NEEDS ASSESSMENT FOR WEIGHT CONTROL NUTRITION EDUCATION FOR FEMALE STUDENTS

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BY

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To the Dean of the Graduate School:

I am submitting herewith a thesis written by Rachel Tristán Riano entitled "Needs Assessment for Weight Control Nutrition Education for Female Students." I have examined this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science with a major in Nutrition.

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ABSTRACT

RACHEL TRISTÁN RIANO

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Overweight and obesity are known to create serious health risks for women. This study tested the efficacy of a nutrition intervention for college females, and identified perceived barriers to weight control and preferences for weight control education. Forty-nine subjects began the study in the fall; 37 subjects completed the study through the spring term (17 experimental, 20 control). The mean age was 25. Experimental subjects were weighed and counseled by a nutritionist monthly. Baseline and final weight, height, body fat, 24-hour food recall, and 1-week physical activity recall were collected for all subjects. Final data included surveys on barriers and preferences. A greater change in energy intake, percent energy intake from fat, body mass index, body fat, and energy expenditure for control versus experimental groups was hypothesized. No statistically significant differences were found. Lack of time and irregular schedules were cited barriers to eating well and exercising. Newsletters, e-mail, and individual counseling were preferred weight control education methods.

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CHAPTER I

INTRODUCTION

Obesity Trends

Obesity in the United States today is reaching epidemic proportions. The percentage of obese men and women increased slowly from 1960 to 1980, and then rose dramatically from 1980 to 1990. During the 1980's, the percentage of obese men nearly doubled and rose by more than 50% for women (Bray, 2003). In recent years, the annual prevalence of obesity among U.S. adults aged 20 and over has increased over time from 19.4% in 1997 to 20.6% in 1998, 21.5% in 1999, 21.8% in 2000, 23.0% in 2001, and 23.9% in 2002 (National Center for Health Statistics [NCHS], 2003).

When the prevalence of obesity and overweight are combined, statistics look even gloomier. According to preliminary results of the current National Health and Nutrition Examination Survey, an estimated 64% of the adult population is either overweight or obese (NCHS, 2002, October 24). In addition, the 1997 National Health Interview Survey revealed that about 40% of U.S. adults never engage in physical activities in their leisure time (NCHS, 2002, June). If current trends continue, it stands to reason that individuals who are overweight are at high risk for becoming obese.

Women and Obesity

The percentages of women who are obese are slightly higher for black and Hispanic women then their male counterparts. The percentage of black women who are

obese is 38.7% compared to 28.9% of black men. The percentage of Hispanic women who are obese is 25.7% compared to 22.2% of Hispanic men. White women are the exception: 21.1% are obese, versus 23.1% of white men (NCHS, 2003). Women are also more likely than men to be sedentary during their leisure time: 43.2% compared to 36.5% (NCHS, 2002, June).

The implications of this growing obesity trend are dismal. Numerous studies have demonstrated the increased risk of chronic diseases that occurs with excess weight in women. Obese women have increased incidences of dyslipidemia, hypertension, and type 2 diabetes, all of which are major contributors to mortality in women (Legato, 1997). They are also at higher risk for gallbladder disease, respiratory disease, gout, sleep apnea, osteoarthritis, and several forms of cancer. In addition, obesity is associated with poor pregnancy outcome, miscarriage, infertility, and polycystic ovarian syndrome (Pettigrew & Hamilton-Fairley, 1997).

The conditions which influence a woman's health, including her ability to control her weight, are unique. In general, women have a tendency to take care of others before they take care of themselves. The importance women give to personal relationships and to their multiple social roles is a key health determinant which makes gender an important consideration (American Dietetic Association and Dietitians of Canada, 1999). Women may also have limited access to education, resources, and money to purchase healthy foods.

Suitable interventions targeting young adult women for obesity prevention are crucial. A review article on diet, activity, and other health-related behaviors in college-

age women by Hendricks and Herbold concluded that the eating behaviors and weight practices of young women are predisposing them to chronic disease conditions later in life (1998).

Need for Nutrition Education Programs

The American Dietetic Association (1996) has affirmed the importance of nutrition education and nutrition intervention for the public to achieve and maintain optimal nutritional health. Defined as "any set of learning experiences designed to facilitate the voluntary adoption of eating and other nutrition-related behaviors conducive to health and well-being" (p. 1183), nutrition education is at the core of preventative and treatment measures for obesity in young women. Nutrition intervention defined by the ADA as "planned change to empower individuals, groups, and populations to make healthful food choices" (p. 1183), is an equally integral part of the process. One researcher who investigated physiological and psychosocial factors that influence weight gain among women concluded that nutrition education in different forms would likely have the potential to assist women in a positive way. (Elvick, 1994).

College: A Good Time to Target Women

The college years may be one of the best times to target women for weight management nutrition education because they have "not yet internalized weight problems and may not yet suffer from self-blame and low self-esteem" (Radbill & Ross, 1995, p. 492). In light of the current epidemic of obesity in the United States and the very real dangers it presents to women, the urgency to intervene through weight control programs for young women is becoming imperative.

College appears to be one of the critical periods of time in which a nutrition intervention for effective weight control for women would be very useful. Graduate students and upper level undergraduates may be even more appropriate targets for weight management interventions because they are often approaching major life changes such as marriages, full-time jobs, and pregnancies. All of these factors have been documented to be associated with weight gain (Elvick, 1994).

Purpose of the Study

Because of the known health risks that overweight and obesity present to women, further studies for suitable interventions would be most fitting. The aim of this study was to conduct a needs assessment for weight control nutrition education for female students. The study sought to specifically determine the "need, content, and mode of delivery" for weight control nutrition education for women 20 – 39 years old (Wright, 1998, p. 2).

The study also tested whether women in their first year in a graduate or upper level undergraduate program receiving a nutrition intervention would be able to control their weight better over the course of the academic year, versus those women receiving no intervention, who would theoretically experience increases in energy intake, percent energy intake from fat, and a decrease in energy expenditure resulting in increases in body weight and percent body fat.

The objectives of the study were as follows:

- to compare changes in total energy intake, percent of energy intake from fat, body mass index, percent body fat, and energy expenditure for female

students who are in monthly contact with a nutrition counselor and weighed monthly versus students with no contact during their first year (9 months) at Texas Woman's University, Houston Center.

- to assess the students' viewpoints of barriers to weight control.
- to determine appropriate and effective methods to deliver weight control education to this population.

Hypotheses

The hypotheses were that, over the interval of the study, there would be a greater change of:

- total energy intake,
- percent of energy intake from fat,
- body mass index,
- percent body fat, and
- energy expenditure

in the women in the control group receiving no intervention compared to the women in the experimental group who are weighed and have contact with a nutrition counselor monthly.

CHAPTER II

LITERATURE REVIEW

Definition of Obesity

Obesity is defined as the excess accumulation of body fat. A body mass index (weight in kilograms divided by height in meters squared) of 30.0 or above is used to classify obesity among adults age 20 years and over. A body mass index (BMI) between 25.0 and 29.9 is the determination for overweight for adults (NCHS, 2002, October 24). Important measurements in the evaluation of obesity are height and weight for the determination of BMI, waist circumference, and body composition (Bray, 2003). Waist circumferences of greater than 35 for women and greater than 40 for men are indicative of high visceral fat and central fatness which is associated with increased health risks (Bray, 2003).

Between the ages of 20 and 55 there is a two-fold increase in the prevalence of obesity. Among women, obesity is twice as common in those of lower socioeconomic status (Beers & Berkow, 1999). It is a complex disease with etiological determinants including genetic, environmental, and regulatory (Beers & Berkow, 1999).

A Problem Reaching Epidemic Proportions

The incidence of obesity in the United States has risen steadily in the past few decades and is continuing to rise. The percentage of obese men and women increased slowly from 1960 to 1980, and then experienced a striking rise from 1980 to 1990.

During the 1980's, the percentage of obese men nearly doubled and rose by more than 50% for women (Bray, 2003). According to data from the 1999-2000 National Health and Nutrition Examination Survey, nearly one third of all adults are classified as obese, and more adult women are affected than men (NCHS, 2002, October 8). The findings showed that 33% of adult women are obese compared with 28% of adult men.

In 1996, the U.S. Department of Health and Human Services issued its annual report on health with a special profile of women's health. It stated that almost a third of adult women lead a sedentary life and that the proportion of overweight women has risen from 1 in 4 to 1 in 3 over the past decade (NCHS, 1996).

In a comprehensive review article on diet, activity, and other health-related behaviors in college-age women, upward trends predisposing women to obesity were found (Hendricks & Herbold, 1998). The Third National Health and Nutrition Examination Survey (NHANES III) which was conducted from 1988-1994 found that 22% of adolescent women ages 12-19 years were at the 85th percentile or greater for weight compared with 15% for the same age group from 1976-1980 reported by NHANES II. Caloric intakes have also been on the rise. According to NHANES III data, women ages 20-29 years consumed 1957 calories/day compared to 1675 calories/day documented by NHANES II. NHANES III data also showed that consumption of total fat and saturated fat were higher than the recommended amounts at 34% of calories and 11.9% of calories, respectively, for 20-29 year-old women. They were also found to have low fiber, fruit, vegetable, and dairy consumption.

Increased Risk of Co-morbid Conditions

Excessive body weight and inappropriate nutrition is known to increase the risks of coronary heart disease, cancer, and diabetes mellitus. Among other preventative measures, nutritional goals should be to decrease dietary fat, enhance the nutrient density of the diet including an increase in fruits and vegetables, and develop an awareness of caloric intake (Bidlack, 1996). Obesity and overweight are factors in four of the ten leading causes of death in the United States every year.

