negatively correlated with time spent engaging in sedentary activities. Strong et al. concluded that, based on this evidence, a clear link existed between the tendency to engage in regular physical activity and social support received from one's social network.

Additionally, a study by Bauer, Laska, Fulkerson, and Neumark-Sztainer (2011) revealed that parental support and encouragement for healthy eating and physical activity are associated with long-term health habits of adolescents. At the same time, parents who encourage their children to engage in dieting may be setting the stage for a host of maladaptive outcomes in their children, particularly disordered eating. Unfortunately, the work of Bauer and colleagues showed a troubling secular trend: between 1999 and 2004, there were significant decreases in parental encouragement to eat healthfully and engage in physical activity between early and middle adolescence. Between middle and late adolescence, parental encouragement for all of the above behaviors decreased for male adolescents; among female adolescents, parental encouragement to diet (i.e., restrict food intake) *increased*. Moreover, the authors observed few secular changes in parental encouragement for positive health behaviors (e.g., eating a healthy diet, participating in regular exercise) during this 5-year span.

Collectively, these findings show that, within the recent past, parents of teenagers (who are now entering, or are in the midst of, young adulthood) are promoting potentially unhealthy habits. At the same time, parents may be failing to promote highly beneficial health behaviors. As a consequence, adolescents may be entering college with inaccurate – or a relative lack of – knowledge of healthy lifestyle behaviors. Evidence suggests these adolescents have not received appropriate support thus far in their lives for health behaviors, at least on a parental level. Just as high levels of quality social support can promote health behaviors, it is also conceivable that a lack of social support – or support and encouragement for unhealthy behaviors – can impact adolescents and young adults as well.

With regard to exercise behaviors specifically, a study by Darlow and Xu (2011) questioned 220 college student participants about their own exercise habits, as well as the exercise behaviors of their friends and romantic partners. Participants also completed a questionnaire assessing perceived support for exercise. Results indicated that friends' and partners' exercise was associated with the participants' own exercise (controlling for participant body weight), but only when participants reported a level of perceived support that was above the sample mean. This finding was observed for both men and women, but was stronger for female participants. The researchers attributed this gender difference to the fact that men are more likely to engage in recommended amounts of exercise than women, and women may be more likely to receive discouragement from exercising by significant others, feel self-conscious in an exercise environment, and perceive more barriers to exercising.

Thus, social support for exercise may be especially important to women, who could be more reluctant than men to begin an exercise regimen or maintain physical activity. However, a potential flaw in this study was that perceived support for exercise was assessed using only one

item: “How much support do you receive for participating in regular physical activity from the people closest to you?” A more fully developed questionnaire based upon multiple support factors would have likely provided a more complete picture of the ways in which support for exercise influences exercise behaviors. In addition, because the study only focused on social support for exercise, it is unknown whether the effect of perceived social support extends to the adoption and maintenance of health behaviors more generally.

Rationale for Current Study

Findings from the research investigations cited above suggest that social support plays a central role in health maintenance, particularly weight management and its associated behaviors (e.g., healthy eating and physical activity). With regard to weight management, individuals who lack social support struggle to both lose weight and maintain their weight losses. In contrast, individuals with higher levels of social support – whether from significant others or group members enrolled with them in a treatment program – are generally more successful in both losing weight and preventing significant weight regain. Additionally, prior research has also suggested that young adults are highly influenced by their social contacts in terms of weight status and WL intentions. The influence of social contacts extends to health behaviors generally, particularly physical activity (Strong et al., 2008).

The study of the relationship between participants’ weight status and that of their peers by Leahey and colleagues (2011) offers numerous implications for further study. The authors assert that a primary goal of future research should be to identify factors that influence weight status and weight management in young adults, given their high risk for obesity and weight gain. With this knowledge, experts can begin to develop effective obesity treatments targeted toward

this population – a particularly critical task, given Leahey et al.'s assertion that young adults are relatively unlikely to participate in behavioral weight management programs. Evidence suggests that social support may be one psychosocial factor that is highly influential in young adults' efforts to manage their weight and health. It follows that social support could be a key component of any behavioral WL program developed for young adults. However, before social support components can be implemented into WL programs, one must first achieve a greater understanding of how social support relates to numerous health behaviors, including body weight or BMI, eating behaviors, and exercise behaviors.

Further, according to Hwang et al. (2011), only one measure currently exists that focuses on social support for weight management. This measure – the Weight Management Support Inventory – was developed using a college student sample. However, access to this questionnaire is limited, and it is unknown whether such a measure of social support would apply to college students who are not actively trying to lose weight, but who are currently attempting to engage in other health behaviors, including healthful eating and physical activity. The development of a new social support questionnaire that could become widely available to practitioners, particularly those who work with college students, would likely assist experts in the development of young adult-focused weight control programs.

To aid in this endeavor, the primary investigator of the current study developed a 37-item social support questionnaire focused on *health behaviors,* rather than WL per se. The assessment focuses on the receipt of socially supportive *behaviors* as judged by participants themselves, in contrast to other social support questionnaires for health behaviors, which focus on the health habits of significant others (e.g., the Health Beliefs Survey developed by Winett, Anderson, Wojcik, Winett, & Bowden, 2007). Questionnaire items were developed based on the four social

support factors that have shown the greatest degree of applicability to the weight management domain: 1) emotional support, 2) instrumental support, 3) informational support, and 4) appraisal support.

Given the vulnerability of college students to weight gain and other unhealthy behaviors, this newly development social support questionnaire was administered to more than 400 Virginia Tech undergraduates; approximately one-fourth of the original sample completed the questionnaire again 1 week later to assess test-retest reliability of the measure. This paper also presents the results of a principal components analysis conducted on the social support questionnaire, in which the investigator attempted to discern the social support factors and types that relate to health behaviors in college students.

Hypotheses

Hypothesis 1. It is predicted that individuals who report higher levels of social support will weigh less (i.e., have lower BMI readings) on average than individuals who report lower levels of social support. Thus, a negative correlation between social support and BMI is predicted.

Hypothesis 2. Higher social support scores will be associated with healthier eating behaviors – specifically, greater fruit and vegetable consumption, lower dietary fat intake, and lower caloric intake of sweetened beverages. In contrast, individuals with lower social support scores are expected to eat fewer servings of fruits and vegetables and more servings of fatty foods. Such individuals are also expected to consume a greater number of calories from sweetened beverages. Hence, the researcher expects a positive correlation between social

support and fruit/vegetable consumption, a negative relationship between social support and fat intake, and a negative relationship between social support and sweetened beverage kcal.

Hypothesis 3. In terms of physical activity, it is anticipated that participants who report higher levels of social support will be more active. That is, participants who obtain higher social support scores will report engaging in exercise on a greater number of days per week, as compared to individuals who obtain lower social support scores.

Hypothesis 4. Given that social norms and social contacts strongly influence young adults' own behaviors and intentions (Leahey et al., 2011), it is expected that individuals who report higher social support will report that friends and family engage in healthy eating as well. Thus, a positive correlation is expected between social support score and scores on the healthy eating components of the Health Beliefs Survey. The same relationship for physical activity is hypothesized – that is, a positive correlation between social support score and scores on the physical activity components of the Health Beliefs Survey.

Hypothesis 5. Also in light of Leahey et al.'s (2011) findings, a positive relationship between participants' actual fruit/vegetable intake and Health Beliefs Survey score with regard to the eating habits of family and friends is expected.

Hypothesis 6. There will be a negative association between participants' actual dietary fat intake and Health Beliefs Survey score with regard to the exercise behaviors of family and friends.

Hypothesis 7. There will be a positive correlation between participants' physical activity scores (during a 1-week time frame) and Health Beliefs Survey score for the physical activity of family and friends.

Hypothesis 8. A hierarchical regression analysis will be conducted to assess whether the new measure of social support incrementally predicts, beyond a general social support measure (i.e., not related to WL) and beyond the four components of the Health Beliefs Survey, amount of physical activity in the past 7 days, as well as fruit/vegetable intake, dietary fat intake, total beverage kcal, and sweetened beverage kcal. It is expected that the new measure of social support will add significant predictive value to these outcome variables that will not be captured by questionnaires assessing general social support or the health behaviors of significant others.

Method

This study examined whether a positive relationship existed between social support, as reported by participants, and a variety of health behavior-related variables. These included BMI, fruit and vegetable intake, dietary fat intake, cognitive restraint for eating behaviors, weekly physical activity, sweetened beverage intake, and the eating and physical activity habits of friends and family members. Additionally, the study investigated whether a negative relationship existed between perceived social support for health behaviors and loneliness. Another primary goal of this study was to examine the reliability and construct validity of the newly developed social support measure. To these ends, test-retest reliability and a principal components analysis of the questionnaire were conducted.

Inclusion and Exclusion Criteria

A total of 540 students completed the Part I battery of online questionnaires between April and August 2011; participants were enrolled in psychology courses at Virginia Polytechnic Institute and State University during the spring and summer 2011 sessions. Of these 540 individuals, 466 met criteria for inclusion in Part II. To be invited to participate in Part II,

individuals must have reported in the opening demographic questionnaire of Part I that a desire to lose weight, eat a healthful diet, and/or exercise regularly was either "important" or "extremely important" to them. In contrast, individuals who rated all of these behaviors as either "somewhat important" or "not at all important" were excluded from further participation in Part II (n = 39).

Additionally, participants were omitted from further participation if they met other exclusionary criteria. For example, three participants were pregnant and one participant was breastfeeding, and therefore omitted from subsequent analyses. Three participants endorsed either a current or previous eating disorder diagnosis and were also excluded. Other exclusion criteria included failure to finish the entire battery of questionnaires (n = 6); failure to include an email address at which the participant could be contacted about Part II (n = 1); illogical or unverifiable answers to demographic questionnaire items (n = 6), presumably due to mathematical errors (e.g., one individual listed her height as 4 feet, 4 inches; another listed his height as 8 feet, 6 inches); taking medications that are known to have a significant effect on body weight (n = 1); completing the entire battery of questionnaires too quickly (i.e., in 10 minutes or less; n = 13); or possible random responding to questionnaire items (e.g., endorsing the same response throughout an entire questionnaire; n = 6).

Procedure

Of the 466 individuals who remained in the Part I sample and were eligible for Part II, 107 (23%) completed Part II. Of those who completed Part II, 89 (83%) were retained in the sample; the remaining participants were eliminated for completing the surveys too quickly. Participants were recruited from the Department of Psychology via the Sona experiment

management system. Students enrolled in *Introductory Psychology* and other departmental courses are permitted to receive up to 10 points of extra credit by participating in ongoing research experiments. Typically, students earn one point of extra credit per hour of research participation.

The study contained two parts, which were both completed online. Participants who signed up via the Sona system were provided with a link to a questionnaire on www.surveymonkey.com. The investigator used the Survey Monkey Web site to create questionnaires that assessed demographics (e.g., age, body weight in pounds, height in inches, race, previous history of weight loss attempts), loneliness, social support for health behaviors, health behaviors of friends and family members, fruit/vegetable intake, dietary fat intake, weekly physical activity, cognitive restraint for eating, and beverage intake (as described below). Individuals who completed Part I received one extra credit point, regardless of whether they met criteria for Part II. Those who met inclusion criteria based on their Part I survey scores were contacted via email regarding Part II. Part II was advertised on Sona as an invitation-only study; therefore, only students who met qualification criteria could register. Students who met qualification criteria were provided with an invitation code in the email message from the researcher. Individuals who signed up for Part II using the Sona system were instructed to enter this invitation code.

Participant Characteristics

Of the 466 participants who took part in Part I, 300 were female (64.4%) and 166 were male (35.6%). The mean age of Part I participants was 19.94 years (SD = 2.11); these individuals ranged in age from 18 to 52 years. The Part I sample consisted of 369 individuals

(79.2%) who classified themselves as "White, non-Hispanic," 27 participants (5.8%) who classified themselves as "Hispanic," 21 individuals (4.5%) who listed their race as "Black, non-Hispanic," 44 individuals (9.4%) who listed their race as "Asian," and 14 individuals (3.0%) who listed themselves as "multiracial."

Participants were required to be at least 18 years of age. All participants were Virginia Tech undergraduates, but came from a variety of academic disciplines, as students university-wide frequently take *Introductory Psychology* and other psychology courses to satisfy general education requirements. Students were recruited without regard to gender or year in school (freshman through senior). Moreover, individuals who completed the study were entered into drawings for two $50 gift cards to Amazon.com. Individuals who completed Part I only were entered into the drawing one time; those who completed Parts I and II were entered into the drawing twice, and therefore, could increase their chances of winning a gift card by completing both parts.

Health Behavior Frequencies. When asked whether they were attempting to lose weight currently, participants were almost evenly split, with 238 participants (51.1%) responding "yes," and 228 participants answering "no." Only 55 participants indicated that they were not currently attempting to eat a healthy diet, but the remaining 411 participants (88.2%) responded positively. Similarly, the vast majority of participants indicated that they were attempting to maintain a regular exercise program; 423 participants (90.8%) responded affirmatively to this question, while only 43 participants indicated that they were not currently attempting to maintain regular physical activity.

Health Behavior Importance. Participants were also asked to rate, on a numerical scale from 1 to 4, the current importance of these two health behaviors (eating a well-balanced diet

and maintaining regular exercise). A rating of 1 indicated the behavior was "not at all important," a rating of 2 corresponded with "somewhat important," a rating of 3 indicated the behavior was "important," and a rating of 4 corresponded with "extremely important." As noted previously, a rating of 3 or higher on *either* of these items was required to be retained in the Part I sample. Participants who rated the importance of these health behaviors as 2 or less did not meet inclusion criteria and were not retained.

