A Comparative Study of Dietary Habits among College Students At-Risk and Not-At-Risk for Eating Disorders and how Such Habits Compare to the Dietary Guidelines

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ABSTRACT

Objective: To examine associations between eating disorder (ED) risk and dietary habits. Also, to determine if ED risk changes after exposure to nutrition education and to investigate how the dietary habits in both at-risk (AR) and not-at-risk (NAR) college students compare the Dietary Guidelines (DG).
Design: A longitudinal observational study over one academic year. Self-reported dietary intake was collected via seven-day food records. The Eating Attitudes Test 26 (EAT-26) was used to assess ED risk. Subjects underwent measurements of height, weight, skin fold, waist circumference and hip circumference.
Subjects/Setting: Data from 507 students enrolled in one of two fall 2005 nutrition/health courses at a land grant university in southwest Virginia were analyzed.
Main Outcome Measures: ED risk, mean daily intake of fruits, vegetables, fiber, whole grains, protein, total calories, and changes in ED risk over one academic year. BMI, weight change, percent body fat, and waist circumference were also evaluated.
Statistical Analysis Performed: Associations between ED risk and mean daily intake of dietary variables were assessed using independent samples t-tests ($p<0.05$). Changes in mean EAT-26 scores were assessed using paired-t tests. Changes in the proportion of subjects categorized as AR and NAR were evaluated using Chi-square analysis.
Results: This study was completed by 192 subjects. Those AR consumed significantly fewer calories than NAR subjects in both September. In April, AR subjects consumed significantly fewer fried vegetable servings than NAR subjects. Chi-square analysis in April revealed that the size of the NAR group increased thus reducing the size of the AR group. Overall, subjects' diets failed to meet the DG for fruits, vegetables, whole grains, and dietary fiber.
Conclusion: Overall dietary intake did not vary significantly between AR and NAR subjects, excepting lower caloric intake and fewer fried vegetable servings in those AR. Both groups failed to meet the DG for fruits, vegetables, whole grains and dietary fiber.
Application: Educational interventions emphasizing the DG may improve ED risk but warrant more specific targeting of poor dietary habits in order to increase the college population's compliance with the DG.

ATTRIBUTION

It has been an honor and a pleasure working with Dr. Kathy Hosig as both an undergrad and graduate student. Her guidance, support, and wisdom have carried me through the years and helped me acquire the knowledge and skills necessary to venture on in the field of nutrition. Dr. Hosig received her B.S. in Human Nutrition and Foods/Dietetics from Virginia Tech. She later completed a M.P.H. in Public Health Leadership from the University of North Carolina at Chapel Hill and a Ph.D. in Foods and Nutrition from Purdue University. I am forever grateful to Dr. Hosig for allowing me to pursue a topic area of my choice for my master's study, and her help has been invaluable in the process to completion. She was essential in helping me organize my thoughts for the Literature Review, giving valuable feedback as to the issues I should cover in this section of my research.

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CHAPTER 1: INTRODUCTION

Definition and Prevalence of Eating Disorders

Of all the mental illnesses recognized by the American Psychiatric Association (APA), eating disorders (ED) currently have the highest mortality rate (1). The numbers of people affected by this mental disease have significantly increased over the last few decades and the trend promises to continue. The APA divides ED into three subclasses: anorexia nervosa (AN), bulimia nervosa (BN), and eating disorders not otherwise specified (EDNOS) (2).

In order to be diagnosed with an ED, an individual must meet certain diagnostic criteria set by the APA. For AN, these include a refusal to maintain body weight at or above the minimally normal weight for age and height; an intense fear of gaining weight or becoming fat even if at normal weight or underweight; a disturbance in the way in which body weight or shape is experienced; an undue influence of body weight or shape on self-evaluation; denial of the seriousness of a low body weight; and amenorrhea in postmenarcheal females (2). For BN, criteria include recurrent episodes of binge eating and/or a sense of lack of control over eating during such episodes; recurrent, inappropriate compensatory behavior in order to prevent weight gain (such as self-induced vomiting; misuse of laxatives, diuretics, enemas or other medications; fasting; or excessive exercise); binge and purge episodes occurring, on average, at least twice a week for three months; undue influence of body weight and shape on self-evaluation; and all such eating disturbances must not occur exclusively during episodes of AN (2). Binge eating episodes are defined as eating in a discrete period of time an amount of food that is definitely larger than normal ingestion (2). EDNOS symptoms are harder to diagnose but involve all symptoms of AN, except amenorrhea and below normal weight. EDNOS diagnostics also include all those for BN with the frequency of binge/purge episodes being less frequent than

twice a week for three months. In addition, those with EDNOS will present inappropriate compensatory behaviors after eating small amounts of food and repeated chewing and spitting out of large amounts of food without swallowing. Those with binge eating disorder (BED) fall within the EDNOS category and are diagnosed upon presentation of recurrent episodes of binge eating in the absence of regular other inappropriate compensatory behaviors as characteristic of BN (2).