Poor nutrition and sedentary lifestyle attribute to 300,000 premature deaths annually in the U.S. The high prevalence of these diseases is evidenced by their high price tag. In 2000, the estimated cost of obesity in the U.S. was $117 billion, most of which resulted from type 2 diabetes, coronary heart disease, and hypertension (National Center for Chronic Disease Prevention and Health Promotion, 2003).

Disease risks have been documented to be minimized for people who maintain their weight, rather than gain weight. A study conducted by the University of Nevada, School of Medicine studied "weight gainers" and "weight maintainers" (St. Jeor et al., 1995). Researchers followed 385 adults over five annual visits. True maintainers were those subjects who maintained their weight at +/-5 pounds of their baseline weight. Results were that 19% of the subjects were true maintainers, and of this group there were three times as many normal weight individuals than obese individuals. The maintainers had slightly healthier levels of risk variables in regards to total cholesterol, HDL and LDL cholesterol, and blood pressure. True maintainers also had lower BMI, percent body fat, and waist-hip ratios than non-maintainers (St. Jeor et al., 1995). A later report

by the same group of researchers stated that maintainers not only had fewer and smaller magnitudes in weight fluctuations, but also showed fewer harmful changes in health risk factors than gainers (St. Jeor et al., 1997).

Detrimental Consequences of Weight Gain With Age

Women who gain weight over their lifetime have an increased risk of developing obesity-related conditions. Analysis of the data from the Nurse's Health Study demonstrated that even modest increases in weight with age could be detrimental to the health of women (Willett et al., 1995). The study began in 1976 with 115,818 women aged 30 to 55 years who responded to a mailed questionnaire and who had no previous history of coronary heart disease or cancer. They were followed for 14 years at 2-year intervals. Researchers found that women who gained weight from 18 years of age had a strongly increased risk of developing coronary heart disease over the next 14 years when adjusted for other risk factors and BMI at age 18. Risks increased progressively with both increasing BMI and increasing amount of weight gained. However, even women who gained smaller amounts of weight and were only classified as mildly overweight and not obese, BMI 25-27, were at increased risk. The results were definitive: "higher levels of body weight, as well as modest weight gains after 18 years of age appear to increase the risks of coronary heart disease in middle-age women" (Willett et al., 1995, p. 461).

Another analysis of the same data by a group of many of the same researchers investigated the relationship between body weight and mortality among women (Manson et al., 1995). They found a J-shaped relationship between BMI and mortality from all

causes. Women who gained 10 kg or more since 18 years of age had increased mortality in middle adulthood. Incidence of hypertension, diabetes, and elevated serum cholesterol were 2 to 6 times higher in women who were overweight. The rates of death from cardiovascular disease among obese women (defined by the researchers as a BMI ≥ 29) were four times greater than the leanest women. Rates of death from cancer were two times greater for obese women than leaner women. Mortality was lowest among the leanest women when smoking was controlled for.

Another study investigated the association between weight change patterns in early adulthood and chronic disease prevalence later in life (French, Jeffery, Folsom, McGovern, & Williamson, 1996). Researchers from the University of Minnesota, School of Public Health analyzed the Iowa Women's Health Study initial 1986 data in which mailed questionnaires were submitted by 41,837 women aged 55-69 years. The average current BMI was 27.5, however only 5.5% had been overweight at age 18 years. The average weight gain between 18-30 years was 13.4 pounds, and the average weight gain from 30 to 50 years was 15.9 pounds. Disease prevalence was found to be lower in weight stable women and those who had lost weight and maintained it than in those who lost and regained weight, gained and maintained weight, or continuously gained weight (French et al., 1996). The prevalence of diabetes and hypertension were lowest in weight loss maintainers and highest in continuous weight gainers. Cardiovascular disease and heart attack prevalence were lowest in weight stable women and highest in weight gainers and weight loss regainers. The prevalence of cancer was highest among weight loss regainers who were a normal weight at 18 years. The overriding conclusion

was that weight stability or weight loss that is maintained is the most desirable weight pattern for the prevention of chronic diseases (French et al., 1996).

These findings emphasize the great danger posed to a woman's health when she gains even modest amounts of weight over the course of her adult life. Also, it is clear that obesity in women is not the only hazard. Being overweight can have gravely serious consequences as well.

Women, Weight, and Life Changes

In light of the overwhelming evidence that obesity plays a major role in the morbidity and mortality of women, one might ask, "What makes women so susceptible to weight gain? When are they most vulnerable to adding pounds? When is the most appropriate time to target women with an intervention?"

What factors are associated with weight changes in adult women? That is precisely the question that Parham of Northern Illinois University set out to answer. She studied 87 women with a mean age of 46 years to identify factors associated with body weight and with year to year changes in body weight (1988). Significant positive correlations were found with BMI and the following variables: (a) systolic and diastolic blood pressure; (b) age; (c) number of children aged 1-6 years; (d) number of chronic illnesses; (e) "satisfaction with health practices" including the recommendations of the dietary guidelines; (f) "satisfaction with food intake" including cutting down on sweets, eating fewer calories, and eating less fat; (g) "eating anxiety" including binge-eating behaviors, night eating, and loss of control when eating; (h) husband pressure; (i) husband involvement; and (j) "gatekeeper index" including percentage of meal planning,

shopping, and preparation each subject reported. Significant negative correlations were found with BMI and (a) "importance of slenderness," and (b) "outlook" including hopes and expectations and life expectancy (Parham, 1988). She also found a low positive correlation between net weight change and BMI. Seventy-nine percent of the weight changers were overweight or obese.

A study with a similar goal was conducted by Elvick. She looked at physiological and psychosocial factors that influence weight gain among women between 25 and 40 years of age (1994). By means of a five-subject focus group and an extensive review of the literature, Elvick cited variables which cause weight gain. An increased consumption of fat and calories and eating regardless of hunger were two such factors. A decrease in physical activity caused by lack of time, interfering family responsibilities, fatigue after a long day at work, unsafe workout areas, cost of gym membership, long distance from facilities, and general lack of motivation was a major factor in weight gain. Pregnancy, increasing age, and psychological stress and/or abuse were other factors. Another factor dealing with time constraints was the consumption of fast foods for convenience. Weight cycling and crash dieting were also found to contribute to weight gain. Elvick concluded that nutrition education in different forms would likely have the potential to assist women in a positive way to prevent weight gain.

Pregnancy is a major determinant of obesity in some women. While most women weigh a little bit more a year after delivery, 15% of women weigh 20 pounds more at one year postpartum for each pregnancy (Beers & Berkow, 1999).

Nurses Harrison, Neufeld, and Kushner examined women going through life transitions, and barriers to social support that these women encountered (1995). They followed six first time mothers, five women who returned to work after staying at home for a mean of 10.9 years, and six women who were retiring from work. They defined support during a life transition as having someone to listen to them as the women problem-solved. They identified the following barriers to support: belief that they would be burdening others, perceived inability to repay others with support, reluctance to ask for support, and non-supportive actions and comments that accompanied offers of support. The life changes required from 2 to 4 years for adjustment for many of the women. The researchers also cited the danger in delaying requests for support until a crisis occurred. This reluctance placed stresses on the women and jeopardized their health. It may be inferred that the vulnerability that occurs when women lack social support during major life transitions can be a precipitating factor in weight gain and subsequent overweight and obesity. Women in their college years are going through a number of life transitions that can make them vulnerable to weight gain.

Current Strategies for Weight Control

The American Dietetic Association states in its 2002 position paper on weight management that "successful weight management to improve overall health for adults requires a lifelong commitment to healthful lifestyle behaviors emphasizing sustainable and enjoyable eating practices and daily physical activity" (p. 1145). Goals for weight management can include: (a) improvement in eating and exercise behaviors, (b) prevention of further weight gain, (c) improvements in physical and emotional health,

(d) small maintainable weight losses, (e) and extensive weight losses. Health practitioners are urged to remind patients of the benefits of a modest 10% weight loss with regard to improved health parameters, and to set both short and long-term goals. The ADA describes how interventions can be externally controlled, internally controlled, or somewhere in-between. The internally controlled approach to weight management is based on the assumption that patients will act upon internal cues of hunger and satiety. However, lengthy interventions are needed to teach patients to perceive signals of hunger and satiety and to learn to trust the signals as a guide to food intake. Externally controlled diets are best for patients who require increased structure and are not able to control their food intake to the extent of weight loss. These range from severe calorie restriction to low-calorie diets. The ADA also addresses adjunct treatment approaches including surgery and pharmacotherapy.

The Institute of Medicine shares a view very similar to that of the American Dietetic Association. They have stated that obesity treatment should have as its goal not weight loss specifically, but weight management and attainment of the most appropriate weight for an individual that is consistent with overall health (1995). The Institute has developed a model called the "Weighing the Options Method" in which people can evaluate different weight loss programs in terms of their appropriateness, safety, and success. It is based on three criteria: (a) "match between program and consumer" including personal and situational factors, state of health, and information and guidance; (b) "treatment options" including do-it-yourself programs, non-clinical programs, and clinical programs; and (c) "outcomes" including long-term weight loss, improved

comorbid conditions, and adverse side effects. Ultimately, the individual will reevaluate the program after proceeding through all three steps.

More recently the Institute of Medicine (2003) has looked at weight management for military personnel, noting that one of the negative consequences of the current overweight and obesity epidemic is a smaller pool of qualified applicants for the armed forces. The Committee on Military Nutrition Research reviewed the scientific evidence, and their recommendations included the following: (a) training should be provided on diet and health including portion control, calorie content of foods, energy balance and activity; (b) education programs on healthy weight should also be established for spouses and families of military personnel; (c) dining facilities should include "heart healthy" fare; (d) BMI and body fat analysis should be done quarterly rather than annually; (e) effective weight management programs should include a reduced calorie diet, aerobic exercise, strength training, counseling, behavior modification, and a structured follow-up program that includes regular contact with weight management counselors; (f) evaluation of programs and following personnel for a minimum of 2 to 5 years; (g) pharmacological therapies should be considered; and (h) exploring the use of internet-based programs for maintaining contact with personnel regardless of their duty stations.