In terms of the importance of healthy eating, the majority of the sample rated this behavior with a 3 or higher. Two hundred thirty-four individuals rated this behavior with a 3, while 168 participants rated the importance of healthy eating with a 4; thus, a total of 402 participants (86.3%) indicated that healthy eating was an important (or very important) part of their lifestyle. A similar pattern was found in terms of the importance of regular exercise ratings; however, even more individuals reported that obtaining regular exercise was "extremely important" to them, as compared to the ratings for healthy eating. Specifically, 170 individuals rated the importance of obtaining regular exercise with a 3, and 247 individuals rated this behavior with a 4. Hence, a total of 417 participants (89.5%) indicated that obtaining regular exercise was, at the very least, "important" to them.

Previous WL Attempts and Experience with Weight Management Programs. In terms of previous WL attempts, 326 individuals (70%) claimed that they had tried to lose weight at least once in their lives. Participants were also questioned about the frequency of their prior WL attempts. More than half of those who had previously attempted to lose weight (266 individuals, or 57.1% of the total sample) claimed that they had tried to lose weight between one and five times. Fifty-four participants (11.6%) claimed they had attempted to lose weight between six and 10 times, eight individuals (1.7%) claimed they had tried to lose weight between

11 and 15 times, and 12 participants (2.6%) endorsed more than 15 prior attempts. Further, individuals who were currently attempting to lose weight were asked approximately how many pounds they had lost as part of their current attempt. The number of pounds lost ranged from 0 to 54, with the vast majority of participants (87.7%) indicating that they had lost 10 pounds or less. A substantial portion (61.1%) indicated they had lost 5 pounds or less.

Students were also asked whether they were participating in a structured weight management program – such as Weight Watchers or Jenny Craig – currently or within the past 6 months. Of the 466 participants, only 16 indicated that they were presently participating in such a program, while the remaining 450 participants were not. Similarly, only 13 individuals reported that they had participated in such a program within the past 6 months. Participants were asked to describe the specific program; most of those who answered this question reported they had tried Weight Watchers, one individual had tried Slimfast, and one participant had tried the South Beach Diet. Only two participants reported trying "diet pills," another participant reported that "high school wrestling" was a structured weight management program he had tried within the past 6 months (although the research team did not consider any form of athletics to be a structured weight management program). The majority of participants were non-tobacco users: 407 individuals, or 87.3% of the total sample.

The research team was also interested in whether participants had attempted previously, or were currently using, self-help methods in an attempt to manage their weight or maintain health behaviors. Examples of self-help methods were not provided to participants; this was left open to individual interpretation, and responses were quite diverse. Of the 466 students in the sample, 70 reported they had used self-help methods. When asked to describe these methods, most participants indicated they had used a Web site or online program, such as Weight

Watchers Online, Slim Fast Online, or 411fit.com. A sizeable proportion of these 70 participants reported they had consulted popular fitness and wellness magazines (e.g., *Men's Health, Self, Fitness*) for exercise, weight-lifting (particularly male participants), and diet ideas. Several participants mentioned they had read "books" but did not elaborate.

Some students reported logging their diet and exercise information on calorie-counting and exercise-tracking Web sites, smartphone applications, or iPad applications. A few students had also utilized the resources of popular personal trainers within American media. These trainers have an extensive array of Web site tools that provide weight management information and support to registered users, much of it at no cost. The majority of those who reported using self-help methods had incorporated modern technology tools into their weight management efforts, which was unsurprising given the nature of the sample (i.e., college students).

BMI Categories. Participants self-reported their weight (in pounds) and height (in inches). Height in inches ranged from 52 to 86, with a mean height of 67.36 inches. Weight in pounds ranged from 92 to 303, with a mean weight of 151.80 pounds. The mean BMI of all participants (n = 466) was 23.44 (SD = 3.88). BMI values ranged from 14.60 to 44.43. Individuals were placed into BMI categories based on self-reported weight and height. The following criteria were used to distinguish BMI categories, as recommended by the World Health Organization (WHO, 2006): a BMI of less than 16.00 is considered severely underweight, a BMI between 16.00 and 18.49 is considered underweight, a BMI between 18.50 and 24.99 is considered normal, a BMI of 25.00 to 29.99 is considered overweight, and a BMI of 30.00 or above is considered obese.

In the current sample, one individual was in the severely underweight range (.2%), 10 individuals were considered underweight (2.1%), 334 were in the normal range (71.7%), 91 were

considered overweight (19.5%), and 30 were in the obese range (6.4%). Within the range of obesity, three subcategories exist: obese class I (BMI = 30.00 – 34.99), obese class II (BMI = 35.00 – 39.99), and obese class III (BMI = 40.00 or above). In the present sample, 18 individuals were classified as obese class I, 10 individuals were classified as obese class II, and two individuals met criteria for obese class III.

Questionnaires Administered

After completing the demographic survey, participants were directed to an online version of the UCLA Loneliness Scale, Version 3 (Russell, 1996). This measure was included to assess general social support, companionship, and loneliness (i.e., not weight management-related support. The rationale behind using the UCLA Loneliness Scale is that general social support should be negatively correlated with loneliness, and therefore, this measure should provide adequate insight into which participants receive the highest amounts of social support.

The UCLA Loneliness Scale is a 20-item scale that assesses the extent to which respondents feel close to others and feel as though they can turn to other people for support and assistance. On a four-point Likert scale, respondents indicate how often they experience each statement (e.g., "How often do you feel that you lack companionship?", "How often do you feel alone?", "How often do you feel part of a group of friends?") A rating of 1 corresponds with "never," while a rating of 4 corresponds with "always." The measure has been shown to be highly reliable, both in terms of internal consistency (with coefficient alphas ranging from .89 to .94) and a test-retest reliability coefficient of .73 over a 1-year period (Russell, 1996). The questionnaire is also highly convergent with other measures of loneliness, such as the NYU Loneliness Scale (Rubenstein & Shaver, 1982) and the Differential Loneliness Scale (Schmidt &

Sermat, 1983), and is negatively correlated with measures of social support. Further, the UCLA Loneliness Scale has been administered to a wide variety of groups, including college students, hospital nurses, public school teachers, and the elderly.

In addition, participants completed four dietary measures: 1) a measure assessing fat intake, 2) a measure assessing fruit and vegetable intake, 3) a measure of beverage consumption, and 4) a measure assessing cognitive restraint while eating. The Block Fruit/Vegetable Screener and Block Dietary Fat Screener were administered at both time points. The same questionnaires were utilized by Gow and colleagues (2010) in their Internet weight management intervention for college students. The Fruit/Vegetable Screener asks participants how frequently they consume fruit juice, fresh or canned fruit, vegetable juice, green salad, potatoes, vegetable soup, and other vegetables (once per month or less, once per week, two to three times per week, or four to six times per week).

The Dietary Fat Screener assesses how frequently participants eat various foods, including ground beef, hot dogs or sausage, fried chicken, non-low fat salad dressing, bacon, and eggs (once per month or less, two to three times per month, one to two times per week, three to four times per week, or five or more times per week). Each frequency corresponds with a numerical value; the numerical value increases based on how often particular foods are consumed. For example, on the Dietary Fat Screener, if a participant eats hamburgers, ground beef, meat burritos, or tacos three to four times per week, he or she would obtain a numerical score of 3 (on a 0 to 4 scale) for this assessment item. Numerical scores for the 17 items on the Dietary Fat Screener and seven items on the Fruit/Vegetable Screener are summed and totaled at the end. Participants are asked to include all meals eaten, including breakfast, lunch, and dinner, as well as snacks. Both assessments can be self-scored, but to minimize response bias and social

desirability factors, participants in the current study simply answered the questions and submitted the completed questionnaires as part of the online battery. The primary investigator then scored the responses. If participants were given the opportunity to score the assessments themselves, as the original forms of the screeners permit, it is possible that their responses would not accurately reflect their dietary patterns and habits.

On the Dietary Fat Screener, a total "fat score" between 0 and 7 corresponds with a very low fat intake (probably less than 25% of total calories consumed, according to the screener). If the total "fat score" is between 8 and 14, the respondent is likely consuming between 30 and 35% of his or her daily calories from fat (nutritional experts recommend about 30%, the screener claims). Individuals who score between 15 and 22 have diets that are very high in fat (i.e., more than 35% of total calories), and the screener recommends that these individuals decrease their fat intake. Finally, individuals who score 23 or above have extremely fat-rich diets (i.e., 40 to 50% of calories), and are given suggestions for decreasing fat intake.

On the Fruit/Vegetable Screener, a total score between 0 and 10 means that the respondent is not eating enough fruits and vegetables (likely less than three servings per day). A score between 11 and 12 still indicates that the individual is not eating sufficient servings of fruits and vegetables each day (the individual may be eating four servings or less, but experts recommend five or more per day). A score between 13 and 15 indicates that the respondent is "doing better than most people," but still not consuming enough daily servings. Lastly, a score of 16 or above means that the participant is "doing very well in fruits/vegetables, probably around five servings a day."

Block and colleagues (2000) demonstrated that the brief screeners correlated strongly ($r >$ .60 for fat intake and $r = .71$ for fruit and vegetable intake; $p < .0001$) with more elaborate

measures of food intake. Block et al. therefore concluded that the brief screeners (which take less than 5 minutes to complete) could serve as a "reasonably accurate ranking of nutrient intake, similar to that of a full-length dietary questionnaire" (p. 288). That is, the screeners showed the ability to identify individuals with high percentages of calories from total fat, saturated fat, and cholesterol, as well as individuals with low intakes of vitamin C, fiber, and potassium.

The third dietary measure administered was the Beverage Intake Questionnaire (BEV-Q; Hedrick, Comber, Estabrooks, Savla, & Davy, 2010). The development of this questionnaire is based on the belief that weight gain may be partially the result of unhealthy beverage consumption. The BEV-Q asks participants about daily beverage intake across several different categories. The instrument provides a mean daily intake of water, sugar-sweetened beverages, and total beverages (in grams and energy) across 19 beverage categories, plus one open-ended category for "other" beverages (identified by the respondent). Participants note the number of times per day each beverage is consumed (never or less than once per week, once per week, 2 to 3 times per week, 4 to 6 times per week, once per day, 2+ times per day, or 3+ times per day), in addition to the amount consumed each time (ranging from less than 6 fl oz to more than 20 fl oz). Beverage categories include water, 100% fruit juice, sweetened juice or lemonade, various types of milk arranged by fat content, tea, coffee, alcoholic beverages, meal replacement beverages, and energy drinks. Test-retest reliability across two study visits was considered acceptable. The BEV-Q measure was significantly correlated with biomarker measurements for total fluid intake, as well as a 4-day food intake record.

The fourth measure of dietary behavior included in the questionnaire battery was the cognitive restraint scale of the Three-Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1985). The TFEQ is a 51-item measure of three dimensions of eating behavior: cognitive

control, disinhibition, and hunger. Restrained eating is defined as "the tendency of some persons to restrict their food intake in order to control their body weight" (Stunkard & Messick, p. 71). The restraint factor of the TFEQ includes 21 items. Twelve of these items are true-false, such as "When I have eaten my quota of calories, I am usually good about not eating anymore," "I deliberately take small helpings as a means of controlling my weight," and "I eat anything I want, anytime I want." Furthermore, respondents are asked to make frequency judgments (rarely, sometimes, usually, always) about nine remaining items, including "How often are you dieting in a conscious effort to control your weight?", "Would a weight fluctuation of 5 lbs affect the way you live your life?", "How conscious are you of what you are eating?", and "On a scale of 0 to 5, where 0 means no restraint in eating…and 5 means total restraint, what number would you give yourself?" The TFEQ has shown good internal consistency (coefficient alpha = .93), as well as a test-retest reliability of .93, for the conscious control of eating factor. All three factors were significantly correlated with current weight.

Moreover, the investigator administered the International Physical Activity Questionnaire - short form, last 7 days, self-administered format (IPAQ). The IPAQ has been previously used with college students (e.g., Gow et al., 2010). The IPAQ asks respondents to recall the amount and duration of vigorous and moderate physical activity, as well as walking, in which they have participated within the past 7 days. Craig et al. (2003) demonstrated that the short form of the IPAQ has acceptable measurement properties for monitoring physical activity levels in adults between the ages of 18 and 65. Further, the instrument was shown to be suitable for assessment of physical activity levels in a variety of diverse settings (including 12 different developed and developing countries).

The questionnaire has four total questions. The first question asks participants to recall the number of days during the past week that they spent engaging in vigorous activity for at least 10 minutes at a time (e.g., heavy lifting, digging, aerobics, or fast bicycling); participants are then asked to indicate how much time in total they spent on those activities. The second question assesses moderate physical activity that participants engaged in for at least 10 minutes at a time (e.g., carrying light loads, bicycling at a regular pace, doubles tennis), while the third question asks participants to list the number of days and hours/minutes spent walking in at least 10-minute bouts (e.g., walking while at work and home, walking for exercise, walking from place to place throughout the day). Finally, the fourth question asks participants to list the number of hours/minutes they spent sitting on weekdays during the past 7 days.

Energy expenditure is calculated by multiplying the duration of time spent engaging in the activity category (vigorous, moderate, walking, or sitting) by the number of days per week spent engaging in the activity category and the MET (metabolic equivalent) of the activity. Each activity category has a MET energy expenditure estimate assigned to it, as reported in Craig et al. (2003). Therefore, the following equation is used to calculate MET hours spent in each domain: (hours/session) x (sessions/week) x METs = MET hours/week.

The battery of questionnaires also included four established social support scales: two scales for friend social support (dietary- and physical activity-related) and two scales for family support (dietary- and physical activity-related). All four scales were developed by Virginia Tech's Center for Research in Health Behavior (CRHB; Winett, Anderson, Wojcik, Winett, & Bowden, 2007) and are part of the Health Beliefs Survey. These healthy eating questionnaires have been used previously with Virginia Tech students (Strong et al., 2008). The scales assess the extent on a 1 (strongly disagree) to 5 (strongly agree) Likert scale that respondents' friends

and family members engage in healthy eating practices. Examples of items include: "keep track of the number of calories they eat each day," "eat 5 or more servings of fruits and vegetables every day," and "cook with very little fat." The physical activity scales are similar; examples of items include: "make time to walk or do other exercise," "set goals to walk or do other exercise," and "plan to walk faster or exercise harder." All scales within the Health Beliefs Survey have demonstrated acceptable to high internal consistency, with Cronbach's alpha ranging from .68 to .90. Further, the scales have predictive validity for both dietary and physical activity behaviors.