There are a number of strategies which individuals who are overweight can utilize for weight loss success. These include biophysical, cognitive-behavioral, and social-contextual strategies (Keller, Oveland, & Hudson, 1997). The biophysical

strategies include caloric restriction which is the most commonly used strategy for weight loss and maintenance, appetite and metabolic rate regulation, and exercise. Cognitive-behavioral strategies involve "the systematic examination of factors preceding and following the target behavior (eating)" (p. 40)." Self-monitoring and stimulus control are integral parts of this strategy. Finally social-contextual strategies focus on social support. This includes verbal reinforcement, using new behavioral approaches to eating along with the participant, assistance in monitoring weight loss activities, prompting appropriate eating behavior, and refraining from negative criticism. These socially supportive strategies are beneficial to individuals when they come from both family members and weight loss therapists (Keller et al., 1997).

Physical activity is an important component of weight management. A sedentary lifestyle reduces energy expenditure and promotes weight gain (Bray, 2003). Furthermore, people who have no regular physical activity are at higher risk of early death than those with modest levels of exercise (Bray, 2003). Conversely, an increase in physical activity is a widely accepted method for both body weight maintenance and the reduction of body weight. A number of epidemiologic studies have found an inverse relationship between physical activity and body weight (DiPietro, 1995). Self-reported higher levels of activity are associated with lower body weight and more healthful distributions of body fat. The research clearly shows that persons who want to lose weight or prevent weight gain should incorporate exercise into their lifestyles (DiPietro, 1995).

Previous Weight Control Interventions for Women

The Women's Healthy Lifestyle Project Clinical Trial sought to prevent weight gain and a rise in LDL cholesterol levels in premenopausal women, thereby reducing their cardiovascular disease risk (Kuller, Simkin-Silverman, Wing, Meilahn, & Ives, 2001). The intervention consisted of a 5-year cognitive-behavioral program in which 260 women restricted their daily fat intake to 25% of calories as total fat and 7% as saturated fat, achieved a modest weight loss of 5 to 15 pounds depending on baseline weight, consumed a 1300 kcal diet to achieve weight loss, and increased physical activity to expend 1000 to 1500 kcal weekly. The control group consisted of 275 participants. Ninety-two percent of all participants were white, and the baseline BMI for both groups was 25 (SD = 3), therefore, the women were not excessively overweight to begin with. The results at 54 months were promising. Weight had decreased 0.2 lb in the intervention group and increased 5.2 lb in the control group ($P = 0.000$). LDL cholesterol increased by only 3.5-mg/dL in the intervention group compared to 8.9-mg/dL for the control group ($P = 0.009$). Although the rise in LDL cholesterol was not completely eliminated in the intervention group, weight gain with age was successfully prevented.

Pre-menopausal women were also the subjects of an educational intervention which aimed to reduce cardiovascular disease risks (Miller, Reber, & Chapman-Novakofski, 2001). A 2-year educational intervention conducted by nutrition researchers at the University of Illinois was administered to 174 women. There were 103 control subjects. The intervention consisted of 6 months of lectures, 6 months of

personal contacts, and 4 additional follow-up sessions in the second year. Topics mostly targeted decreasing dietary fat. All instructors had at least a master's degree in nutrition, and some were Registered Dietitians. While no significant changes were found in BMI, percent body fat, and waist-to-hip ratio, the treatment group was significant for change in percent of calories from fat (33% at baseline versus 29% at 24 months, $P < .01$). The results demonstrated that nutrition education can successfully change dietary behavior.

A South African study investigated the effects of exercise versus dietary education for weight loss in obese women. Bertram, Venter, and Stewart (1990) placed 45 women on a 5000 kJ diet and divided them into three groups: (a) exercise for three one-hour sessions a week, (b) attend a one-hour lecture session once a week, and (c) a control group. The program lasted 16 weeks. Body mass and percent body fat were equally reduced in the two intervention groups. They concluded that interpersonal contact and behavioral modification in the form of regular exercise or lecture sessions was important in maintaining compliance with diet and ultimately weight loss. Weekly lectures on nutrition-related topics were found to be as effective for weight loss and body fat loss as tri-weekly exercise sessions (Bertram et al., 1990). This study illustrates the importance of continued contact with nutrition experts for weight control education to facilitate women with weight loss.

Another study which focused on minority women documented promising results with the implementation of a combined nutrition education and physical activity intervention. The "Women's Health Trial: Feasibility Study in Minority Populations" analyzed body weight and waist and hip circumferences of 351 women in a control

group and 575 women in an intervention group at baseline, six months, and twelve months. The women in the intervention group were instructed by a nutritionist in classes of eight to fifteen participants. They met once per week for six weeks, biweekly the following six weeks, and monthly for the remaining nine months. Findings indicated that physical exercise was negatively associated with body weight and waist and hip circumference, while an index of unhealthy eating habits was positively associated (Bhargava & Guthrie, 2002).

The Pound of Prevention Study was a low-intensity intervention trial examining whether weight gain with age could be prevented (Jeffery & French, 1997). A total of 1,226 subjects (18.6% men, 48.5% high-income women, and 33% low-income women) were divided into three groups including a control, an intervention, and an intervention plus a lottery incentive for participation. The intervention consisted of monthly newsletters and semiannual classes on nutrition and exercise. After one year, subjects in the intervention conditions reported a significantly increased frequency of weight monitoring compared to control groups (Jeffery & French, 1997). Although weight changes failed to reach statistical significance, likely due to the short time period, hypothesized trends were noted in high-income women and men. That is, there was less weight gain among intervention participants versus controls. These initial results are promising for the prevention of obesity through a low-intensity intervention.

A literature review which examined the results and effectiveness of 32 diet and physical activity interventions delivered in health care settings on cardiovascular disease

risk factors in women found that effects were relatively modest but statistically significant for physical activity, BMI, dietary fat, blood pressure, and serum cholesterol (Wilcox, Parra-Medina, Thompson-Robinson, & Will, 2001). The authors noted that the effects were observed even though most interventions were low-intensity involving brief counseling periods with a health care provider and the distribution of educational materials. Greater effects were seen in interventions with less than 6 months of follow-up, especially with regards to physical activity, which the authors attributed to the high drop-out rate which often occurs with lengthier interventions. They suggested that interventions should address behavior maintenance in order to improve adherence to physical activity over time. Effects were also larger for samples with a mean age over 50, which was attributed to the fact that CVD risk factors increase with age, and therefore, there is more room for improvement in older subjects.

Another important finding from the review was that "combined" interventions (targeting cholesterol, dietary, fat, and physical activity) were not diluted, but were found to be as effective as the "single-behavior" interventions. Also, the authors noted that the vast majority of the studies reviewed included only a small percentage of persons of color or none at all, and that more studies were clearly needed on low-income, ethnically diverse persons. It was also noted that physical activity and dietary assessments were subject to considerable measurement error, as many of the measures used were single-item or very brief inventories due to lack of time in health-care settings to implement lengthy assessments (Wilcox et al., 2001).

Weight Behaviors and Eating Patterns of College-Age Women

College women from New York and California were the subjects of a study that looked at factors that influenced their food consumption behavior and nutritional adequacy (Koszewski & Kuo, 1996). Of 141 subjects, 54% reported dissatisfaction with their weight. Food restriction was found to have begun at the mean age of 15.2+/-2 years among these women. Another important finding was that a full 40% of the respondents reported having lost and regained at least ten pounds in the last two years. Researchers found an association between dissatisfaction with weight and yo-yo dieting. As meal frequency and nutritional adequacy of the diet decreased, satisfaction with weight also decreased. Among the most cited reasons for nutritional inadequacy were: lack of transportation to buy food, insufficient time for food preparation, insufficient time available to eat, and inability to get food at a good price.

Insufficient time for food preparation and financial constraints could cause college women to frequent fast food restaurants. Young adult women, aged 20-45, who consumed three or more meals per week at fast food restaurants have been found to have higher energy and fat intakes and greater body weights (French, Harnack, & Jeffery, 2000).

Housing location may be another contributing factor in the diet and activity patterns of college women. One study showed that college women who lived on campus had lower physical activity levels, higher protein and fat intakes, and higher serum cholesterol and triglycerides than students living off campus (Brevard & Ricketts, 1996).

Food consumption patterns of college women were observed at a private New England University. The study of 59 college-age women found that some skipped meals to control their weight. Among this group of women termed "concerned eaters" by the researchers, women who consumed 192 fewer calories than other groups were more likely to be on a diet, were more likely to see themselves as overweight, and yet on average they weighed 98% of their ideal body weight (Bailey & Goldberg, 1989). Other groups, including "regular eaters," were presumed to have controlled their weight through portion sizes and other means, as their weights also fell within normal limits. Another study found that up to 90% of college women have demonstrated binge-eating symptoms (Streigel-Moore, Silberstein, Frensch, & Rodin, 1989).

Weight reduction methods of college women were documented by Arrington, Bonner, and Stitt (1985). In a survey of 400 college women at a southern university, 48% reported following a weight reduction program since admission to college. Hypocaloric diets ranging from 300-1800 calories/day were reported as a means for weight loss by 47% of subjects who followed a weight reduction program. Physical activity was cited by 19% of women. Other methods in order of popularity were: protein-sparing modified fast, weight loss drugs, weight loss clinics, diuretics, laxatives, low carbohydrate diets, and purgative uses. Although energy reduction and physical activity methods of weight reduction had the slowest rates of weight loss, these methods were preferred by the women because of their absence of harmful side effects and low cost.

Previous Weight Control Interventions for College Women

Researchers at Iowa State University proposed an intervention in hopes of defeating the legendary "freshman 15" in college women (Matvienko, Lewis, & Schafer, 2001). The legend refers to the high tendency of students to gain fifteen pounds in their first year in college, presumably due to stresses from the life transition of high school to college. The intervention was simple: 21 women enrolled in a basic nutrition course during their first semester of college and 19 women in the control group did not. Measurements of weight and macronutrient consumption were taken at baseline, four months later, and sixteen months later. Results were promising. Students with a higher BMI (>24) in the intervention group reported lower fat, protein, and carbohydrate intakes compared with the higher BMI students in the control group. In addition, higher BMI intervention students maintained their body weight for one year, whereas, higher BMI control students gained 9.2 +/- 6.8 kg. The findings from a similar study in which college women also took an introductory nutrition course reported that dietary patterns were found to improve significantly (Skinner, 1991).

In a weight control program conducted by graduate students in nutrition at the University of Kentucky, diet and behavior therapy were the main components utilized (Sloan, Tobias, Stapell, Ho, & Beagle, 1976). A twelve-week program was developed and conducted by university graduate students. Fifteen women began the program and nine completed it (60%). Among the students completing the program average weight loss was 2/3 of a pound per week, and one third of the women reached their weight loss goal. Weekly group and individual sessions were held, and subjects kept food diaries,

practiced stimulus control techniques, weighed themselves daily, and set rewards for each pound lost (Sloan et al., 1976).

A weight control program for students conducted by nutrition seniors was implemented at the University of Maine at Orono (Musgrave & Thornbury, 1976). The program consisted of selection of a 1,200 calorie diet from the regular menu served in school foodservice facilities and weekly nutrition education lessons. The lessons covered topics such as food composition and food substitutions, hidden fats, carbohydrate exchanges, lack of permanence of fad diets, meal planning and budgeting, and exercise. The popularity and success of the program were attributed to the fact that student teachers could relate to the routines and food preferences of the subjects. It was also observed that of the two student teachers, the one who had personally experienced a struggle with weight loss was a more effective mentor than the one who had always been thin and had not experienced self-denial of food.

CHAPTER III

METHOD

Participants

The subjects were obtained from the Texas Woman's University – Houston Center. Subjects included 49 women in their twenties and thirties who were first-year graduate students and/or upper level undergraduates working on degrees in health-related fields. All were full-time students. The subjects were obtained as a sample of convenience. Announcements requesting subjects to participate in a nutrition study were made in student classes, and signs were posted on bulletin boards throughout the school.

Procedure

The research protocol was approved by the Texas Woman's University Institutional Review Board prior to initiating the study (see Appendix A).

The study had multiple dependent variables including changes in: total energy intake, percent of energy intake from fat, body mass index, percent body fat, and energy expenditure. The latter variable was determined based on body weight and hours spent at various activity levels with metabolic equivalents assigned for activities ranging from sleep to very vigorous activity (see Appendix B).

Subjects were randomly assigned to a control (25 subjects) or experimental (24 subjects) group. Both groups were seen in August 1998 and completed 24-hour food recalls (see Appendix C), weekly physical activity recalls (see Appendix D),

demographics information, and consent forms. The dietary recall form was developed by the principal investigator and previous student assistants. The physical activity recall form was obtained from The Lifestyle Counselor's Guide for Weight Control (Wolfe & Blair, 1996). Also in August 1998, each participant was weighed, her height was measured, and her percent body fat was determined by bioelectrical impedance. All of this information made up the baseline data.

The experimental group was then seen for monthly weigh-ins from September 1998 through March 1999. Open-ended questions were also asked about dietary and activity patterns. Nutritional advice and counseling was given as needed by one of two nutrition counselors, the principal investigator and her assistant (see Appendix E). The principal investigator had a doctoral degree in nutrition and was a Registered Dietitian. The assistant had a bachelor's degree in nutritional sciences and was completing a dietetic internship and master's degree in nutrition during the time of the study.

In April 1999, both the experimental and control subjects returned for final data collection, which consisted of the same questionnaires and measurements as the baseline data. In addition, questionnaires about perceived barriers to weight control (see Appendix F) and preferences for delivery of weight control nutrition education (see Appendix G) were administered. The questionnaires were also developed by the principal investigator in previous years.

Food Processor was the software package which was used to analyze the diet recalls. All data was entered into and analyzed by Statistical Package for Social Sciences (SPSS).

The research project was conducted by Doris Wright, Ph.D., R.D. The student researcher served as a Research Assistant and participated in baseline and final data collection, data entry, data analysis, and monthly weighing and counseling sessions. The student researcher also analyzed and summarized the final data and outcomes.

Statistical Analysis

Each hypothesis was tested using a 2 by 2 split plot ANOVA design with two factors group (experimental/control), which was a between-subjects factor, and time (pre/post), which was a within-subjects factor. The specific hypothesis of differential change was tested using interaction contrasts ($p<.05$).

Descriptive statistics were used to report demographics, perceived barriers to weight control, and preferences for delivery of weight control education.

CHAPTER IV

RESULTS

Subjects

A total of 49 women (24 assigned to the experimental group and 25 to the control group) were recruited and completed the baseline data. Of these women, 37 (17 experimental and 20 control) completed the study through final data collection. All of the figures for statistical analysis, including the demographics, were obtained using only the data from the 37 subjects who completed the study.

Age

Among the subjects who completed the study, the mean age of women in the control group at baseline was 26.3 years (S.D. = 4.97), with a range from 21 to 38. The mean age of women in the experimental group at baseline was 24.2 years (S.D. = 1.86), with a range from 20 to 31. The mean age of both groups combined was 25.3 years (S.D. = 3.50).

Ethnicity

Seventy percent of all subjects were Caucasian, 13.5% were Hispanic, 10.8% were Asian, and 5.4% identified themselves as "other ethnicity." The experimental group included 13 Caucasian women, 2 Asian, 1 Hispanic, and 1 other. The control group included 13 Caucasian women, 4 Hispanic, 2 Asian, and 1 other.

Table 1

Demographics

Category	All Subjects (37)	Experimental Group (17 Subjects)	Control Group (20 Subjects)
Mean Age (years)	25.30	24.18	26.25
Ethnicity (%)			
Caucasian	70.3	76.5	65.0
Hispanic	13.5	5.9	20.0
Asian	10.8	11.8	10.0
Other	5.4	5.9	5.0
Black	0.0	0.0	0.0
Marital Status (%)			
Single	89.0	100.0	20.0
Married	11.0	0.0	80.0
Number of Dependents (%)			
0 Dependents	89.2	0.0	80.0
1 Dependents	2.7	0.0	5.0
2 Dependents	2.7	0.0	5.0
3 Dependents	0.0	0.0	0.0
4 Dependents	5.4	0.0	10.0
Enrollment Status (%)			
Full-time	100.0	100.0	100.0
Part-time	0.0	0.0	0.0
Degree Status (%)			
Graduate	92.0	100.0	85.0
Undergraduate	8.0	0.0	15.0
Employment Status (%)			
Unemployed	48.6	47.1	50.0
Full-time	2.7	5.9	0.0
Part-time	48.6	47.1	50.0
Residence (%)			
Off-Campus	67.6	35.3	30.0
On-Campus	32.4	64.7	70.0

Marital and Dependent Status

Eighty-nine percent of the subjects were single during the course of the study. Only four women were married, and all four were in the control group. Also, 89% of the subjects had zero dependents. Four of the women in the control group had dependents, versus none of women in the experimental group. Of those four women, three were married with 4,4, and 2 dependents, respectively, and one was single with 1 dependent. None of the students in either of the groups were pregnant during the study.

Student and Employment Status

All of the subjects were full-time students, and approximately half had jobs aside from their studies. Ten of the women in the control group were employed part-time and the other ten were unemployed. Eight women in the experimental group were employed part-time, one was employed full-time, and eight were unemployed. Most of the subjects were graduate students, with the exception of three undergraduates in the control group.

Residence

Approximately two-thirds of the participants lived off campus, and the remaining one third lived on campus in a student dormitory. Among women in the control group, 6 lived on campus and 14 lived off campus. Six women in the experimental group lived on campus and 11 lived off campus.

Intervention Participation Rate

Among the subjects in the experimental group who completed the study, 15 of 17 of the women came to all 7 monthly weight and counseling sessions from September

through March. The other two women attended 6 and 4 sessions. Therefore, the mean number of sessions attended was 6.8 (S.D.= 0.39), with a range from 4 to 7.

Hypotheses Not Supported

Total Energy Intake

The mean energy intake at baseline was 1710 kcal/day for the control group and 1680 kcal/day for the experimental group (see Table 2). At the final data collection, mean energy intake was 1664 kcal/day and 1874 kcal/day for the control and experimental groups, respectively. The test of the interaction was not significant, $F(1,35)=2.193$, $p=.148$. Therefore, the hypothesis that over the interval of the study there would be a greater change in energy intake in the subjects receiving no intervention compared to the subjects who were weighed and had contact with a nutrition counselor monthly was not supported.

Percent of Energy Intake from Fat

The mean percent of energy consumed as fat at baseline was 25.8 for the control group and 29.6 for the experimental group (see Table 3). At the final data collection, mean percent fat intake was 26.6 and 30.6 for the control and experimental groups, respectively. The test of the interaction was not significant, $F(1,35)=.004$, $p=.951$. Therefore, the hypothesis that over the interval of the study there would be a greater change in percent energy intake from fat in the subjects receiving no intervention compared to the subjects who were weighed and had contact with a nutrition counselor monthly was not supported.