The final Part I questionnaire consisted of a measure of social support for weight management and associated health behaviors developed by the primary investigator. The questionnaire was termed the Health Behavior Inventory for College Students, or HBI-CS, and consisted of 37 items. The HBI-CS was constructed based on a four-component model of social support for weight management used to develop the Weight Management Support Inventory (WMSI; Rieder & Ruderman, 2007), as well as research on types of social support offered in online weight management communities (Hwang et al., 2010).

In particular, the WMSI is based on four factors with regard to the provision of weight management-related social support within face-to-face relationships: 1) emotional (e.g., encouragement), 2) instrumental (i.e., tangible support), 3) informational, and 4) appraisal (i.e., provision of feedback). Because it is unknown whether such a factor structure would apply to social support for exercise and healthy eating (as opposed to weight management), a principal components analysis was conducted on the HBI-CS. Respondents were provided with the following instructions: "Think about your day-to-day interactions with friends, family members, and other significant face-to-face relationship partners in your life – specifically with regard to your efforts to lose weight and/or maintain a healthy lifestyle. Thinking about the past 7 days,

please use the following scale to indicate how much you agree with the statements below." Participants were instructed to indicate their level of agreement with 37 statements on a four-point Likert scale (0 = not at all, 1 = rarely, 2 = sometimes; 3 = frequently).

Emotional support and encouragement-related items included, "[Significant others in my life] encourage me to keep going when I feel like giving up," "They participate in 'friendly competition' or challenges with me," and "They compliment or recognize my accomplishments, no matter how small." Examples of instrumental support-related items included, "They exercise with me on a consistent basis," "They are available when I need them," and "They give me helpful reminders to exercise." The third factor – informational support – was assessed by items such as, "They offer useful tips on managing my weight and/or health," "They provide me with helpful information on weight management (e.g., caloric content of foods, healthy recipes)," and "They have discussed the benefits of physical activity with me." Lastly, the fourth factor – appraisal or feedback – was assessed by items such as, "They provide me with useful feedback on my weight management or health-related behaviors," "They have made me aware of some maladaptive habits or behavior patterns related to my weight or health habits," and "They compliment me for making healthy choices."

Part II was completed approximately 1 week following Part I. Participants who met criteria for, and elected to participate in, Part II provided their body weight and height for a second time. A total of 89 individuals completed Part II in its entirety and were retained in the sample, as noted above. Further, participants completed the UCLA Loneliness Scale, Block Dietary Fat Screener, Block Fruit/Vegetable Screener, BEV-Q, cognitive control scale of the Three-Factor Eating Questionnaire, IPAQ, CRHB scales, and HBI-CS for a second time. The

purpose of Part II was primarily to calculate the test-retest reliability of the HBI-CS, although by completing all surveys twice, test-retest stability could be determined for any of the measures.

Results

Overview

Analyses were conducted using the 466 individuals who met criteria for inclusion into Part I of the study. Of these participants, 89 were included in the Part II sample. Part II was only administered for test-retest reliability purposes of the HBI-CS; however, the investigator did nonetheless conduct exploratory analyses to examine the correlations between social support score and the primary outcome variables of interest, as described below. Part I participant data was examined in terms of mean scores on the major assessment instruments: the UCLA Loneliness Scale, HBI-CS, Block dietary screeners, Heath Beliefs Survey (four scales), cognitive restraint scale of the Three-Factor Eating Questionnaire, and BEV-Q (specifically, average fluid ounces per day consumed from sweetened beverages). Next, the investigator conducted correlational analyses with regard to the major hypotheses. Third, based on some results discovered in the tests of major hypotheses, the researcher conducted exploratory analyses to probe into these issues further. Lastly, both reliability and validity analyses of the HBI-CS were conducted.

HBI-CS Principal Components Analysis

The 37 initial items included in the HBI-CS were analyzed in a principal components analysis (PCA). This method of analysis was chosen because the primary investigator did not have clear a priori hypotheses about the types or categories of social support for health behaviors

in college students within their face-to-face relationships. Although the HBI-CS was developed based on a prior investigation of social support in weight management support groups (Hwang et al., 2010), the researcher could not be certain that the types of social support gleaned in the present study would mimic those detected by Hwang et al., primarily because Hwang and colleagues investigated social support within an *online* context. Also, the current investigation involved a specific target group: college students. The primary investigator reasoned that the four types of social support analyzed by Hwang et al. may not apply to college students in particular.

The test-retest reliability of the 37-item HBI-CS was examined over a period of approximately 1 week. The measure demonstrated adequate test-retest stability: $r = .79$, $p < .001$. Initially, the factorability of 37 HBI-CS items was investigated. The Kaiser-Meyer-Olkin measure of sampling adequacy was .964, which is well above the recommended value of .6. Bartlett's test of sphericity was also significant (chi-square [666] = 11,034.82, $p < .001$). The diagonals of the anti-image correlation matrix were all greater than .9; which suggests that all items could be included in the PCA. An examination of communalities revealed that all communality values were greater than .4 (see Table 1), which provides evidence that each item shared common variance with other items.

In an analysis of the total variance explained, five components had eigenvalues greater than 1 (see Table 2). This criterion, commonly known as the unity rule, is frequently recommended as a method for component extraction (Child, 2006). The initial eigenvalues showed that the first factor explained 43.89% of the variance, the second factor explained 6.40% of the variance, the third factor explained 4.55% of the variance, the fourth factor explained 3.53% of the variance, and the fifth factor explained 2.83% of the variance. In total, the five-

component model explained 61.21% of the variance among the items. Further, an examination of the resultant scree plot (see Figure 1) revealed that, from factor six onward, there appeared to be a straight line sloping in the downward direction.

Subsequently, an analysis was performed on the initial five-component model to screen out any items that were highly related to more than one factor of social support. That is, items were examined for cross-loadings. If an item loaded onto more than one factor, and a difference between the loadings of less than .2 was found, the item was eliminated. Twenty-two items met these criteria, and were subsequently eliminated. At this step, the eliminated items included the following item numbers (see Appendix A for the full questionnaire): 6, 11, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 30, 31, 32, 35, 36, and 37.

Upon inspection of the remaining items, it was discovered that component 4 only contained one item, which was #26. Moreover, it was discovered that only two items loaded onto component 5: items 13 and 14. As a rule of thumb, each component should contain at least three items (Starkweather & Herrington, 2011); consequently, both components 4 and 5 were eliminated from subsequent analyses. Therefore, in total, 12 items were retained, and 25 items were eliminated, from the original HBI-CS questionnaire.

On the remaining 12 items, a PCA was conducted using varimax rotation. A correlation analysis of component scores revealed no relationship between the components; as a result, an orthogonal rotation strategy (i.e., varimax rotation) was used. The three factors explained 67.76% of the variance. All items had primary loadings greater than .5; most items had primary loadings above .7. This factor loading matrix is presented in Table 3.

Upon examination of the item loadings onto the various components, a three-factor solution was supported, which represents a departure from the factor structures of social support

questionnaires in previous weight management research. The present analyses seemed to support a combination of the same labels that Rieder and Ruderman (2007), as well as Hwang et al. (2010), found in their respective investigations. The four factors in Rieder and Ruderman's WMSI were: 1) emotional support, 2) instrumental support, 3) informational support, and 4) appraisal. In Hwang et al.'s study of social support as provided within an Internet WL community, three types of social support themes were detected: 1) encouragement and motivation, 2) information, and 3) shared experiences. In the current study, three labels were gleaned from an inspection of the factors: 1) instrumental support for a healthy lifestyle, 2) motivational support and accountability, and 3) modeling healthy behaviors. These factor labels are presented in Appendix B.

Additionally, internal consistency for each scale was examined using Cronbach's alpha. Scale 1 (instrumental support for a healthy lifestyle), which contained five items, had an alpha of .88. Scale 2 (motivational support and accountability), which contained four items, had an alpha of .82. Scale 3 (modeling healthy behaviors), which contained three items, had an alpha of .75.

Reliability Comparisons: 37- vs. 12-item HBI-CS. As previously noted, the original 37-item HBI-CS instrument achieved a test-retest stability of $r = .79$, $p < .001$. The same reliability test was also conducted for the 12-item measure, and the following identical result was obtained: $r = .79$, $p < .001$. Further, the internal consistency of both scales – the 37-item and 12-item – was assessed using Cronbach's alpha. The 37-item instrument revealed a Cronbach's alpha of .96, while the 12-item instrument showed a Cronbach's alpha of .88.

HBI-CS: Validity Data

To assess construct validity of the HBI-CS, the study included a measure of restrained eating: the cognitive restraint scale of the Three-Factor Eating Questionnaire. The researcher expected that HBI-CS scores would be significantly related to restrained eating. Results showed a significant positive relationship between these two variables: $r(464) = .17$, $p < .001$. Hence, those who reported greater social support for health behaviors also reported higher scores on a measure of restrained eating. The construct validity of the 12-item HBI-CS measure was also assessed. Findings indicated a significant positive relationship between the 12-item scale and restrained eating: $r(464) = .14$, $p = .003$.

For concurrent validity purposes, the correlations between the 12-item HBI-CS and the dependent measures in hypotheses 1, 2, and 3 were examined. These findings are explained in greater detail below as part of the "Tests of Hypotheses" section.

To examine convergent validity of the HBI-CS, the investigator administered four modules of the Health Beliefs Survey, as the research team expected these measures of the same construct – social support – to demonstrate agreement with one another. Results indicated that the 37-item HBI-CS was significantly correlated with the four scales of the Health Beliefs Survey in a positive direction, as detailed above (see hypothesis 4). Additionally, correlational analyses were also conducted on the 12-item HBI-CS measure. Table 4 presents a side-by-side comparison of the 37- and 12-item HBI-CS instrument in terms of convergent validity. As the table shows, correlational values between the HBI-CS and other assessment measures related to social support (four modules of the Health Beliefs Survey, and the UCLA Loneliness Scale) for the 37- and 12-item instruments are quite comparable.

Further, to ensure convergent validity (i.e., agreement between a general social support measure and the more specific HBI-CS), the UCLA Loneliness Scale was administered. Results

showed a significant negative correlation between loneliness score and social support score for health behaviors: $r(464) = -.36$, $p < .001$.

Assessment Scores

Table 5 presents the mean scores and standard deviations of each of the major assessment instruments at both time 1 ($n = 466$) and time 2 ($n = 89$): HBI-CS, UCLA Loneliness Scale, Block Fruit/Vegetable Screener, Block Dietary Fat Screener, IPAQ – vigorous exercise, IPAQ – moderate exercise, IPAQ – walking, the four scales of the Health Beliefs Survey, the cognitive restraint subscale of the Three-Factor Eating Questionnaire, and the average number of fluid ounces consumed from sweetened beverages per day.

Additionally, on the Block Dietary Fat Screener, the 466 participants were placed into groups based on the feedback corresponding with their numerical dietary fat score. The group labels were low fat intake, normal fat intake, high fat intake, and very high fat intake. Cutoff scores for each of these four categories were provided by the Block questionnaire, as described in the Method section. In the current sample, 26 students scored in the very low range (a total score between 0 and 7), 108 scored in the normal range (a total score between 8 and 14), 170 scored in the high range (a total score between 15 and 22), and 162 scored in the very high range (a total score of 23 or higher).

Participants were also placed into groups based on the feedback corresponding with their numerical fruit/vegetable intake score. The group labels were very low intake; not enough intake; above average intake, but still less than the recommended level of five servings per day; and high intake (i.e., doing very well). A total of 89 participants scored in the very low range (a total score between 0 and 10), 209 scored in the "not enough" range (a total score of 11 or 12),

98 scored in the above average – but still not enough – range (a total score between 13 and 15), and 70 scored in the "very well" range (a total score of 16 or higher, or at least five servings of fruits and vegetables per day).

In terms of physical activity data, participants were asked to report the number of days over the past week that they had engaged in vigorous exercise (i.e., those activities that require hard physical effort and cause the individual to breathe much harder than normal). Of the 466 participants, 53 reported that they had not engaged in any vigorous-intensity exercise (i.e., 0 days within the past week). Forty individuals reported that they participated in vigorous exercise for 1 day, 66 reported 2 days, 98 reported 3 days, 78 reported 4 days, 83 reported 5 days, 27 reported 6 days, and 21 reported that they had engaged in vigorous physical activity during all 7 days.

Further, frequency counts were obtained for the number of days during the past week that individuals had participated in moderate-intensity exercise. The IPAQ defines moderate exercise as activities that require moderate physical effort and cause the individual to breathe somewhat harder than normal (excluding walking, which has its own category). The following data were obtained: 56 individuals reported 0 days of moderate exercise, 45 reported 1 day, 88 reported 2 days, 96 reported 3 days, 77 reported 4 days, 43 reported 5 days, 24 reported 6 days, and 37 reported 7 days.

Thirdly, frequency counts were obtained for walking data as well. That is, participants were asked to list the number of days within the past week that they had engaged in walking for at least 10 minutes at a time for exercise or leisure purposes, or walking while traveling from place to place. The vast majority of participants reported they had walked for at least 10 minutes per bout on all 7 days of the past week (n = 299). Only nine participants reported they had not walked at all for at least 10 minutes at a time, seven individuals reported they had walked during

1 day, 11 individuals reported 2 days, 13 reported 3 days, 33 reported 4 days, 57 reported 5 days, and 37 reported 6 days.