Table 2

Total Energy Intake (kcal/day)

	Group	Mean	Standard Deviation	N
Baseline	Control	1710	400.52	20
	Experimental	1680	468.17	17
Final	Control	1665	433.15	20
	Experimental	1874	487.61	17

Note. The test of the interaction was not significant, $F(1,35)=2.193$, $p=.148$.

Table 3

Percent of Energy Intake from Fat

	Group	Mean	Standard Deviation	N
Baseline	Control	25.8	7.02	20
	Experimental	29.6	9.09	17
Final	Control	26.6	8.28	20
	Experimental	30.6	10.03	17

Note. The test of the interaction was not significant, $F(1,35)=.004$, $p=.951$.

Body Mass Index

The mean body mass index at baseline was 22.7 for the control group and 21.6 for the experimental group (see Table 4). At the final data collection, mean body mass index was 22.4 and 21.2 for the control and experimental groups, respectively. The test of the interaction was not significant, $F(1,35)=.002$, $p=.966$. Therefore, the hypothesis that over the interval of the study there would be a greater change in body mass index in the subjects receiving no intervention compared to the subjects who were weighed and had contact with a nutrition counselor monthly was not supported.

Energy Expenditure

The mean estimated energy expenditure at baseline was 2176 kcal/day for the control group and 2073 kcal/day for the experimental group (see Table 5). At the final data collection, mean energy expenditure was 2168 kcal/day for the control group and 2074 kcal/day for the experimental group. The test of the interaction was not significant, $F(1,35)=.018$, $p=.893$. Therefore, the hypothesis that over the interval of the study there would be a greater change in energy expenditure in the subjects receiving no intervention compared to the subjects who were weighed and had contact with a nutrition counselor monthly was not supported.

Percent Body Fat

The mean percentage of body fat at baseline was 25.5 for the control group and 27.0 for the experimental group (see Table 6). At the final data collection, mean percent body fat was 24.7 and 25.9 for the control and experimental groups, respectively. The test of the interaction was not significant, $F(1,35)=.164$, $p=.688$. Therefore, the

Table 4

Body Mass Index (kg/m²)

	Group	Mean	Standard Deviation	N
Baseline	Control	22.7	2.66	20
	Experimental	21.6	3.87	17
Final	Control	22.4	2.66	20
	Experimental	21.2	3.17	17

Note. The test of the interaction was not significant, $F(1,35)=.002$, $p=.966$.

Table 5

Energy Expenditure (kcal/day)

	Group	Mean	Standard Deviation	N
Baseline	Control	2176	375.86	20
	Experimental	2073	414.00	17
Final	Control	2168	355.31	20
	Experimental	2074	416.08	17

Note. The test of the interaction was not significant, $F(1,35)=.018$, $p=.893$.

Table 6

Percent Body Fat

	Group	Mean	Standard Deviation	N
Baseline	Control	25.5	3.77	20
	Experimental	27.0	3.84	17
Final	Control	24.7	5.14	20
	Experimental	25.9	2.89	17

Note. The test of the interaction was not significant, $F(1,35)=.164$, $p=.688$.

hypothesis that over the interval of the study there would be a greater change in percent body fat in the subjects receiving no intervention compared to the subjects who were weighed and had contact with a nutrition counselor monthly was not supported.

Perceived Barriers to Weight Control Survey

General Statements

Almost one third (32.4%) of subjects responded that they completely agreed that they consciously work on controlling their weight, and 64.8% completely agreed or somewhat agreed (see Table 7). A total of 54% of subjects completely agreed or somewhat agreed that it is more difficult to control their weight when in school; 32.4% completely agreed to this statement.

Eating Well for Weight Control

More than half of all subjects (51.4%) completely agreed that their irregular schedules make eating well more difficult, and 86.5% completely or somewhat agreed (see Table 8). In response to the statement, "fatigue at the end of the day affects my eating habits at home," 43.2% completely agreed and 70.2% completely or somewhat agreed. Subjects were noticeably split on whether they consumed soft drinks for an energy/caffeine boost when at school and studying; 43.2% completely agreed and 35.1% completely disagreed. Almost 30 percent of subjects (29.7%) completely agreed that when they are under stress, they tend to eat more, and 59.4% of subjects completely or somewhat agreed to that statement. Nearly one quarter (24.3%) of subjects completely agreed that they have no time to prepare meals during the week because of their school schedule, and 54% completely or somewhat agreed. Forty-three percent of subjects

Table 7

General Statements Related to Weight Control

Statement	% Completely Agree 1	2	3	4	% Completely Disagree 5	% Not Applicable
I consciously work on controlling my weight.	32.4	32.4	21.6	5.4	8.1	0.0
My family/significant other supports my weight control efforts.	27.0	13.5	27.0	2.7	8.1	21.6
It is more difficult to control my weight when I am in school.	32.4	21.6	13.5	10.8	16.2	5.4

Note. Scale of 1 to 5; 1 = Completely Agree, 5 = Completely Disagree

Table 8
Statements Related to Eating Well for Weight Control

Statement	% Completely Agree 1	2	3	4	% Completely Disagree 5	% Not Applicable
My use of convenience foods makes it difficult to control my weight.	21.6	21.6	18.9	16.2	10.8	10.8
When I am under stress, I tend to eat more.	29.7	29.7	13.5	16.2	10.8	0.0
My finances limit my ability to buy foods that would help control my weight.	5.4	8.1	8.1	32.4	43.2	2.7
My irregular schedule makes eating well more difficult.	51.4	35.1	2.7	8.1	2.7	0.0
Because I cook for one person, preparing healthy foods is difficult.	16.2	16.2	16.2	16.2	16.2	18.9
I consume soft drinks for an energy/ caffeine boost when at school and studying.	43.2	2.7	8.1	10.8	35.1	0.0
I eat more when there is a major test or project due.	24.3	10.8	35.1	16.2	13.5	0.0
Because I am in school, I frequently eat out.	16.2	18.9	18.9	27.0	18.9	0.0
Fatigue at the end of the day affects my food habits at home.	43.2	27.0	10.8	18.9	0.0	0.0
I have no time to prepare meals during the week because of my school schedule.	24.3	29.7	16.2	10.8	13.5	5.4
I need to learn to cook healthy foods.	27.0	8.1	18.9	18.9	27.0	0.0
I frequently pick up something from a fast food restaurant on my way home from school, because I don't have time to prepare a meal.	5.4	16.2	16.2	21.6	40.5	0.0

Note. Scale of 1 to 5; 1 = Completely Agree, 5 = Completely Disagree

completely or somewhat agreed that their use of convenience foods makes it difficult to control weight. Also, nearly a quarter of subjects (24.3%) completely agreed that they eat more when there is a major test or project due, and 35.1% completely or somewhat agreed.

More than three quarters of subjects (75.6%) completely or somewhat disagreed that their finances limit their ability to buy foods that would help control their weight; 43.2% completely disagreed and 32.4% somewhat disagreed. Also, 62.1% of subjects completely or somewhat disagreed to the statement, "I frequently pick up something from a fast food restaurant on my way home from school, because I don't have time to prepare a meal," with 40.5% completely disagreeing and 21.6% somewhat disagreeing.

Exercise and Activity for Weight Control

Forty-three percent of subjects completely agreed that their irregular schedule makes exercising more difficult, and 72.9% completely or somewhat agreed to that statement (see Table 9). Also, 40.5% of subjects completely agreed that if their time is limited, they omit rather than reduce exercise time, and 62.1% of subjects completely or somewhat agreed. Seventy percent of subjects completely or somewhat agreed that they intentionally look for lifestyle activities to keep their activity level higher. Nearly a quarter (24.3%) of subjects completely agreed that while in school, their life is more sedentary, and 35.1% completely or somewhat agreed to that statement. Sixty-two percent of subjects completely or somewhat disagreed that exercise facilities are not convenient.

Table 9

Statements Related to Exercise and Activity for Weight Control

Statement	% Completely Agree 1	2	3	4	% Completely Disagree 5	% Not Applicable
I intentionally look for lifestyle activities (i.e., taking stairs, walking extra distance) to keep my activity level higher.	27.0	43.2	18.9	5.4	5.4	0.0
My irregular schedule makes exercising more difficult.	43.2	29.7	13.5	8.1	5.4	0.0
While in school, my life is more sedentary.	24.3	10.8	18.9	27.0	18.9	0.0
I have no time for regular exercise.	13.5	16.2	16.2	35.1	18.9	0.0
Exercise facilities are not convenient.	2.7	18.9	13.5	29.7	32.4	2.7
I am too tired after school to exercise.	16.2	32.4	16.2	27.0	8.1	0.0
If my time is limited, I omit rather than reduce my exercise time.	40.5	21.6	16.2	8.1	10.8	2.7

Note. Scale of 1 to 5; 1 = Completely Agree, 5 = Completely Disagree

Responses to Open-Ended Questions

Lack of time for meal preparation and/or grocery shopping was the most cited barrier to eating well; fifteen subjects stated it was their main barrier. One subject stated, "because I spend so much time studying, one of the last things I want to do when I get home is plan and prepare a meal." Three students identified inadequate kitchen facilities including limited refrigeration and only having a microwave oven as their greatest barrier to eating well. One subject stated, "I live in the dorm, and it's very inconvenient to cook for myself. I end up eating a lot of prepackaged/convenience foods that are high in sodium." Other barriers to eating well listed by one subject each were: large restaurant portions; cooking for self on a daily basis; cost; temptations; discipline; boredom which causes snacking; binge-eating at night, especially on carbohydrates; weakness with fried foods; lack of an appetite; pickiness; and having a "sweet tooth."