Group Comparisons on Assessment Scores

Individuals who completed Part I only (n = 359) were compared to students who completed Parts I and II (n = 89) in terms of BMI and scores on assessment instruments. The BMI readings of individuals who completed Part I only were not significantly different than the BMI readings of those who completed Part II as well. Further, assessment scores did not significantly differ between the two groups of participants. Groups were compared on the following assessments using a multivariate analysis of variance (ANOVA): UCLA Loneliness Scale, Block Dietary Fat Screener, Block Fruit/Vegetable Screener, HBI-CS, CRHB Health Beliefs Survey components (friends scale for healthy eating, family scale for healthy eating, friends scale for physical activity, and family scale for physical activity), cognitive control scale of the Three-Factor Eating Questionnaire, days spent in vigorous exercise, days spent in moderate exercise, days spent walking, and sweetened beverage intake (in terms of fluid ounces).

Participants from Part I (n = 466) were grouped into BMI categories to determine whether significant differences between groups existed on assessment scores. Again, a multivariate ANOVA was conducted. No significant differences between the five major BMI groups – severely underweight, underweight, normal, overweight, obese – were detected in terms of scores on the questionnaires listed above.

Repeated measures ANOVAs were conducted to determine whether significant changes in assessment scores existed between time 1 and time 2 for the 89 participants who completed both parts. The only dependent variable for which a significant change was found between time

1 and time 2 was UCLA Loneliness Scale score. Specifically, at time 1, the mean score for the 89 individuals who completed both parts of the study was 34.73 (SD = 8.04). However, at time 2, the mean score among these 89 participants was 37.70 (SD = 7.04), $F(1,88) = 33.32$, $p < .001$.

Tests of Hypotheses

Hypothesis 1. It was expected that individuals who reported greater social support according to the HBI-CS would have lower BMI readings. In this way, a significant negative correlation was predicted between HBI-CS score and BMI. A Pearson correlation analysis revealed that, contrary to expectations, a significant relationship did not exist between these two variables. This analysis was based on the 37-item HBI-CS. However, a second correlational test was conducted to examine the relationship between the 12-item HBI-CS and BMI. This test revealed the same nonsignificant finding.

Hypothesis 2. It was predicted that individuals who reported higher social support scores as measured by the HBI-CS would have higher fruit/vegetable consumption, lower dietary fat intake, and lower sweetened beverage intake, as compared to individuals with lower social support scores. To test this hypothesis, a Pearson correlation was conducted between Block Fruit/Vegetable Screener total score and HBI-CS total score. The correlation between Block Fruit/Vegetable Screener total score (M = 11.24, SD = 4.45) and HBI-CS total score (M = 72.68, SD = 21.79) was significant, $r(464) = .10$, $p < .03$. However, the correlation between Block Dietary Fat Screener total score and HBI-CS total score – although negative – was not significant. In addition, the researcher did not find a significant correlation between sweetened beverage intake and HBI-CS score. Thus, hypothesis 2 was only partially supported.

When a second group of correlational analyses were conducted based on the 12-item HBI-CS measure, again, only fruit/vegetable intake was significantly related to social support: $r(464) = .11$, $p = .02$.

Hypothesis 3. It was anticipated that participants with higher social support scores would also have higher physical activity scores (i.e., a greater amount of activity in the past week). To test this hypothesis, three facets of physical activity were examined: number of days over the past week spent in vigorous exercise, number of days over the past week spent in moderate-intensity exercise, and number of days over the past week spent walking for at least 10 minutes at a time. The investigator elected *not* to examine the number of minutes or hours per day spent exercising, due to the wide variety of participant responses. Presumably due to errors in mathematical calculations, a few respondents indicated that they had engaged in exercise for more than 168 hours per week – a clear impossibility. Therefore, the investigator determined that *days per week* spent participating in various intensities of exercise, rather than the amount of time spent exercising per day, would serve as a more accurate indicator of participant physical activity.

Results provided partial support for this hypothesis, indicating that social support scores were correlated only with days spent in vigorous exercise. That is, the correlation between weekly vigorous exercise total score ($M = 3.22$ days, $SD = 1.89$) and HBI-CS total score ($M = 72.68$, $SD = 21.79$) was significant, $r(464) = .11$, $p < .02$. Social support scores were not significantly correlated with days spent in moderate exercise or days spent walking for at least 10 minutes at a time.

The 12-item HBI-CS measure was significantly correlated with vigorous exercise only: $r(464) = .10$, $p < .03$.

Hypothesis 4. It was predicted that individuals who reported higher social support scores for health behaviors (according to the HBI-CS) would also obtain higher scores on four components of the Health Beliefs Survey: 1) Healthy Eating – Family, 2) Healthy Eating – Friends, 3) Physical Activity – Family, and 4) Physical Activity – Friends. These findings were hypothesized because the Health Beliefs Survey measures social support for healthy eating and physical activity by questioning the respondent about whether family members and friends engage in health behaviors themselves.

Indeed, significant positive correlations between HBI-CS score and scores on the Health Beliefs Survey were observed. Specifically, the correlation between HBI-CS total score (M = 72.68, SD = 21.79) and the Healthy Eating – Family questionnaire of the Health Beliefs Survey (M = 34.24, SD = 9.21) was significant, $r(464) = .25$, $p < .001$. Likewise, the correlation between HBI-CS total score and the Healthy Eating – Friends section of the Health Beliefs Survey (M = 33.38, SD = 9.23) was significant, $r(464) = .30$, $p < .001$. The two exercise questionnaires of the Health Beliefs Survey were positively correlated with HBI-CS score as well. The correlation between HBI-CS total score and Physical Activity – Family questionnaire total score (M = 27.95, SD = 8.01) was as follows: $r(464) = .21$, $p < .001$. HBI-CS total score and Physical Activity – Friends total score (M = 29.22, SD = 6.99) achieved the following correlation results: $r(464) = .35$, $p < .001$.

Hypothesis 5. It was anticipated that a positive relationship would exist between the healthy eating behaviors of family and friends and the fruit/vegetable servings that the participants actually consumed. In this way, a positive association between total score on the healthy eating sections of the Health Beliefs Survey and total score on the Block Fruit/Vegetable Screener was predicted. Results indicated that significant positive correlations did in fact exist.

In particular, the correlation between the Healthy Eating – Family subscale of the Health Beliefs Survey and Block Fruit/Vegetable Screener was as follows: $r(464) = .09$, $p < .05$. The relationship between the Healthy Eating – Friends section of the Health Beliefs Survey and Block Fruit/Vegetable Screener achieved the following correlation: $r(464) = .116$, $p = .01$. Hence, hypothesis 5 was fully supported.

Hypothesis 6. Hypothesis 6 predicted that, just as a positive relationship was expected between healthy eating behaviors of significant others and participants' own fruit/vegetable intake, a negative correlation would exist between healthy eating behaviors of family and friends and participants' own dietary fat intake. In other words, it was expected that individuals who reported that family members and friends exercised caution in terms of their own dietary habits would themselves report eating less dietary fat. In fact, this prediction was confirmed. There was a significant negative correlation between the Healthy Eating – Family questionnaire and the Block Dietary Fat Screener: $r(464) = -.23$, $p < .01$. Additionally, a significant negative correlation existed between the Healthy Eating – Friends questionnaire and the Block Dietary Fat Screener: $r(464) = -.10$, $p < .03$.

Hypothesis 7. It was predicted that, according to IPAQ scores, participants who reported a greater amount of time engaged in vigorous exercise, moderate exercise, and walking would also report (according to the Health Beliefs Survey) that their friends and family are physically active on a regular basis. Specifically, the researcher examined the correlation between total score on the Physical Activity – Family questionnaire and days spent in vigorous exercise according to the IPAQ. The following correlation was obtained: $r(464) = .10$, $p < .04$; therefore, the relationship between these two variables was significant.

Additionally, the correlation between total score on the Physical Activity – Friends questionnaire and days spent in vigorous exercise was $r(464) = .19$, $p < .01$. Further, days in the past week engaged in moderate exercise did not achieve a significant relationship with the Physical Activity – Family questionnaire, although the association approached significance at $p = .06$. However, the investigator did find a significant relationship between the Physical Activity – Friends questionnaire and days spent in moderate exercise; the correlation between these two variables was $r(464) = .13$, $p < .01$. Lastly, the relationship between days spent walking and the physical activity of family and friends was examined. In this case, the association between the Physical Activity – Family scale and days spent walking was significant: $r(464) = .11$, $p < .02$, but the relationship between the Physical Activity – Friends scale and days spent walking failed to achieve significance.

Hypothesis 8. The researcher conducted a hierarchical regression analysis to determine whether the HBI-CS would incrementally predict, beyond the predictions provided by other social support measures, several primary outcome variables: fruit/vegetable intake, fat intake, sweetened beverage intake, vigorous exercise, moderate exercise, and walking. Scores on a measure of general social support, the UCLA Loneliness Scale, were placed into the model at step 1. At step 2, two measures of the Health Beliefs Survey were placed into the model; the specific questionnaires that were included depended on the outcome variable being assessed. That is, if the dependent variable was physical activity (vigorous- or moderate-intensity exercise, or walking), the researcher input the two Health Beliefs Surveys related to physical activity (one questionnaire for family and one questionnaire for friends) into the model. On the other hand, when the dependent variable being assessed was related to diet (fruit/vegetable intake, dietary fat

intake, or beverage intake), the Health Beliefs Surveys related to healthy eating (one for family and one for friends) were used at step 2. In step 3, the HBI-CS total score variable was entered.

Analyses revealed that the inclusion of HBI-CS total score into the model at step 3 did not significantly predict any of the outcome health behaviors above and beyond the ability of the Health Beliefs Surveys to predict the outcome variables at step 2. Specifically, the Health Beliefs Survey, combined with the UCLA Loneliness Scale, was able to predict the following at a significant level: 1) dietary fat intake, 2) days spent in vigorous exercise, 3) days spent in moderate exercise, and 4) days spent walking. The specific statistical results obtained from these analyses – UCLA Loneliness Scale alone at step 1 versus UCLA Loneliness Scale plus Health Beliefs Survey at step 2 – are not presented, as they are not part of the original hypotheses and do not involve the HBI-CS.

Bonferroni Corrections

Because many of the hypotheses described above involved multiple dependent measures within a single hypothesis, the researcher applied a Bonferroni correction and conducted the tests of the major hypotheses for a second time. The Bonferroni adjustment was conducted by dividing the traditional level of significance, or $p = .05$, by the number of comparisons being conducted within each hypothesis. The tests that failed to reach significance when the alpha level was set at .05 were not conducted for a second time.

Hypothesis 2 contained three dependent variables: fruit/vegetable intake, fat intake, and sweetened beverage intake. Therefore, .05 was divided by 3 for a new significance level of .02. The relationship between the 37-item HBI-CS score and fruit/vegetable intake, which was significant previously, was no longer significant after the Bonferroni correction was applied.

Further, the correlation between the 12-item HBI-CS instrument and fruit/vegetable intake was also nonsignificant following the Bonferroni correction. The correlations between the 37- and 12-item HBI-CS scores and fat intake, as well as HBI-CS score and sweetened beverage intake, failed to reach significance initially (i.e., when the alpha level was set at .05); thus, these tests for significance were not conducted again.

Similarly, within hypothesis 3, only one dependent measure achieved significance in terms of its relationship with the 37-item HBI-CS score when the alpha level was set at .05 (vigorous exercise). Hypothesis 3, however, also contained three dependent measures of physical activity: vigorous intensity, moderate intensity, and walking. Therefore, the Bonferroni correction was applied by dividing .05 by 3. After this correction was applied, days spent in vigorous exercise was still significantly correlated with HBI-CS score at the $p = .02$ level. When the relationship between the 12-item HBI-CS measure and vigorous exercise was examined using the Bonferroni correction, the corresponding p value narrowly missed the significance mark.

In addition, all four dependent measures in hypothesis 4 retained significant relationships with HBI-CS score when the 37-item version was examined. When .05 was divided by 4, a new p value of .01 was obtained. All four components of the Health Beliefs Survey were correlated with HBI-CS score at a level of $p < .001$. When the 12-item version was examined, HBI-CS score was still significantly correlated with the four subscales of the Health Beliefs Survey at a level of $p < .001$.

In hypothesis 5, the Bonferroni adjustment was applied by dividing .05 by 2, the number of dependent measures within this hypothesis ($p = .03$). Fruit/vegetable intake was no longer significantly correlated with the family eating module of the Health Beliefs Survey. However,

fruit/vegetable intake *was* significantly related to score on the friends eating scale at the $p = .01$ level. In hypothesis 6, the relationships between fat intake and both the family and friends scales for healthy eating continued to be significant. The correlation between fat intake and the family eating scale was significant at the $p < .001$ level, while the correlation between fat intake and the friends eating scale was significant at $p < .03$.

Lastly, hypothesis 7 examined the relationship between IPAQ scores and the physical activity of family and friends, according to the Health Beliefs Survey. A total of six comparisons were conducted as part of this hypothesis; hence, .05 was divided by 6 for a p value of .01. Vigorous exercise retained its significant relationship with the friends exercise scale at the $p < .001$ level, while the relationship between moderate exercise and the friends exercise scale was significant at $p < .01$.

Exploratory Analyses

Even though Part II of the current study was conducted primarily to examine test-retest reliability of the HBI-CS, the investigator also examined correlations between social support and the outcome variables of interest for the Part II data (similar to analyses that were conducted for Part I data, as described above). As previously noted, 89 individuals completed Part II. Results indicated that, as was the case with the Part I data, there was no significant relationship between HBI-CS score and BMI, as reported at Part II. There was again a negative correlation between HBI-CS score and UCLA Loneliness Scale score: $r(87) = -.40$, $p < .001$. The relationship between HBI-CS score and dietary fat intake trended toward, but failed to reach, significance. Unlike the Part I data, there was no significant association between HBI-CS score and fruit/vegetable intake.