Fourteen subjects listed time constraints as their greatest barrier to exercise. One subject wrote, "so many things to get done that exercise is not always a priority." Six subjects listed a lack of energy, and five subjects listed motivation as their main impediment. Other barriers to exercise listed by one subject each were: lack of opportunity; distance to exercise facilities; responsibilities of a single mom, discipline, inconvenient parking caused by living in the dormitory, lack of an exercise partner, and illness. Two subjects apparently had no barriers to exercise. One stated, "I have no barriers because I completely enjoy it," and another stated, "nothing."

Preferences of Weight Control Nutrition Education Methods

From a list of suggested methods, the subjects were asked to identify delivery methods for obtaining weight control nutrition education that they thought would be helpful, and also the three that they thought would be the most useful (see Appendix G). The subjects thought that (a) newsletters, (b) e-mail messages, and (c) having a monthly conference to be weighed and discuss food intake and activity level, would be among the three most useful delivery methods for obtaining weight control education, garnishing 18.8%, 17.7%, and 15.6% of the votes, respectively (see Table 10 for actual numbers). These three methods were also the most frequently cited methods that subjects thought would be helpful.

Individual counseling sessions and group classes were the next most popular choices among the three methods subjects thought would be most useful, receiving 12.5% of the votes each. The internet received 11.5% of the votes for top three methods. Lastly, access to a scale, signs in public places, and telephone calls/voice mail received the least votes for being among the three most useful methods. These methods received 4.2%, 4.2%, and 3.1% of votes, respectively.

Table 10

Preferences of Weight Control Nutrition Education Methods

Suggested Education Delivery Method	Number of Checks Received (Indicating the subject thought this method would be helpful.)	Number of Circles Received (Indicating the subject thought this method would be among the 3 most useful.)
Newsletters	22	18
E-mail Messages	23	17
Having monthly conference to be weighed and discuss food intake and activity level.	20	15
Individual counseling sessions	17	12
Group classes	16	12
Internet	17	11
Access to a scale	14	4
Signs in public places	7	4
Telephone calls/voice mail	5	3

Note. From a list of suggested education delivery methods to help them manage their daily food intake and physical activity, subjects were asked to check all the methods that they felt would help them and circle the three methods they felt would be most useful (see Appendix G).

CHAPTER V

DISCUSSION

Although the present study failed to support the hypotheses, it was successful in learning more about college women's perceived barriers to weight control, and preferences for delivery of weight control information. The exploration of possible reasons why the hypotheses did not occur as thought would be helpful at this point.

Total Energy Intake

The first hypothesis tested whether there would be a greater change in total energy intake from baseline data to final data for the experimental versus the control groups. It was thought that the control group, with the pressures of school and adjusting to the first year in a rigorous academic program in a medical field, would have increased their caloric intake by the end of the first year, and/or the experimental group's caloric intake would have decreased due to the monthly weight monitoring activities. However, no differences were found between the two groups. In fact, the data show that the trend was opposite of what was expected, but not statistically significant. The mean energy intake of the control group actually decreased by 46 kcal/day, from 1710 kcal/day at baseline to 1664 kcal/day at final data collection. Conversely, the data show that the mean energy intake of the experimental group increased by 194 kcal/day, from 1680 kcal/day at baseline to 1874 kcal/day at final.

A disadvantage of the method for obtaining the total energy intake was that it was based only on a 24-hour food recall. Certainly, there is the possibility that the day which a subject(s) reported on was markedly different from her typical daily intake due to extraneous factors. Also, subjects may have inadvertently under-reported or over-reported their actual caloric consumption. The fact that brief dietary assessments lead to high error rates has been brought up by a group of researchers who summarized the findings of 32 diet and exercise interventions (Wilcox et al., 2001). Closer inspection of the raw data reveals several obvious outliers including two women in the control group whose final recalls were 806 kcal/day and 975 kcal/day, respectively, and one woman in the experimental group whose baseline recall was 777 kcal/day. Clearly figures such as these could not be the typical daily intake for a young adult woman.

Percent of Energy Intake from Fat

The second hypothesis tested whether there would be a greater change in percent of energy intake from fat. Again, the premise at the beginning of the study was that the control group would have an increase in fat consumption secondary to increased challenges to eating well during the academic year, and/or that the experimental group would have a decreased consumption of fat because of increased nutrition awareness resulting from monthly contact with the nutrition counselor. Once again, the assumptions were not proven in this study. It is interesting to note that the percent of energy consumed from fat did go up nearly a full percentage point from baseline to final reporting for both groups of women. The control group's fat intake increased from 25.8% to 26.6% (up 0.8%) from baseline to final data collection. The experimental

group experienced a full percentage point increase from 29.6% to 30.6% ofkilocalories from fat. The good news is that, at least for this subset of college women, percent of energy intake from fat was mostly consistent with the U.S. Dietary Guidelines recommendations for good health: less than 30% of calories from fat.

Previous studies have demonstrated that nutrition interventions have been successful in helping women lower their fat intakes (Matvienko et al., 2001; Miller et al., 2001; Skinner, 1991). Possible reasons why the results of the present study differed from previous interventions are wide-ranging. In the study conducted by Matvienko et al., the subjects for which a decreased fat intake was statistically significant had a higher BMI (>24) to begin with. The women in the present study had an average BMI in the range of 21 to 22. It could be that the women in Matvienko's study had more room for improvement in dietary consumption as compared to those in this study. Miller et al. noted that their 2-year intervention specifically targeted lowering dietary fat intake. The longer length of the intervention combined with the fact that the focus was on dietary fat, as compared to a general nutrition, physical activity, and weight control focus in this study could explain the difference in findings. In addition, as with total energy intake, percent energy intake from fat was also subject to a high error rate by use of a brief 24-hour food recall and the possibility of over or under-reporting typical daily fat intake.

Body Mass Index

The third hypothesis tested whether there would be a greater change in body mass index for the experimental versus the control group over the course of the academic year. The assumption was that monthly weight monitoring with a nutrition

counselor would help prevent weight gain in the intervention group as compared to the control group. The results were not statistically significant. The average body mass index actually decreased slightly for both groups. The mean baseline BMI for the control group was 22.7 at baseline and decreased to 22.4 at the end of the study. For the experimental group, the mean baseline BMI was 21.6 and the final was 21.2.

Previous studies have reported statistically significant findings for reductions in body weight in intervention groups (Bertram et al., 1990; Sloan et al., 1976). Other studies reported significant findings for maintenance of baseline body weight by intervention groups as compared to increases in body weight in the control groups (Kuller et al., 2001; Matvienko et al., 2001). Still, other studies were similar to the present study in that they also failed to find any significant weight changes in control versus intervention groups (Jeffery & French, 1997; Miller et al., 2001).

The fact that most of the subjects in the present study were within the healthy weight range (BMI of 19-25) to begin with, may have been a factor in the failure to see noteworthy changes in BMI. In the study conducted by Matvienko et al., it was the higher BMI women (>24) in the intervention group who maintained their body weight over the course of the study as compared to the higher BMI women in the control group who gained weight. Of the 37 women who completed the present study, only 5 were overweight at baseline (4 control subjects and 1 experimental subject) and only 1 was obese at baseline (experimental subject). This sole obese subject, having been randomly assigned to the experimental group, was weighed and counseled monthly, and experienced a significant weight loss. Her baseline BMI was 32.1 and dropped to 28.2

by the conclusion of the study, for a total weight loss of 22 pounds. This singular case suggests that, had the majority of the subjects participating in the present study been obese at the onset, the results may have been remarkably different.

The fact that this study only lasted nine months could have been another disadvantage. The Pound of Prevention study, like this study, reported weight changes were insignificant, which the authors attributed to the short intervention period of one year (Jeffery & French, 1997).

There are other social and environmental factors which may have contributed to the ability of both the experimental and control subjects to maintain their body weights during the study course of the present study. The very fact that the majority of the women were graduate students (92%) is proof of their above average level of education. The majority of the women were also Caucasian (70.3%). It may also be inferred that the majority of the women were not financially restricted from making healthy food choices because of the fact that 75.6% either somewhat or completely disagreed with the statement, "My finances limit my ability to buy foods that would help control my weight." It has been documented that low socioeconomic status and race (minorities) are both strong risk factors for obesity in women (Beers & Berkow, 1999). In addition, because the subjects were all studying health-related fields, they may have been more aware of the health risks of overweight and obesity.

Energy Expenditure

The hypothesis that there would be a greater change in energy expenditure for the experimental versus the control groups was not proven. Energy expenditure, calculated

from the weekly physical activity recall, was vastly unchanged for both groups. Baseline energy expenditure for the control group was 2176 kcal/day as compared to 2168 kcal/day at final data collection; an insignificant decrease of only 8.0 kcal/day. Likewise, the baseline energy expenditure for the experimental group was 2073 kcal/day and final was 2074 kcal/day for a difference of only 1.0 kcal/day.

A review article which investigated 32 diet and physical activity interventions reported modest but significant effects for physical activity (Wilcox et al., 2001). That same article also observed that effects were larger for samples with a mean age over 50 years, attributed to the fact that the older subjects were more sedentary to begin with. By contrast, in this study, the mean age of all subjects was 25.3 years.

The possibility of error due to incorrect self-reporting may have been a contributing factor to inaccurate physical activity recalls. It is interesting to note that reported energy expenditures consistently ranged from 200-500 kcal/day higher than reported energy consumption at both final and baseline data collection. Discrepancies in energy intake and expenditure were higher in the control group than in the experimental group.

Percent Body Fat

This study hypothesized that there would be a greater change in percent body fat in the experimental versus the control groups over the course of the academic year. The results failed to show a difference between the two groups. Both groups experienced similarly modest declines in percent body fat. Baseline percent body fat for the control

group was 25.4% and final was 24.7%, a decrease of 0.7%. For the experimental group, baseline body fat was 27.0% and final was 25.9%, a decrease of 1.1%.