However, as was the case with the Part I data, the investigator did find a significant correlation between HBI-CS score and days spent in vigorous exercise, as measured by the IPAQ: $r(87) = .27$, $p < .01$. In this case, a significant correlation between HBI-CS score and days spent in moderate-intensity physical activity was found as well: $r(87) = .19$, $p = .05$. The relationship between HBI-CS score and days spent walking remained insignificant in Part II.

Like Part I, all four components of the Health Beliefs Survey were significantly related to HBI-CS score in Part II. The relationship between HBI-CS score and the family scale for healthy eating was as follows: $r(87) = .36$, $p < .001$. The correlation between HBI-CS score and the friends scale for healthy eating was: $r(87) = .25$, $p = .01$. Further, the relationships between HBI-CS score and the family and friends scales for physical activity were as follows, respectively: $r(87) = .24$, $p < .02$; $r(87) = .33$, $p = .001$. Finally, although BEV-Q score (i.e., sweetened beverage intake) remained unrelated to HBI-CS score in Part II, the investigator did find a significant association between HBI-CS score and cognitive restraint score, as assessed by the Three-Factor Eating Questionnaire: $r(87) = .27$, $p = .005$.

Moreover, the researcher also conducted correlational analyses between the predictor variable (HBI-CS score) in Part I and the primary outcome variables in Part II. Significant relationships were found for the following variables: Block Fruit/Vegetable Screener ($r[87] = .24$, $p < .03$), days spent in vigorous exercise ($r[87] = .24$, $p < .03$), the Health Beliefs Survey's family scale for healthy eating ($r[87] = .42$, $p < .001$), the Health Beliefs Survey's friends scale for physical activity ($r[87] = .31$, $p = .003$), and the cognitive restraint scale of the Three-Factor Eating Questionnaire ($r[87] = .30$, $p = .004$).

Additionally, the possibility exists that Part I results would be different if the 25 items of the HBI-CS which cross-loaded onto more than one component, or were part of a factor with an

insufficient number of items, were eliminated, and participants' social support scores based on only the 12 remaining questions were recalculated. The investigator reasoned that, in this case, a relationship between HBI-CS score and some of the outcome variables may be found. Results of these preliminary analyses largely mirrored the original hypotheses tests using the 37-item HBI-CS measure. First, a relationship between social support score (on the revised HBI-CS) and BMI was still not detected.

The significant relationship that was previously found between social support score and fruit/vegetable intake was retained when the shorter version of the HBI-CS was examined: $r(464) = .11$, $p < .03$. For social support and dietary fat intake, a negative correlation was found, but – as was the case with the original 37-item HBI-CS instrument – the relationship was not significant. Analyses also failed to detect significant correlations between the BEV-Q outcome variable (sweetened beverage intake) and social support using the 12-item measure.

Moreover, a significant positive relationship between social support score on the shortened measure and vigorous exercise was found: $r(464) = .10$, $p < .03$. The relationship between social support score and moderate activity approached – but did not achieve – significance, while the correlation between social support score and walking remained insignificant. Finally, the 12-item HBI-CS score was significantly correlated with all four scales of the Health Beliefs Survey; specific correlational values were very similar to those obtained using the original HBI-CS (as part of the hypothesis 4 test).

To further examine the relationship between social support and various health behavior indicators, participants were grouped into quartiles based on Part I HBI-CS score. Participants scoring in the lowest quartile ($n = 117$) and participants scoring in the highest quartile of the HBI-CS ($n = 118$) were compared. Those who scored in the lowest quartile had a mean HBI-CS

score of 44.25 (*SD* = 13.74), while participants who scored in the highest quartile had a mean score of 99.59 (*SD* = 7.44). In terms of BMI, a univariate ANOVA revealed no significant difference between the highest and lowest quartile groups. However, significant differences between groups did exist on other outcome variables, including the UCLA Loneliness Scale, Block Fruit/Vegetable Screener, days spent in vigorous exercise according to the IPAQ, cognitive control scale of the Three-Factor Eating Questionnaire, and all four questionnaires comprising the Health Beliefs Survey. These differences are shown in Table 6.

Additionally, because the majority of the sample reported currently trying to lose weight (contrary to expectations), the investigator conducted an exploratory analysis which examined group differences in BMI at Part I. That is, in a univariate ANOVA, the mean BMIs of those trying to lose weight and those not trying to lose weight were compared. The mean BMI for those trying to lose weight was 24.27 (*SD* = 4.09), while the mean BMI for those not trying to lose weight was 22.59 (*SD* = 3.47), $F(1, 464) = 22.72$, $p < .001$. Given this group difference, a second exploratory analysis was executed to determine whether there was a significant difference in HBI-CS score between those trying and not trying to lose weight. Indeed, a significant difference did exist, $F(1,464) = 4.50$, $p < .04$. Specifically, the mean HBI-CS score of those trying to lose weight was higher: 74.76 (*SD* = 21.44), compared to a mean of 70.50 (*SD* = 21.97) for those not trying to lose weight.

Given that individuals who were trying to lose weight reported higher social support scores, the investigator also examined whether an interaction existed between HBI-CS social support score and whether or not individuals were trying to lose weight. This exploratory analysis was conducted in an attempt to answer the following question: Does the relationship between social support and various outcome variables – including BMI, dietary fat intake,

fruit/vegetable intake, beverage intake, health behaviors of family and friends, physical activity, and restrained eating – vary according to whether one is attempting to lose weight? Results did not reveal a significant social support x attempting to lose weight interaction for any of the outcome variables of interest (listed above).

In addition, a significant gender difference in mean HBI-CS score was detected. Female participants scored significantly higher on the HBI-CS than male participants. The mean HBI-CS score among female participants was 75.41 (SD = 21.43), while the mean HBI-CS score among male participants was 67.74 (SD = 21.61), $F(1, 464) = 13.60$, $p < .001$. Therefore, further analyses were conducted to explore a possible interaction between HBI-CS score and gender for the primary Part I outcome variables. Among these variables, significant social support x gender interactions only existed for fruit/vegetable intake ($F[1, 464] = 1.47$, $p = .02$) and the friends' exercise scale of the Health Beliefs Survey ($F[1,464] = 1.42$, $p < .04$).

Also, because many participants (i.e., more than 70%) scored in the "high" or "very high" range for fat intake, the fat intake variable was divided into quartiles. The intent was to conduct an exploratory analysis to determine whether those in the lowest quartile of fat intake differed significantly from those in the highest quartile of fat intake in terms of HBI-CS score. A univariate ANOVA revealed no significant differences between fat intake quartile groups. That is, these two groups did not differ in terms of social support reported for health behaviors.

Discussion

Primary Aims

The primary goal of the present study was to evaluate whether college students who endorsed higher levels of social support for their health maintenance efforts, including weight

management, healthy eating, and physical activity, achieved healthier outcomes than those who endorsed lower levels of social support for the same behaviors. This objective was examined by determining whether significant relationships existed between social support score, according to the HBI-CS, and a variety of outcome variables: BMI, fruit/vegetable intake, dietary fat intake, weekly physical activity (vigorous, moderate, and walking), cognitive restraint for eating, sweetened beverage intake, and the healthy eating and physical activity behaviors of participants' family and friends. It was predicted that, compared to those scoring lower on the social support measure, participants who endorsed high levels of social support would have lower BMI readings, a higher fruit/vegetable intake, a lower dietary fat intake, greater weekly physical activity in all three activity domains, greater cognitive restraint while eating, and lower sweetened beverage intake. Additionally, it was anticipated that participants endorsing higher levels of social support would also report that their friends and family members engaged in health behaviors themselves – specifically, healthy eating and physical activity.

The secondary aim of the present study was to examine the psychometric properties of the newly developed measure of social support for health behaviors. This measure was termed the Health Behavior Inventory for College Students, or HBI-CS. The survey was designed to tap into participants' feelings and perceptions about the extent to which their significant others supported them in their health behavior and weight control efforts. Specifically, the test-retest reliability of the measure was examined by administering the questionnaire to a subset of participants at two different time points. At time 1, 466 students completed the questionnaire, and 107 of these students returned to the survey Web site approximately 1 week later to complete the HBI-CS for a second time. However, only 89 of these 107 participants were retained in the Part II sample.

To assess construct validity of the HBI-CS, the investigator included a measure of restrained eating: the cognitive restraint scale of the Three-Factor Eating Questionnaire. It was expected that HBI-CS scores would be significantly related to restrained eating. A significant positive relationship between these two variables was found; in other words, those who reported greater social support for health behaviors also reported higher scores on a measure of restrained eating. This relationship was found for both the 37- and 12-item versions of the HBI-CS. To examine convergent validity of the HBI-CS, the researcher administered four modules of the Health Beliefs Survey. It was expected that the Health Beliefs Survey and HBI-CS – which purport to measure the same construct (social support) – would demonstrate agreement with one another. Results indicated that the HBI-CS was significantly correlated with the four scales of the Health Beliefs Survey in a positive direction. Again, these significant relationships were found for both the 37- and 12-item versions of the HBI-CS.

When levels of correlations were examined between HBI-CS scores and Health Beliefs Survey scores at Part I and Part II, *r* values ranged from .21 to .36. Given these low to moderate correlations, it is unlikely that the HBI-CS and Health Beliefs Survey are assessing exactly the same construct. More likely, both sets of measures are assessing social support, but from different angles. That is, the HBI-CS focuses more on the respondent's perception of feeling supported by significant others in various health-related behaviors and endeavors, whereas the Health Beliefs Survey focuses more on the respondent's perception of whether friends and family members participate in such behaviors themselves.

Further, the Health Beliefs Survey is more specific than the HBI-CS in terms of delineating specific behaviors related to healthy eating or physical activity (e.g., "…cook with very little fat," "…make time to walk or do other exercise"). In contrast, some items of the HBI-

CS approach health behaviors more generally (e.g., "…have made an effort to help me with my health-related goals and plans," "…encourage me to keep going when I feel like giving up"). It is possible that these two sets of questionnaires share some overlap because both are assessing health behaviors in a social context. However, correlations may have only remained at the moderate level (at best) because the two sets of surveys assess and examine social support in different ways.

Further, the researcher included a general measure of social support – the UCLA Loneliness Scale – to ensure convergent validity between this measure and the more specific HBI-CS. As expected, there was a significant negative correlation between loneliness score and social support score for health behaviors at time 1 and time 2. Individuals who scored higher on loneliness reported less support for their health behaviors from significant others. Unexpectedly, however, from time 1 to time 2, UCLA Loneliness Scale scores did rise. The change in scores was statistically significant, with a mean score increase of about 3 points. Therefore, at time 2, individuals reported being slightly more lonely than at time 1. Finally, a principal components analysis was conducted to demonstrate construct validity. This analysis suggested that the HBI-CS was based on a three-component model of social support. Thus, the PCA shed additional light on the mechanisms by which social support for health behaviors operates in a college sample.

HBI-CS Factorability and Psychometric Properties

Evidence suggests that the HBI-CS is a reliable measure of social support. Test-retest reliability over a span of approximately 1 week was satisfactory (r = .79 for both the 37- and 12-item versions). Internal consistency levels for each of the three factors were also adequate,

ranging from .75 to .88. Somewhat disappointingly, results of the current investigation suggest that the HBI-CS did not replicate the factor structure of other social support for weight management – namely, the WMSI (Rieder & Ruderman, 2007) and Hwang et al.'s (2010) detection of three social support types provided on online message boards. However, the use of a three-factor structure, rather than a four- or five-factor structure, was warranted in the present study, given that both the four- and five-factor models produced at least one factor that contained less than three items. Further, when the number of components was reduced from five to three, and 25 items were eliminated from the original HBI-CS due to cross-loadings, the total variance explained by the extracted factors increased by more than 6%.

Instrumental social support clearly emerged as a primary factor of the HBI-CS; given that participants were rating their face-to-face relationship partners on social support received for health behaviors. Results also indicated that motivational support played a role in participants' diet, exercise, and weight management behaviors. Notably, a new type of social support – modeling – was revealed in the component analysis of the HBI-CS. This suggests that an important part of the support that participants receive for engaging in health behaviors concerns whether significant others actually engage in health behaviors themselves. For college students (and perhaps young adults generally), a crucial aspect of support may come from behaviors, rather than verbal support or feedback. Many university students tend to have busy, active lifestyles encompassing multiple demands; having an exercise or diet partner to model health behaviors during stressful times may thus be a primary method of conveying support.

Comparison of HBI-CS Versions

Based on the findings of the current study, the 12-item version of the HBI-CS appears to be equivalent to the 37-item version. Each significant relationship between HBI-CS score and a health-related outcome variable that was detected for the 37-item version – fruit/vegetable intake, vigorous exercise, cognitive restraint for eating, and the four components of the Health Beliefs Survey – was retained when the 12-item version was examined. In this way, construct and convergent validity were also demonstrated for the 12-item HBI-CS measure. Further, the 1-week test-retest reliability for both the 37- and 12-item versions was identical: $r = .79$. When internal consistency of both questionnaires was investigated, Cronbach's alpha was higher for the 37-item version (alpha = .96), but Cronbach's alpha for the 12-item version (alpha = .88) was still highly satisfactory. Overall, the current data largely do not support the inclusion of an additional 25 items as part of the HBI-CS instrument. Future research is needed to determine whether the 12-item instrument is able to capture the relevant dimensions of social support that play a critical role in weight management and health behaviors.

Tests of Hypotheses

It was hypothesized that a significant relationship would exist between social support, as assessed by the HBI-CS, and BMI. Specifically, it was expected that individuals with higher social support scores would have lower BMIs, and vice versa. This hypothesis was not supported in the current study; contrary to expectations, there was no relationship between social support score and BMI. One might consider the following explanation for the failure to detect a significant relationship between these two variables. First, the current study included participants who were trying to lose weight. In fact, as previously noted, more than 50% of the sample reported that they were currently engaged in a WL attempt. Further, as previously

reported, the number of pounds that participants had lost as part of their current attempt ranged from 0 to 54. Thus, the possibility exists that individuals who had lost some weight within the recent past (i.e., before the study began), but still have not reached their goal weight (i.e., their BMI is still in the overweight or obese range), nonetheless reported high levels of social support for health behaviors. Despite a high BMI, it may be argued that these participants currently feel support from significant others in their efforts to lose weight. In fact, it may be partly because of a high level of social support that such individuals have been able to lose weight in the first place.

To investigate the above explanation further, a univariate ANOVA comparing the BMIs of those trying to lose weight (n = 238) versus those not trying to lose weight (n = 228) was conducted. There was indeed a significant difference. As one would predict, those participants who were trying to lose weight had a significantly higher mean BMI than participants who were not trying to lose weight. Interestingly, however, the group who reported trying to lose weight also had significantly higher mean HBI-CS scores that those who reported they were not trying to lose weight. Although this difference was not specifically hypothesized, it suggests that social support may be an important component of the WL process.

In addition, it is possible that individuals who are attempting to lose weight are more focused on social support, and hence endorse higher levels, than individuals who are not engaged in weight control. It is also conceivable that individuals who are currently focused on losing weight deliberately solicit social support from significant others. For example, a college student who has several pounds to lose might ask a friend or roommate to go with her to exercise at a campus fitness facility, or to go for a run outside together. In this way, she is seeking the tangible support of a significant other to engage in a particular health behavior with her.

Individuals who are not trying to lose weight, in contrast, may not have the same motivation to exercise (or engage in other health behaviors) with other people, and hence do not solicit social support to the same degree.

The hypothesis concerning the relationship between social support score and BMI was made with the assumption that most Virginia Tech students included in the sample would not be trying to lose weight. This assumption was based on the claim that Virginia Tech students are less likely to be overweight than the young adult population at large (B. Davy, personal communication, July 2010). Rather, it was expected that BMIs would be lower in participants with greater social support, in part because the support these individuals receive enables them to keep their weight at a healthy level. Because this underlying assumption was incorrect (in fact, the majority of the sample was trying to lose weight), it may have affected the relationship between social support and BMI.

Therefore, instead of BMI, the more critical variable in terms of determining social support's influence on health behavior might be intention or desire to lose weight. That is, the number on the scale may not matter as much as the effort or attempts made to manage one's weight. If an individual has an intention to lose weight, and makes the effort to do so, he or she may utilize social support to a greater extent, or find social support to be more important. On the other hand, those who may be engaging in healthy lifestyle behaviors, but do not have the intention to lose weight per se, likely find social support less important. When this explanation is considered, it is not surprising that no relationship was detected between social support for health behaviors and BMI.

Secondly, it was predicted that individuals who reported higher social support scores would eat and drink more healthfully than those with lower social support scores. Specifically,

the researcher expected a positive correlation between social support and fruit/vegetable intake, and a negative correlation between social support and fat intake. It was also predicted that negative correlations would exist between social support and sweetened beverage intake. This hypothesis was partially supported; results did detect a significant positive association between social support and fruit/vegetable intake. However, this relationship was only significant when the traditional alpha level of .05 was used; after a Bonferroni correction was applied, the relationship dropped to nonsignificant. Hence, it is possible that individuals who report more social support tend to eat more fruit and vegetable servings, as compared to individuals with lower social support scores.

However, social support score was unrelated to another index of healthy eating: fat intake. In addition to a correlational analysis, HBI-CS scores were grouped into quartiles, and a univariate ANOVA was conducted to determine whether the highest HBI-CS quartile group had significantly different fat intake scores than the lowest HBI-CS quartile group. This ANOVA failed to detect a significant difference between social support quartile groups. Two separate ANOVAs were conducted for both beverage intake variables; results failed to detect significant differences between the highest and lowest HBI-CS quartile groups for sweetened beverage intake. Taken together, these results suggest that, to the extent that participants' significant others play a role in their dietary habits, supportive others may find it easier to encourage healthy eating (i.e., fruit/vegetable consumption) than to discourage unhealthy eating (i.e., dietary fat consumption, sweetened beverage consumption).

As discussed earlier, most participants had relatively high fat intake scores. Therefore, the possibility exists that no correlation was found between social support and fat intake because fat intake scores were so high at the outset. It is possible that a positive relationship between

these two variables may have been found in a sample with lower average fat consumption. To test this assumption in an exploratory fashion using the current sample, the researcher divided participants into quartiles based on fat intake score. The investigator then conducted a univariate ANOVA comparing the highest and lowest fat intake quartile groups on their HBI-CS scores.

These two groups did not differ significantly from one another in terms of social support; in fact, there were no significant differences between any of the four quartile groups. However, it is worth noting that the cut-off score corresponding with the lowest quartile was 13. While not in the "high" range per se, a score of 13 is still considered to be excessive (i.e., beyond the fat intake experts recommend), according to the Block questionnaire. In a college student sample, eating foods high in dietary fat, or drinking highly caloric beverages (e.g., alcohol), may be so habitual, or even inevitable to a certain extent (particularly for students with campus dining plans), that social support does not play a role in dietary fat intake or beverage intake.

Like the dietary data, the physical activity data provided only partial support for the original hypothesis. In particular, a positive correlation between social support and physical activity scores was expected. As noted previously, the researcher could not use total IPAQ score as an outcome variable due to concerns about the accuracy of some participants' responses. However, the investigator was able to use three separate physical activity outcome variables: days per week spent in vigorous exercise, days per week spent in moderate exercise, and days per week spent walking. One would predict that all three of these outcome variables would relate positively to social support. In actuality, however, only vigorous physical activity was positively correlated with social support (both before and after the Bonferroni adjustment was applied); the correlations between social support and moderate activity, as well as social support and walking, failed to reach significance.

It is suspected that the reason social support was only significantly correlated with vigorous physical activity has to do with the way that most college students define "exercise" or "physical activity." The examples of vigorous physical activity provided by the IPAQ – heavy lifting, digging, aerobics, and fast bicycling – are what many young people consider to be "exercise." In other words, when students visit their campus fitness center, the activities they typically engage in – whether cardiovascular exercise or resistance training – would be classified as "vigorous," according to the IPAQ. On the other hand, activities that the IPAQ defines as moderately intense, such as carrying light loads, biking at a regular pace, and doubles tennis, might be activities that college students do not engage in as frequently, or do not consider "exercise." It may be argued that the students in the current sample knew they were completing a questionnaire on physical activity, and this prompted them to consider either their own regular exercise activities, or the exercise activities of others in their age group. These common physical activities (e.g., running, weight-lifting, cycling, using an elliptical machine) tend to be on the vigorous end of the intensity spectrum.

Further, it is possible that walking was unrelated to social support because the mean number of days spent walking was so high to begin with in this particular sample. That is, most Virginia Tech students spend a considerable amount of time walking; this may simply be an inevitable part of attending college on a sprawling, spacious campus. Nonetheless, current results indicate that students who report higher levels of social support are also likely to spend more days during the week engaged in vigorous exercise. Not only did analyses show a positive correlation between social support and vigorous exercise, but it was also discovered that, when HBI-CS scores were grouped into quartiles, there was a significant difference between the highest- and lowest-scoring groups in terms of vigorous physical activity frequency.

This positive relationship between social support and exercise corresponds with previous findings in college students, particularly Strong et al.'s (2008) investigation of the health behaviors of Virginia Tech students. In particular, Strong et al. found that students who reported more support from friends were more physically active, as compared to students who reported less support. Interestingly, however, the Virginia Tech students in the current sample seemed to be more physically active than the Virginia Tech students in Strong et al.'s sample. That is, the majority of students in Strong et al.'s study did not meet recommended government guidelines for physical activity, and exercised less in college than they did in high school. Although these findings seem to mirror the typical physical activity patterns among college students overall (see Hellmich, 2008), most of the Virginia Tech students in the present sample met or exceeded these guidelines, according to their own self-report (at least in terms of exercise intensity).

Because the health behaviors of family and friends were predicted to be highly influential in terms of participants' own eating and exercise behaviors, the investigator administered four components of the Health Beliefs Survey. Specifically, scales assessing support for dietary and physical activity in family and friends were given. Support was measured by asking participants whether their significant others engaged in relevant health behaviors (e.g., cooking with very little fat, making time to walk or engage in other exercise). Results indicated that positive correlations did exist between scores on the Health Beliefs Survey (both for family and friends) and participants' own fruit/vegetable intake. However, after the Bonferroni adjustment was applied, only the relationship between the friends eating scale and fruit/vegetable intake remained significant. At the same time, negative relationships between scores on the Health Beliefs Survey (both for family and friends) and participants' own dietary fat intake were found. These significant correlations were retained even when the Bonferroni corrections were used.

These findings suggest that, to some extent, students may pattern their own healthy eating behaviors after the behaviors and attitudes they detect in family members and friends. Future investigations should explore this finding in greater detail, as it corroborates the significance of having positive role models to follow as one attempts to manage weight and health.

Likewise, it was predicted that a significant relationship would exist between the physical activity behaviors of family and friends, according to the Health Beliefs Survey, and participants' actual physical activity behaviors, according to the IPAQ. For vigorous exercise, significant associations were found for both the family and friends scales initially, but after the Bonferroni correction was applied, only the friends scale retained a significant relationship with vigorous exercise. For moderate activity, a significant relationship was detected for the physical activity of friends, but not the physical activity of family; this relationship was still found after the Bonferroni adjustment was employed. Lastly, for walking, results revealed the opposite pattern; days spent walking was related to the physical activity behaviors of family, but not friends. After the Bonferroni correction, however, this relationship dropped to nonsignificant. Again, one might suspect that significant relationships between family and friends' physical activity behaviors and participants' own vigorous physical activity were found because these young adult participants tend to consider vigorous activities "exercise" to a greater extent than moderate-intensity activities or walking.

Finally, a hierarchical regression analysis indicated that the HBI-CS did not add a significant amount of predictive value in estimating the major outcome variables, above and beyond the predictive value offered by the Health Beliefs Survey subscales. This finding could be expected, given that the HBI-CS and the four components of the Health Beliefs Survey were significantly correlated at a moderate level (see hypothesis 4). Still, given that .35 is the highest

correlation between the HBI-CS and any of the four components of the Health Beliefs Survey at Part I, it is unlikely that the HBI-CS and Health Beliefs Survey are assessing the same construct, as noted earlier. One might conclude that, in the prediction of weight- and health-related outcomes, perceived social support for general health behaviors may be less important than actual behaviors of significant others.

Health Behavior Frequencies

Contrary to expectations, slightly more than half of the total sample of 466 individuals reported that they were currently trying to lose weight. This particular finding was unanticipated, given the previously noted assertion that Virginia Tech undergraduates are generally less likely to be overweight than other young adult groups (B. Davy, personal communication, July 2010). That is, 238 (51.1%) endorsed that they were attempting to lose weight, even though only 121 participants (25.9%) actually met criteria for overweight or obesity, based on self-reported height and weight. In other words, many individuals in the current sample were trying to lose weight, even though their BMI was in the normal range or below.

The reason for this desire to lose weight that more than 50% of the sample possessed was not explored. However, it is conceivable that college students might be particularly susceptible to cultural biases regarding beauty, thinness, and a gender-specific ideal body type. Research has shown that female college students in particular engage in a great deal of social comparison with regard to the appearance of their peers, which may lead to the desire to lose weight and unhealthy methods of weight control (Lindner, Hughes, & Fahy, 2008). Taken together, these

factors – although not assessed in the current study – may account for these participants' reported desire to lose weight (whether or not they were actually overweight).

Even if some participants were not attempting to lose weight currently, survey findings indicated that the majority of the sample (70%, or 326 participants) had tried to lose weight previously. More than 80% of participants who had tried to lose weight at least once in their lives had made relatively few attempts (i.e., between one and five). This number of previous attempts is unsurprising, given the average age of participants in the sample; an older sample would likely have reported a greater number of prior WL attempts.

Moreover, those participants who were currently attempting to lose weight had lost a wide range: between 0 and 54 pounds. However, most participants (more than 60%) had lost only 5 pounds or less as part of their current attempt. "Weight loss attempt" was loosely defined; participants were simply asked to estimate the number of times in which they had deliberately changed their behavior or lifestyle in an attempt to lose weight. Nonetheless, "weight loss attempt" is a subjective term. Therefore, not all participants may have defined "weight loss attempt" in the same manner, potentially affecting the accuracy and trustworthiness of the results.

An analysis of gender differences revealed that a significantly greater percentage of female participants (n = 300) than male participants (n = 166) reported that they were currently trying to lose weight and had attempted to lose weight previously. In terms of current WL intentions, 187 female participants (62.3% of the female sample), as compared to 51 male participants (30.7% of the male sample) reported that they were currently trying to lose weight; this represented a statistically significant difference. The gender differences among those who had previously tried to lose weight were equally striking. Specifically, 236 female participants

(78.7%) reported they had tried to lose weight at least once, while only 90 male participants (54.2%) endorsed at least one prior WL attempt.

Even though gender differences were not explicitly hypothesized, these exploratory analyses reveal clear discrepancies between male and female participants that may have influenced survey results, given that more females than males participated in the study. Additionally, females scored significantly higher than males on the HBI-CS overall, and significant interactions were found between HBI-CS score and gender for fruit/vegetable intake, as well as the exercise behaviors of friends (according to the Health Beliefs Survey). These findings provide evidence that females may be more attentive to socially supportive factors in their environments, as compared to males.