A diet and exercise intervention conducted in South Africa reported significant decreases in percent body fat in intervention subjects (Bertram et al., 1990). Equally remarkable decreases in body mass were cited. The women in the present study did not have a significant change in body mass, as did the women in the South African study. Also, some of the South African women participated in tri-weekly exercise sessions as part of the intervention, whereas, subjects in the present study did not participate in any additional exercise sessions. Often, changes in percent body fat are secondary to changes in body mass and increased physical activity, as was seen in the South African study. Because the present study did not find significant differences in BMI and energy expenditure, it could have been predicted that percent body fat would also remain unchanged.

One factor which may have affected the validity of the results is the accuracy of the body fat analysis measurement. Although widely used and acknowledged as reputable, the bioelectrical impedance method of body fat analysis does have its disadvantages. It is an indirect method of measuring body fat because it measures only body water, which is then used to estimate body fat, and the actual measurement adds a small amount of additional information to the equations which use weight, height, age, and gender (Bray, 2003) If the subject's water status is not stable, results could be inaccurate.

Completion Rate

The completion rate and the individual reasons why subjects did not complete the study may have affected the outcomes of the research. Subjects who completed the study were present for both baseline and final data collection. Among intervention subjects who met these criteria for completion, the minimum number of monthly sessions attended was four. Seventy-five percent of all subjects who began the study completed it (71% of experimental group subjects and 80% of control group subjects).

Twelve women failed to complete the study. The reasons for their lapse in participation were not documented, however, in this researcher's experience, the majority of the non-completers dropped out of the study because they were going to be undertaking clinical rotations away from the Houston area during the second semester. It is a possibility, nevertheless, that some of the non-completers, particularly those in the control group, did not complete the study due to embarrassment about weight gain that occurred over the past year. Obviously, if this was the case, it may have hindered the ability of the study to obtain significant results.

Perceived Barriers to Weight Control

Overwhelmingly, the most cited barrier to eating well and physical activity by the women in this study was an irregular schedule (86.5% and 72.9% completely or somewhat agreed, respectively). Related to schedule irregularity, "time constraints" was the most popular response to the open-ended questions about barriers to eating well and exercising. Other barriers that were documented included: (a) being in school, (b) fatigue at the end of the day, (c) stress, (d) lack of time to prepare meals, (e) use of

convenience foods, (f) over-consumption when there is a major test or project, (g) omitting exercise routines due to limited time, (h) having a sedentary lifestyle while in school, (i) inadequate dormitory kitchen facilities, (j) lack of energy to exercise, and (k) lack of motivation to exercise.

These findings were similar to those of previous studies which documented women's perceived barriers to weight control. Elvick cited psychological stress and decreased physical activity levels due to lack of time, fatigue after a long day at work, and lack of motivation (1994). Elvick also reported interfering family responsibilities and long distance from exercise facilities as barriers to physical activity, which were noted by one subject each in the present study. Koszewski and Kuo's study of food consumption behaviors of college women documented "insufficient time for food preparation" as a barrier (1996). Brevard and Ricketts reported that college women who lived on campus had lower physical activity levels and higher protein and fat intakes (1996), which are correlated with the present study's findings of inadequate dormitory kitchen facilities, distance to exercise facilities, and inconvenient dormitory parking.

Preferences for Delivery of Weight Control Nutrition Education

The women reported that newsletters, e-mails, and monthly contact with a nutrition counselor would be the three most useful methods for delivery of weight control nutrition education. These findings are consistent with the Committee on Military Nutrition Research's recent recommendations for weight management programs (Institute of Medicine, 2003). Their recommendations included regular contact with

weight management counselors and exploring the use of internet-based programs for maintaining contact with military personnel at remote duty stations.

CHAPTER VI

CONCLUSIONS AND IMPLICATIONS FOR FUTURE RESEARCH

The present study failed to track the reasons why subjects dropped out before completion. In future studies, it would be crucial to document reasons for non-completion. This would help rule out the possibility that subjects dropped out because of embarrassment about weight gain. It would also be helpful to implement an exclusion criteria at the beginning of future studies. Potential subjects would be asked about their availability for the duration of the study, and those who would not be accessible for the entire period would be excluded.

Because most of the women in this study were graduate students, they may have already learned how to independently balance their daily food intake and physical activity to control their weight. It is possible that more marked results would be seen in future studies in which incoming freshmen (first-year college students) who are not studying health-related fields are the subjects.

Also, a longer intervention time and a larger sample size may result in a higher probability of obtaining significant results. A longer intervention would likely increase the chances that the control group's weight would rise gradually over the years, as compared to the intervention group who would theoretically be controlling their weight better. In addition, many of the previous studies of weight control nutrition interventions

had hundreds of subjects participating, thereby increasing the chances for statistically significant findings with even modest individual-subject results.

There is also the consideration that most of the women in this study were within the healthy weight range at the start of the study. Future studies could expect to obtain more dramatic results by recruiting subjects who are overweight or obese to begin with as was documented by Matvienko et al. (2001). Hypothetically, there would be more room for improvement in weight, percent body fat, energy consumption, and energy expenditure in overweight versus normal weight young women.

The majority of the women in this study were Caucasian. Minority women would be an excellent group to target for future studies, considering their higher risk for overweight, obesity, and chronic health conditions, and the fact that fewer studies have been done on these women (Wilcox et al., 2001).

Because time for physical activity and healthy meal preparation was found to be a major barrier to weight control for the women in this study, the exploration of interventions in which time management skills are taught in addition to the usual nutrition and exercise topics would be of interest. Stress was also found to be a contributing factor to effective weight control, hence, interventions in which a stress management component are taught would be useful research in this area.

E-mail messaging was one of the top two choices selected by the subjects in this study as a method of weight control education delivery. This finding, combined with the recent recommendation by the Committee on Military Nutrition Research to explore internet-based programs for weight management (Institute of Medicine, 2003), suggests

future studies evaluating the effectiveness of internet-based programs for the delivery of weight control education would also be beneficial.

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APPENDIXES

APPENDIX A

Application to Human Subjects Review Committee,

Exempt Review Only

TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON
HUMAN SUBJECTS REVIEW COMMITTEE - HOUSTON CENTER

Application to Human Subjects Review Committee
Exempt Review Only

Approved by HSRC Chair [signature] Date 5-27-99

If it is the decision of the research committee (for student research) or the department coordinator (for faculty research) that the proposed research is exempt from expedited or full review by the Human Subjects Review Committee (HSRC), please complete the following form. Three copies of this properly signed form must be submitted to the chair of the HSRC. In addition, one copy of all research instruments (i.e. questionnaires, interview schedules, etc.) must also be included. If this application is exempt because it has received approval from another IRB, include a copy of the final approval letter.

Principal Investigator(s): Rachel Tristan SS# _____

_____ SS# _____

Faculty Advisor: Doris E. Wright, Ph.D., R.D. Department: Nutrition and Food Science

Title of Study: Needs Assessment for Weight Control Nutrition Education for Female Students

X Is Exempt from Human Subjects Review Committee review because (see p. 11 of Policies and Procedures manual): the study was already approved.

Estimated beginning date of the study: _____

Estimated duration of the study: _____

Research being conducted for:
Professional Paper ___ Thesis X Dissertation ___ Class Project ___ Pilot Study ___ Faculty ___

Is this research being conducted for a non-university sponsor? Yes ___ No X

Name of Sponsor: _____

If using disk application, respond to questions as presented. If typing you may use attached sheets.

1. Give a brief description of the study (use continuation pages or attachments, if necessary). Describe the subjects, i.e., are they adults, institutionalized, minors; how many? Describe the procedure that relates to the subjects' participation, i.e., what will the subjects do or what will be done to them and where the study will be done.

2. What are the potential risks to the human subjects involved in this research or investigation (use continuation pages if necessary)?

The research protocol and the HSRC application has been read and approved by the members of the student's research committee.

Research Committee:

Type name	Signature
Dr. Doris E. Wright, RD (Chair)	[illegible] / May 14, 1999
Dr. John Radcliffe, RD	[illegible] / May 14 / 1999
Ms. Linda Cashman, RD	Linda Cashman 5/26/99

OR (for faculty)

The research protocol and the HSRC application has been read and approved by the academic administrator.

Academic Administrator Date

Fall 1998

1. The purposes of the study are to: (a) compare changes in total caloric intake, fat intake, weight, body fat, and energy expended through exercise for college women who have been in contact with a nutrition counselor and weighed monthly over the course of the academic year compared to those who have not had such contact, (b) determine barriers to weight control for college women, and (c) determine preferred modes of delivery for weight control education.

The subjects are college women from Texas Woman's University - Houston Center. There are 49 subjects who were randomly assigned to control and experimental groups. There are 25 women in the control group and 24 women in the experimental group. The study is being done at Texas Woman's University – Houston Center.

At the beginning of the academic year, all of the subjects completed 24-hour food recalls, a physical activity and sleep recall from the previous week, and demographics data. The subjects were weighed and their height was measured. Their percent body fat was determined by bioelectrical impedance. This procedure lasts about five minutes and the subject must lie down and sticky electrodes are placed on their hand and foot. An imperceptible electric current flows through their body.

Subjects assigned to the experimental group came back monthly to be weighed and discuss weight control, eating, and exercise issues with a nutrition counselor.

At the end of the academic year, all of the subjects were brought back to collect final data. This consisted of the 24-hour food recall, a physical activity and sleep recall from the previous week, weighing the subjects, and measuring their percent body fat by bioelectrical impedance. In addition, a questionnaire about barriers to weight control and a questionnaire about preferred methods for weight control education were administered.