Results also indicate that the vast majority of the sample placed a high priority on health behaviors. Even if some participants were not attempting to lose weight per se, nearly the entire sample reported that healthy eating and maintaining regular exercise were an "important" or "very important" part of their lifestyle. Specifically, 402 participants (86.3%) reported that eating a healthy diet was, at the very least, "important" to them, while even more participants – nearly 90% of the sample, or 417 students – reported that regular physical activity was "important" or "very important." To the extent that these ratings of importance translate into actual healthy eating or physical activity behavior, one could conclude that the current sample is quite dedicated to maintaining a healthy lifestyle.

Interestingly, a low percentage of participants in the sample reported that they had participated in either a structured weight management program or self-help methods for weight control. This finding is fairly surprising, given the number of participants in the current sample who endorsed a desire to lose weight, as well as the number of participants who indicated they

had tried to lose weight previously. This finding is also somewhat troubling, as it suggests that many of those students who did endorse an intention to lose weight may be attempting to do so using questionable (i.e., potentially unhealthy) methods.

Students who did endorse a desire to lose weight were not questioned further regarding the methods they had employed to achieve this goal. Only those students who reported they had used self-help methods in an attempt to lose weight were given the opportunity to elaborate on methods they had used (and not all participants chose to elaborate). Further, because "self-help" was not explicitly defined, some participants may have elected not to describe particular WL methods they had used, simply because they did not consider these methods "self-help."

At the same time, however, one must consider the relatively young age of most study participants (i.e., a mean age of roughly 20 years). Had an older sample been recruited, the investigation results would have arguably found a greater percentage of participants who had reported: 1) previous WL attempts, and 2) previous attempts to manage weight using structured programs (e.g., Weight Watchers) or self-directed approaches. Nonetheless, the finding that few participants had used structured WL programs or self-help approaches to lose weight, despite that more than half the sample reported they were currently attempting to lose weight, suggests a need to develop weight management programs specifically tailored for college students. Such programs may teach this vulnerable population about healthy and unhealthy weight control strategies. Still, further research must explore the methods college students use to manage their weight in greater detail.

Assessment Scores

In this sample of college students, dietary fat intake, according to the Block questionnaire, was fairly high. The mean Block dietary fat score was 19.42, which lies in the "high" range. Moreover, 332 of the 466 participants scored in either the "high" or "very high" range for fat intake (i.e., a score of 15 or higher), based on the frequency of particular foods eaten during the past year.

Further, although 108 participants scored in the "normal" range of fat intake, according to Block and colleagues (2000), a person scoring in the "normal" range of fat intake is still consuming too much dietary fat. The questionnaire provides the following feedback to those scoring in the "normal" range: "Your fat intake is [about the same as] most Americans, probably between 30 and 35% of calories. Experts recommend that it be less than 30%." Therefore, a total of 440 participants (94.4%) in the current sample are arguably consuming too much dietary fat, according to Block et al.'s guidelines. Still, when only the "high" and "very high" ranges are considered, 71.2% of the sample still falls under these categories. The relatively high fat intake is not surprising, given the typical college student diet. The Block Dietary Fat Screener contains numerous foods that are staples of the college student diet, including fast food and other convenience items (e.g., hamburgers, French fries, chips, pizza).

Fruit and vegetable intake scores were somewhat better than dietary fat scores. The mean score of 11.24, although not in the lowest intake range, is still within the "not enough" range. The following feedback is provided for those who score between 11 and 12: "Your diet is like most Americans – low in fruits and vegetables! You're eating fewer than 4 servings [per day], but experts recommend 5 or more." Even a score between 13 and 15 is considered to be "not enough" fruit and vegetable servings (i.e., still less than five servings per day). Therefore, in

total, 396 participants (85%) scored in the lowest three ranges of fruit/vegetable intake, and are consuming less than the recommended amount of servings on a daily basis.

Again, this low intake of fruits and vegetables is not surprising for college students. Many students – particularly those who live on campus – eat in dining halls and other on-campus eateries, and may not shop regularly in grocery stores, where access to fresh produce is significantly greater. Nonetheless, the average fruit/vegetable intake scores in the current sample is considerably greater than those found in Gow et al.'s (2010) sample of college students. In Gow and colleagues' research, students barely consumed any fruits and vegetables; baseline (i.e., pretreatment) fruit/vegetable intake scores across treatment groups ranged from 1.32 to 1.87, and did not change significantly as a result of the weight management intervention.

In terms of physical activity, students in the current sample obtained much better scores, as compared to their dietary scores. Of 466 total participants, only 53 reported they did not engage in any vigorous physical activity, such as running, fast bicycling, and other aerobic activities, during the past week. Further, 209 participants (44.8% of the entire sample) reported engaging in vigorous physical activity more days than not during the week (i.e., at least 4 days). When one examines moderate-intensity exercise, only 56 individuals reported 0 days of activity. However, the mean number of days during the past week that participants engaged in moderate-intensity exercise was somewhat lower than the respective mean for vigorous exercise: 3.08 days per week, compared with 3.22 days per week.

Nonetheless, at the aggregate level, these physical activity results are impressive, given that the American Heart Association currently recommends at least 150 minutes of moderately intense physical activity per week, or 75 minutes of vigorous exercise per week (American Heart Association, 2011). Clearly, a large percentage of the current sample is engaging in regular

exercise that is above and beyond recommended amounts in terms of intensity. Participants did enter the number of minutes per week spent exercising, but as previously noted, these data are unreliable and could not be assessed, given that some participants entered an unrealistic number of exercise hours per week.

In terms of walking, the mean score – 6.01 days per week – is to be expected, given the large, spread-out nature of the Virginia Tech campus. Furthermore, 299 of the 466 participants (64.2%) reported walking at least 10 minutes per bout on all 7 days of the week. Particularly during weekdays, the vast majority of Virginia Tech students will be walking 10 minutes or more as they travel to class and other obligations. Even during weekends, it is conceivable that students are walking in bouts of at least 10 minutes, as they make their way around campus (e.g., to dining halls, the library, and fitness facilities). In summary, the physical activity data obtained from the current sample – in terms of vigorous- and moderate-intensity exercise, as well as walking – suggests that participants are generally quite active and incorporate regular exercise into their daily lifestyle.

Limitations

The present investigation is based completely on self-report data that was collected in a Web-based context. As such, several limitations must be noted. First, participants reported their own height and weight, rather than reporting to the laboratory for these measurements. The self-report and Web-based nature of the data did enable us to collect responses from as many students as possible. If students needed to report to the laboratory to complete measures, it is unlikely that 466 would have participated; further, the feasibility of obtaining and collecting laboratory measures from 466 students is questionable. However, students may not have possessed

completely accurate knowledge of their height and weight, and the self-report of weight in particular is subject to social desirability effects. Social desirability effects and other forms of self-report bias may be magnified in an online context, as participants can complete each self-report measure in the privacy of their own homes. Therefore, it cannot be guaranteed that the calculation of BMI represents participants' true values for height and weight.

In addition to height and weight, all other measures were collected in the same manner, and were thus vulnerable to bias. This is particularly true of the IPAQ. As previously noted, some participants entered nonsensical values when asked to list the number of minutes they had engaged in vigorous or moderate activity, as well as walking. This may have been due to errors in mathematical calculations or social desirability concerns. However, it is unlikely that completing the IPAQ in the laboratory in the presence of an experimenter, instead of online, would have completely eliminated participants' tendency to make computational errors.

The IPAQ was used in the current study because it is brief, assesses different forms of exercise, has been validated using cross-cultural samples, and has been used previously with college students (Gow et al., 2010). Still, because of the computational issues cited above, future studies may wish to use a different index of physical activity. Such a measure may be self-report in nature, but future research would likely be enhanced by including a measure of physical activity that is based on actual exercise behavior, rather than participants' self-report of their exercise behavior.

Future studies may wish to corroborate participants' self-report data with informant measures. For example, both the participants, as well as their significant others (e.g., friends, family members) could complete the measures. Future investigations may also adapt the social support for health behavior measure so that both parties – participants and informants – can

complete the questionnaire. Such a strategy might shed additional light on social support perceptions and how these may differ between face-to-face relationship partners. Further, informant data (e.g., on measures of physical activity or healthy eating behaviors of the target individual) would help to ensure the accuracy of self-report data.

Lastly, one potential problem that arises with online research concerns the amount of time it takes participants to complete the battery of questionnaires. In the current study, the investigator had access to this information, as Survey Monkey provides completion times for each survey entry. Participants were eliminated if they completed the entire Part I study in less than 10 minutes. Presumably, if a participant completed the study in an extremely (perhaps unrealistically) short amount of time, the possibility exists that his or her responses may have been random, or he or she may not have seriously considered the survey items while completing the questionnaires. In any case, responses may not be accurate in such instances.

However, this 10-minute time frame was chosen somewhat arbitrarily (i.e., if a participant took 11 minutes to complete the study, he or she was retained in the sample). On the other side of the coin, some participants took more than 1 hour to complete the battery of questionnaires, but were still retained in the sample. Taking an excessively long time to complete the battery of questionnaires may indicate that the participant was distracted (i.e., engaged in another activity, such as doing homework or watching television) while completing the measures. Hence, even though the participant took a long time to finish the surveys, there is the possibility of inaccuracies in his or her responses.

Unfortunately, no "magic number" exists in terms of how long it should realistically take a typical college student to complete the battery of questionnaires. In the future, investigators who conduct online research might consider building a timer into the survey construction, which

would prevent individuals from progressing through the questionnaires too quickly. Alternatively, future investigators may wish to run a pilot test before the actual study begins, in which a separate sample of individuals would be invited into the laboratory to complete the measures. This way, the investigators would have an idea of the amount of time that survey completion is "supposed" to take. Still, it might be argued that, even if participants were to complete surveys in the laboratory (rather than online), it is simply not possible for the researcher to completely prevent excessively rapid questionnaire completion.

Conclusion

The results and implications of the present investigation provide insight into the study of weight management and health behaviors, particularly as they relate to social support. First, the study demonstrates that social support is related to various aspects of weight management and a healthy lifestyle, including the consumption of healthy foods (i.e., fruits and vegetables) and participation in regular exercise at a vigorous intensity. Moreover, social support relates positively to cognitive restraint while eating, suggesting that social support plays an important role in monitoring one's food intake and making sensible dietary choices. Although social support was unrelated to BMI, it was related to the desire and intention to lose weight. Individuals who were currently trying to lose weight indicated, to a greater extent than those not trying to lose weight, that social support was an important part of their weight management and health maintenance efforts. Specifically, individuals trying to lose weight obtained greater social support scores than those who were not trying to lose weight.

Overall, evidence from the current study suggests that social support affects *process* variables related to weight management, including indicators of healthy eating (i.e.,

fruit/vegetable intake, cognitive restraint while eating), vigorous physical activity, and health behaviors of significant others. Because the current research team did not have access to how much weight participants had lost before beginning the study (rather, participants were only questioned about current body weight), the process variables mentioned previously may be better criteria than BMI for judging the impact of social support on weight management.

The present study demonstrates that instrumental support, motivational support, and modeling desired behaviors are important aspects of weight control and health. Notably, unlike instrumental and motivational support, modeling was not explored in previous studies on social support and weight management (e.g., Rieder & Ruderman, 2007; Hwang et al., 2010). Nonetheless, young people may respond in a particularly powerful way to positive role models, including friends and family. This finding illustrates that the inclusion of significant others in weight management programs for young adults is critical, although careful attention must be paid to the selection of significant others and their respective health habits.

Findings from the current study may be used to develop new or build upon existing weight management programs for young adults, as well as programs which emphasize health behaviors on a more global level. Intervention programs should assess social support currently available in participants' lives, as well as the types of social support that presently exist or could be obtained (e.g., instrumental, motivational, modeling). Next, programs should concentrate on types of social support that individuals may lack as they begin a weight management program, and should instruct participants on ways to build support and garner supportive contacts in these areas. To target college students in particular, such health behavior interventions might be built into university curricula as a general education requirement. Alternatively, students with an interest in losing weight or improving their lifestyle habits may elect to enroll in these

interventions at their university. Such programs should target measurable health outcomes (e.g., the achievement of fitness milestones or adherence to a well-balanced dietary plan) and continually monitor perceived social support throughout the process.

However, individuals do not need to be engaged in a formal WL program to benefit from the findings of the present research. Individuals with a desire to maintain a regular exercise program or make healthier dietary choices to enhance overall wellness might derive benefits as well. The development and maintenance of supportive relationships with others who share one's health goals is critical; without these supportive contacts, individuals may ultimately be less successful in their health-related endeavors.