2. The potential risks to the human subjects include:

- embarrassment of weight status
- embarrassment of percent body fat
- inconvenience of filling out forms, being measured, and/or coming in monthly
- any other psychosocial and/or body image problems surfacing or being exacerbated

TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

HUMAN SUBJECTS REVIEW COMMITTEE - HOUSTON CENTER

HSRC APPROVAL FORM

Name of Investigator(s): Doris E. Wright, Ph.D., R.D.

Social Security Number(s): _____

Name of Research Advisor(s): _____

Address: Department of Nutrition and Food Sciences - Houston

Dear: Dr Wright

Your study entitled: Needs Assessment for Weight Control Nutrition Education for Female Students

(The applicant must complete the top portion of this form)

has been reviewed by the Human Subjects Review Committee - Houston Center and it appears to meet our requirements in regard to protection of the individual's rights.

Please be reminded that both the University and the Department of Health and Human Services regulations typically require that signatures indicating informed consent be obtained from all human subjects in your study. These are to be filed with the Human Subjects Review Committee Chairman. Any exception to this requirement is noted below. Furthermore, according to HHS regulations, **another review by the HSRC is required if your project changes or if it extends beyond one year from this date of approval.**

Any special provisions pertaining to your study are noted below:

_____ The filing of signatures of subjects with the Human Subjects Review Committee is not required.

_____ Other: see attached sheet.

✓ No special provisions apply.

Sincerely,

Gayle Hersch

Gayle Hersch, Ph D
Co-Chairperson, HSRC - Houston Center

7-20-98
Date

HSRC 1997

APPENDIX B

Determination of Energy Expenditure

Determination of Energy Expenditure

Energy expenditure was estimated by the method described in The Lifestyle Counselor's Guide for Weight Control (Wolfe & Blair, 1996). The weekly physical activity recall form (Appendix D), obtained from the same source, was an essential tool utilized to determine energy expenditure. Data obtained directly from this recall were used in the calculations. Table 11 details the energy expenditure calculations.

Table 11

Energy Expenditure Calculations

1. (Number of hours Sleeping) × 1 MET[a]
2. (Number of hours Moderate Activity) × 4 MET
3. (Number of hours Vigorous Activity) × 6 MET
4. (Number of hours Very Vigorous Activity) × 10 MET

+ 5. (Number of hours Light Activity[b]) = 168 hours − (Total of lines 1-4) × 1.5 MET

Total (lines 1-5) = Number of Kcal expended/Kg of body weight

× Body weight (Kg)

= Total Kcal expended/week ÷ 7 = Total Kcal expended/day[c]

Note. [a]MET = Metabolic Equivalent. Defined as a multiple of the resting metabolic rate; one MET is equal to 3.6 mL of oxygen/kg of body weight per minute (Mahan & Escott-Stump, 1996). [b]Light Activity is calculated by subtracting the number of hours spent in all other activities, including sleep, from 168 (the number of hours in a week) and multiplying by 1.5 MET. [c]Although the direct result of the physical activity recall is the estimation of the energy expenditure for a week, the results are divided by 7 to obtain the average daily energy expenditure, and thus be able to compare to energy consumption per day.

APPENDIX C

Twenty-Four Hour Diet Recall Directions

& Food Intake Record

24 HOUR DIET RECALL DIRECTIONS

1. List everything you ate and drank in a 24 hour period. The period should begin with the first thing you ate in a day, and end 24 hours later.

2. Include all snacks: candy, gum, alcoholic beverages, soft drinks, chips, etc.

3. Provide additional information for each food as needed. For example, list what was in a tossed salad, a casserole, or on your pizza or hamburger. This is needed to identify foods properly for later assessment.

4. Include all extras: butter for bread, sauce on vegetables, dressing on salads, gravy, jelly, nuts, cream, and sugar.

5. Record if foods eaten are reduced fat or fat-free. If milk is consumed, record fat content.

6. Record the amount of each food item, i.e., fruit, approximate size (small, medium, or large); beverages in cups or ounces; meat, fish, cheese in ounces; bread in slices, cooked vegetables in cups or number of pieces.

7. Record vitamin and/or mineral supplements you take.

ramos
98

Code:_____
Date:_____

24 HOUR RECALL OF FOOD INTAKE

TIME	FOOD EATEN – DESCRIPTION OF PREPARATION	AMOUNT

ramos
98

APPENDIX D

Physical Activity Recall Form

CODE:_____

PHYSICAL ACTIVITY RECALL

In order to estimate how many calories you burn during one week, please remember the amount of time you participated in activity each day last week. You only have to remember the time spent in moderate, vigorous, very vigorous activity, and sleep. Once you have decided how many hours you participated in moderate, vigorous, and very vigorous activities, write that number in the box under the day of the week for each activity level and sleep. If you did not participate in these activities everyday, leave the boxes blank.

Hours spent in light physical activity like office work, light housework, activities involving sitting, etc., will be calculated after you fill in the hours spent performing the other activities.

EXAMPLE:

Moderate Activity – (brisk walking = 3-4 miles in one hour, golf, yard work, heavy housecleaning, vacuuming carpet, volleyball, weight lifting, calisthenics exercise, mowing yard, etc.)

Mon	Tue	Wed	Thurs	Fri	Sat	Sun
	½				1	1

1. **SLEEP** (includes naps)

Mon	Tue	Wed	Thurs	Fri	Sat	Sun

2. **Moderate Activity** – (brisk walking = 3-4 miles in one hour, golf, yard work, heavy housecleaning, vacuuming carpet, volleyball, weight lifting, calisthenics exercise, mowing yard, etc.)

Mon	Tue	Wed	Thurs	Fri	Sat	Sun

3. **Vigorous Activity** – (very brisk walking = 4.5 to 5.5 miles in one hour, aerobic dance, skating, doubles tennis, swimming, hiking, fast dancing, stair climbing – moderate pace, etc.)

Mon	Tue	Wed	Thurs	Fri	Sat	Sun

CODE:_____

4. **Very Vigorous Activity** – (soccer, basketball, jogging, stair climbing – fast pace, backpacking with heavy pack, jumping rope, swimming – fast pace)

Mon	Tue	Wed	Thurs	Fri	Sat	Sun

5. Was the level of activity last week usual for you, more than usual, or less than usual?

(check one) Usual_____ More than usual_____ Less than usual_____

If not "usual," how was it different?

_____

_____

_____

_____

_____

_____

_____

Describe work activity.

_____

_____

_____

_____

Appendix E

Monthly Counseling and Weight Log

Code:_____

Counseling Log

Date	Weight
September	
October	
November	
December	
January	
February	
March	

Counseling discussion/plan:
Date; pre-assessment; summary of concerns discussed; plan; specific ideas related to barriers or helpful modes of education.

Note. This form was used exclusively by the nutrition counselors to document monthly weights and to summarize the counseling sessions.

APPENDIX F

Perceived Barriers to Weight Control Survey

Code:_____

Please read each question and circle the number that corresponds to the statement that is most characteristic of your opinion. If a statement does not apply to you, circle the NA. This survey is voluntary. Your completion of this survey indicates your willingness to participate.

	Completely Agree				Completely Disagree	Not Applicable
General Statements:						
I consciously work on controlling my weight.	1	2	3	4	5	NA
My family/significant other support my weight control efforts.	1	2	3	4	5	NA
It is more difficult to control my weight when I am in school.	1	2	3	4	5	NA
Statements related to eating well to control my weight:						
My use of convenience foods makes it difficult to control my weight.	1	2	3	4	5	NA
When I am under stress, I tend to eat more.	1	2	3	4	5	NA
My finances limit my ability to buy foods that would help control my weight.	1	2	3	4	5	NA
My irregular schedule makes eating well more difficult.	1	2	3	4	5	NA
Because I cook for one person, preparing healthy foods is difficult.	1	2	3	4	5	NA
I consume soft drinks for an energy/caffeine boost when at school and studying.	1	2	3	4	5	NA
I eat more when there is a major test or project due.	1	2	3	4	5	NA
Because I am in school, I frequently eat out.	1	2	3	4	5	NA
Fatigue at the end of the day affects my food habits at home.	1	2	3	4	5	NA
I have no time to prepare meals during the week because of my school schedule.	1	2	3	4	5	NA
I need to learn to cook healthy foods.	1	2	3	4	5	NA
I frequently pick up something from a fast food restaurant on my way home from school, because I don't have time to prepare a meal.	1	2	3	4	5	NA

The greatest barrier to eating well is:

	Completely Agree				Completely Disagree	Not Applicable
Statements related to exercise and activity for weight control:						
I intentionally look for lifestyle activities (i.e., taking stairs, walking extra distance) to keep my activity level higher.	1	2	3	4	5	NA
My irregular schedule makes exercising more difficult.	1	2	3	4	5	NA
While in school, my life is more sedentary.	1	2	3	4	5	NA
I have no time for regular exercise.	1	2	3	4	5	NA
Exercise facilities are not convenient.	1	2	3	4	5	NA
I am too tired after school to exercise.	1	2	3	4	5	NA
If my time is limited, I omit rather than reduce my exercise time.	1	2	3	4	5	NA

The greatest barrier to exercise is:

APPENDIX G

Preferences of Weight Control Nutrition Education Methods Survey

Code:_____

One purpose of this research is to determine how students would like to have information related to weight control and nutrition available to them. Your responses will help determine how nutrition education is planned for college students.

Please **check all** of the following ways that would help **you** manage your daily food intake and physical activity:

_____e-mail messages
_____Telephone calls/voice mail
_____Newsletters
_____Internet
_____Group classes
_____Individual counseling sessions
_____Signs in public places
_____Access to a scale
_____Having a monthly conference to be weighed and discuss food intake and activity level
_____Other suggestions, please specify_____

Now, **circle the three** that you think would be **most** useful for you.