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Table 1. HBI-CS Communalities: Principal Components Analysis

Communalities		
	Initial	Extraction
HBI-CS Q1	1.000	.669
HBI-CS Q2	1.000	.678
HBI-CS Q3	1.000	.540
HBI-CS Q4	1.000	.669
HBI-CS Q5	1.000	.618
HBI-CS Q6	1.000	.538
HBI-CS Q7	1.000	.679
HBI-CS Q8	1.000	.702
HBI-CS Q9	1.000	.602
HBI-CS Q10	1.000	.674
HBI-CS Q11	1.000	.646
HBI-CS Q12	1.000	.697
HBI-CS Q13	1.000	.641
HBI-CS Q14	1.000	.661
HBI-CS Q15	1.000	.646
HBI-CS Q16	1.000	.613
HBI-CS Q17	1.000	.610
HBI-CS Q18	1.000	.586
HBI-CS Q19	1.000	.539
HBI-CS Q20	1.000	.551
HBI-CS Q21	1.000	.445
HBI-CS Q22	1.000	.696
HBI-CS Q23	1.000	.545
HBI-CS Q24	1.000	.543
HBI-CS Q25	1.000	.678
HBI-CS Q26	1.000	.532
HBI-CS Q27	1.000	.702
HBI-CS Q28	1.000	.599
HBI-CS Q29	1.000	.503
HBI-CS Q30	1.000	.439
HBI-CS Q31	1.000	.574
HBI-CS Q32	1.000	.649
HBI-CS Q33	1.000	.714
HBI-CS Q34	1.000	.529
HBI-CS Q35	1.000	.635
HBI-CS Q36	1.000	.687
HBI-CS Q37	1.000	.617

Table 2. HBI-CS Eigenvalues

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.239	43.889	43.889	16.239	43.889	43.889
2	2.368	6.401	50.289	2.368	6.401	50.289
3	1.684	4.551	54.840	1.684	4.551	54.840
4	1.308	3.534	58.374	1.308	3.534	58.374
5	1.049	2.834	61.209	1.049	2.834	61.209
6	.928	2.507	63.716			
7	.899	2.429	66.144			
8	.851	2.300	68.445			
9	.767	2.073	70.518			
10	.693	1.874	72.392			
11	.661	1.787	74.179			
12	.615	1.663	75.842			
13	.581	1.571	77.414			
14	.555	1.499	78.913			
15	.529	1.431	80.344			
16	.514	1.388	81.732			
17	.473	1.279	83.011			
18	.467	1.262	84.274			
19	.450	1.217	85.491			
20	.411	1.111	86.602			
21	.408	1.103	87.705			
22	.383	1.035	88.740			
23	.374	1.012	89.751			
24	.361	.975	90.726			
25	.343	.927	91.653			
26	.328	.887	92.540			
27	.315	.851	93.391			
28	.300	.811	94.202			
29	.291	.787	94.990			
30	.274	.742	95.731			
31	.269	.727	96.459			
32	.257	.694	97.153			
33	.232	.627	97.781			
34	.226	.610	98.391			
35	.216	.583	98.973			
36	.191	.517	99.491			
37	.188	.509	100.000			

Table 3. HBI-CS Component Loadings: 3-Component Model

Rotated Component Matrix

	Component		
	1	2	3
HBI-CS Q7	.816		
HBI-CS Q12	.808		
HBI-CS Q8	.797		
HBI-CS Q4	.782		
HBI-CS Q9	.671		.375
HBI-CS Q2		.802	
HBI-CS Q5		.791	
HBI-CS Q3		.751	
HBI-CS Q1		.726	
HBI-CS Q33			.887
HBI-CS Q10			.835
HBI-CS Q34		.342	.533

Table 4. Comparison of 37-item and 12-item HBI-CS: Convergent Validity Data

Assessment Instrument	37-item HBI-CS		12-item HBI-CS	
	r	*P*	*r*	*p*
Health Beliefs Survey - Family Eating	.25	< .001	.25	< .001
Health Beliefs Survey - Friends Eating	.30	< .001	.30	< .001
Health Beliefs Survey - Family Exercise	.21	< .001	.21	< .001
Health Beliefs Survey - Friends Exercise	.35	< .001	.33	< .001
UCLA Loneliness Scale	-.36	< .001	-.38	< .001

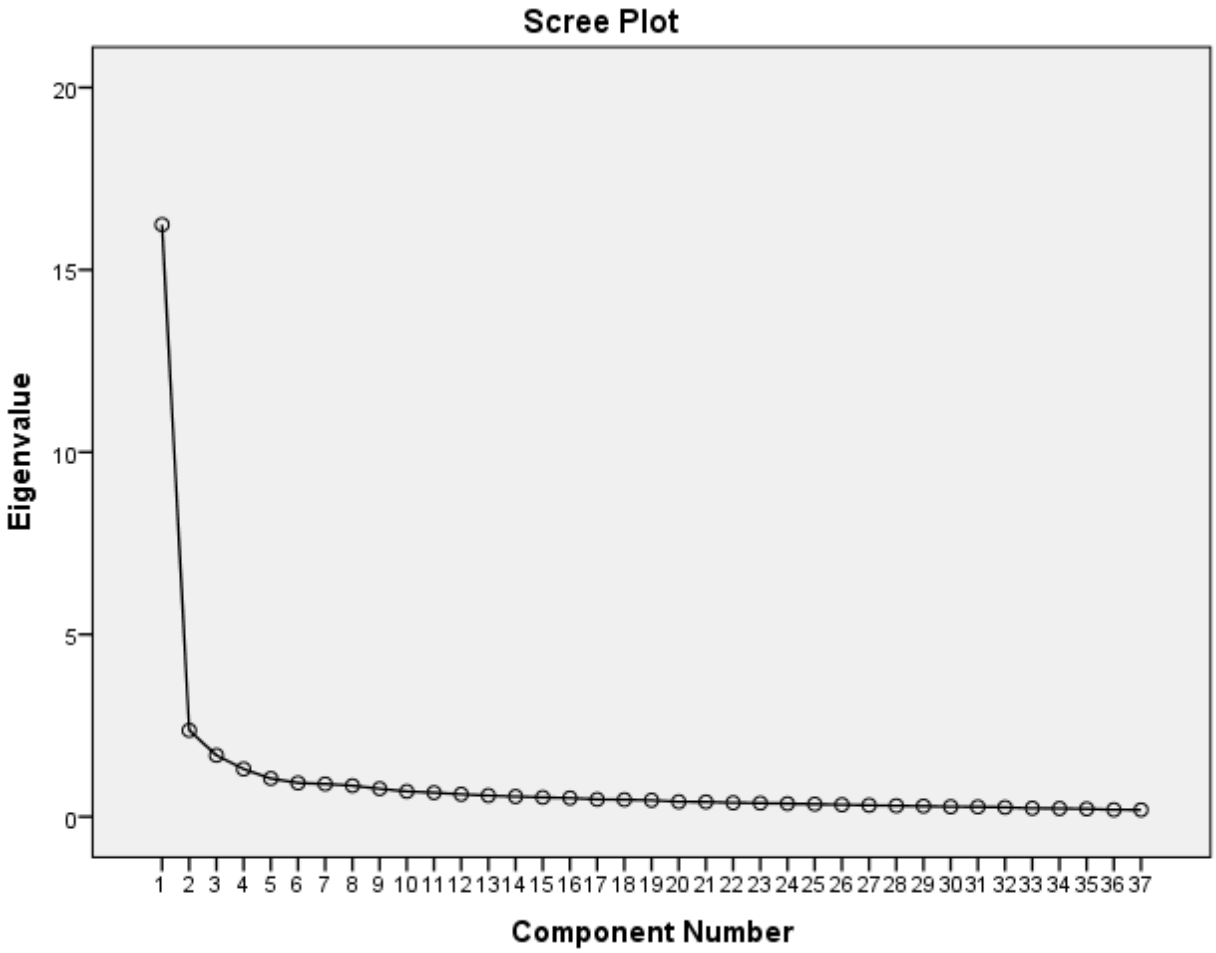
Table 5. Mean Assessment Scores – Part I and Part II

Dependent Measure	Part I Mean (SD) $n = 466$	Part II Mean (SD) $n = 89$
UCLA Loneliness Scale	35.38 (8.58)	37.70 (7.04)
Block Dietary Fat Screener	19.42 (7.81)	18.33 (6.67)
Block Fruit/Vegetable Screener	11.24 (4.45)	10.70 (4.40)
IPAQ – days spent in vigorous exercise	3.22 (1.88)	3.08 (1.96)
IPAQ – days spent in moderate exercise	3.07 (1.99)	3.01 (1.85)
IPAQ – days spent walking	5.99 (1.68)	5.98 (1.52)
HBI-CS	72.68 (21.79)	70.08 (21.88)
Health Beliefs Survey – family eating scale	34.24 (9.21)	36.07 (8.84)
Health Beliefs Survey – friends eating scale	33.38 (9.23)	33.97 (9.04)
Health Beliefs Survey – family exercise scale	27.95 (8.01)	28.08 (8.39)
Health Beliefs Survey – friends exercise scale	29.22 (6.99)	29.90 (6.70)
Three-Factor Eating Questionnaire – cognitive control scale	11.03 (5.18)	11.60 (5.29)
BEV-Q – average daily fl oz from sweetened beverages	15.47 (18.66)	10.17 (10.11)

Table 6. Mean Assessment Scores by HBI-CS Quartile Group

Dependent Measure	Lowest HBI-CS Quartile Mean (SD)	Highest HBI-CS Quartile Mean (SD)	*F*	*p*
UCLA Loneliness Scale	39.05 (9.21)	30.85 (6.37)	63.18	< .001
Block Fruit/Vegetable Screener	10.64 (4.45)	12.16 (4.94)	6.14	< .02
IPAQ – days spent in vigorous exercise	2.92 (1.93)	3.56 (1.96)	6.29	< .02
Health Beliefs Survey – family eating scale	30.91 (9.01)	37.13 (9.03)	27.87	< .001
Health Beliefs Survey – friends eating scale	29.42 (8.67)	36.66 (9.05)	39.23	< .001
Health Beliefs Survey – family exercise scale	26.31 (8.27)	30.51 (8.11)	15.47	< .001
Health Beliefs Survey – friends exercise scale	26.07 (7.11)	32.66 (6.30)	56.64	< .001
Three-Factor Eating Questionnaire – cognitive control scale	9.67 (5.34)	12.34 (4.69)	16.61	< .001

Figure 1. Scree Plot Based on the Initial Five-component Model of the HBI-CS



Appendices

Appendix A

Full-Scale HBI-CS

0	1	2	3
Not at all	Rarely	Sometimes	Frequently

Directions: Think about your day-to-day interactions with friends, family members, and other significant face-to-face relationship partners in your life – specifically with regard to your efforts to lose weight and/or maintain a healthy lifestyle. Thinking about the past 7 days, please use the following scale to indicate how much you agree with the statements below.

0 = not at all
1 = rarely
2 = sometimes
3 = frequently

Within the past 7 days, in my interactions with friends, family, and other significant people in my life, with regard to my weight management and health-related behaviors, I have found that…

1. ____ They are reliable and dependable; I know I can count on them to keep me accountable for my health-related behaviors.
2. ____ They encourage me to keep going when I feel like giving up.
3. ____ They compliment or recognize my accomplishments, no matter how small.
4. ____ They provide me with helpful information on weight management (e.g., caloric content of foods, healthy recipes).
5. ____ They participate in "friendly competition" or challenges with me.
6. ____ They are available when I need them.
7. ____ They give me encouragement to stick with a healthy eating plan.
8. ____ They have made an effort to help me with my health-related goals and plans.
9. ____ They have discussed the benefits of physical activity with me.
10. ____ They have offered to exercise with me.
11. ____ They give me helpful reminders to exercise.
12. ____ They have discussed the benefits of healthy eating with me.
13. ____ They understand why a healthy lifestyle is important to me.
14. ____ They can relate to my reasons for wanting to be healthy.
15. ____ They give me encouragement to stick with my exercise plan.
16. ____ They are happy for me when I achieve a personal goal.
17. ____ They are more helpful to my weight management/health maintenance efforts than other people in my life.
18. ____ They set a good example for me as I work toward my goals.
19. ____ They keep me accountable for the choices I make.

20. ____ They check on me periodically to see how I am doing.
21. ____ They share their own health-related goals with me.
22. ____ They offer useful tips on managing my weight and/or health.
23. ____ They have made me aware of some maladaptive habits or behavior patterns related to my weight or health habits.
24. ____ They compliment me for making healthy choices.
25. ____ They provide helpful tips on how to get back on track if I have a setback.
26. ____ They express concern for my health and well-being.
27. ____ They provide me with useful feedback on my weight management or health-related behaviors.
28. ____ They encourage me to take "baby steps" by setting short-term, manageable goals.
29. ____ Take my questions, needs, or requests seriously.
30. ____ Help me to distract myself when I am tempted to eat out of boredom.
31. ____ They encourage me to be physically active even when I don't feel like it.
32. ____ They have provided useful tips/suggestions for me to increase my physical activity.
33. ____ They exercise with me on a consistent basis.
34. ____ They "practice what they preach" by maintaining healthy habits themselves.
35. ____ They provide me with useful ways or ideas to resist unhealthy temptations.
36. ____ They make me feel like we're in this together with regard to weight management and health-related goals.
37. ____ They make me feel like I have someone to turn to in my quest to be healthy.

Appendix B

HBI-CS: Twelve-Item Instrument and Corresponding Components

Factor 1: Instrumental Support

7. They give me encouragement to stick with a healthy eating plan.

12. They have discussed the benefits of healthy eating with me.

8. They have made an effort to help me with my health-related goals and plans.

4. They provide me with helpful information on weight management (e.g., caloric content of foods, healthy recipes).

9. They have discussed the benefits of physical activity with me.

Factor 2: Motivational Support & Accountability

2. They encourage me to keep going when I feel like giving up.

5. They participate in "friendly competition" or challenges with me.

3. They compliment or recognize my accomplishments, no matter how small.

1. They are reliable and dependable; I know I can count on them to keep me accountable for my health-related behaviors.

Factor 3: Modeling Healthy Behaviors

33. They exercise with me on a consistent basis.

10. They have offered to exercise with me.

34. They "practice what they preach" by maintaining healthy habits themselves.

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MEMORANDUM

DATE: January 18, 2012

TO: George A. Clum, Kristen Frey

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires May 31, 2014)

PROTOCOL TITLE: Development and Validation of a Social Support Inventory for Health Behaviors in College Students

IRB NUMBER: 11-037

Effective February 15, 2012, the Virginia Tech IRB Chair, Dr. David M. Moore, approved the continuation request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at http://www.irb.vt.edu/pages/responsibilities.htm (please review before the commencement of your research).

PROTOCOL INFORMATION:
Approved as: **Expedited, under 45 CFR 46.110 category(ies) 7**
Protocol Approval Date: **2/15/2012 (protocol's initial approval date: 2/15/2011)**
Protocol Expiration Date: **2/14/2013**
Continuing Review Due Date*: **1/31/2013**
*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:
Per federally regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Date*	OSP Number	Sponsor	Grant Comparison Conducted?

*Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office (irbadmin@vt.edu) immediately.

cc: File