The various forms of ED affect all races, ages, genders, and societal classes. Nevertheless, women are more commonly affected than men as 0.5% to 3.7% of women have AN while 1.1% to 4.2% of women deal with BN (3). The literature on ED in males is tenuous, but generally males are said to account for 5-10% of AN cases and 10-15% of BN (4). Estimates for the overall prevalence of EDNOS do not exist as of yet, as its symptoms are not as easy to recognize and diagnose. Therefore, the EDNOS category makes defining a population wide ED prevalence rate difficult. Many people may fall within the EDNOS diagnostics but have no idea that they are symptomatic and thus do not seek treatment. A variety of risk factors, such as sociocultural pressures, biology and genetics, emotions and cognitions, environment, and life stresses, have been acknowledged and defined by the APA for the three categories of ED (5). The overall understanding of risk and the synergism between risk factors continues to grow as more clinical studies are conducted.

ED prevalence also varies by age. Individuals between the ages of ten and twenty-four are at a higher risk for the development of ED (6). The onset of ED peaks during puberty and the early adult years, the age range of most women found on America's college campuses, and many researchers have identified the university setting as an environmental risk factor for ED (6). A 2007 survey conducted by the National Eating Disorders Association (NEDA) revealed

startling data in regards to the awareness and prevalence of ED among college women. Almost 20% of survey respondents claimed that they either had or were suffering from an ED while an alarming 75% of that group noted that they had never sought treatment (7). Thus, prevention attempts targeted at the college population are necessary.

Health Consequences of Eating Disorder Behavior

Aside from the high risk of death from untreated, chronic ED, other serious side effects can also occur that are both physical and psychological in nature. Physical consequences include, but are not limited to: malnutrition, dehydration, severe organ damage (heart, kidney, and/or liver), tooth or gum erosion, esophageal tears and ruptured stomach (1). Malnutrition presents differently for each ED category. While those with AN eat very little and receive little to no nutrients, those with BN or EDNOS do obtain some level of nutrition. Daily intake varies and thus their nutrition status is unclear. Moreover, few data exist regarding the average nutritional status for ED individuals, in addition to differences in nutritional status among ED classifications.

The psychological consequences of ED may include: depression, low self-esteem, shame or guilt, impaired relationships, mood swings, perfectionism, and extremist thinking (1). Such serious, and sometimes fatal, health consequences warrant persistent efforts to detect those at-risk for developing an ED with subsequent attempts at ED prevention in high-risk populations.

Screening

Many psychologists and psychiatrists attest to the fact that ED are some of the most difficult mental illnesses to treat due to a complex etiology. Therefore, an effective screening tool helps to identify at-risk populations before any prevention efforts are carried out. In researching the cultural effects of ED in the 1970's, David M. Garner and Paul Garfinkel

developed the Eating Attitudes Test (EAT) as a screening tool for ED symptoms (8). The EAT has since become the EAT-26, a shorter self-report survey that rates individuals scoring at least twenty out of twenty-six as at-risk (AR) for an ED. Many research studies employ the EAT-26 as an effective, economical screening tool for identifying high risk populations.

Prevention Strategies

A number of different strategies have been used to prevent and/or treat ED. Two ED prevention research meta-analyses have shown that prevention methods such as healthy weight control didactics, screening paired with educational classes, and cognitive/behavioral therapies have most commonly been tried (9,10). Newer methodologies, such as computer/internet based programs and mind/body based programs, have recently been developed and reviewed in the literature (11-13). A primary prevention method has yet to be determined as the research reveals conflicting results across the variety of implemented prevention programs. A variety of confounding variables, such as population demographics and risk for an ED, amount of exposure to program components, and level of participant interaction, influence the effectiveness of prevention attempts (10). A meta-analytic review of the literature revealed that multisession, interactive, targeted programs were most effective in reducing symptomology of ED (10).

Purpose of This Study

The purpose of this study was two-fold. First, the diets of both not-at-risk (NAR) and AR individuals were analyzed by evaluating daily intake of fruits, vegetables, whole grains, fiber, and total calories. Comparisons were drawn to determine whether one group was more successful at meeting the Dietary Guidelines (DG) than the other. Second, the changes, if any, in EAT-26 scores over one academic year were evaluated to determine whether risk for ED changed with exposure to health education.

Rationale for This Study

In order for prevention and/or treatment programs to be effective, a thorough understanding of the dietary behaviors and daily intakes, eating attitudes, and physical activity of AR individuals is needed. To date, insufficient data on this subject exists. Various studies have assessed the macronutrient intakes of ED individuals as compared to national averages for healthy individuals. However, intake data of particular food groups is lacking. The DG place much emphasis on whole grains, fruit and vegetable intake, low fat dairy and healthy fats, straying from the older recommendations based on particular macronutrients (14). A prevention approach focused on meeting general food group guidelines may prove to be an effective strategy to use in ED prevention programs. This positive emphasis on healthful eating as defined by adequate daily servings of food groups may facilitate a decrease in ED risk for AR individuals as opposed to older methods which tend to emphasize the negative effects of certain behaviors. This is especially true if the AR subjects are found to have worse dietary habits than the NAR subjects.

REFERENCES CITED

1. American Psychiatric Association. Practice Guidelines for the Treatment of Patients with Eating Disorders. Ed. Laura J. Fochtmann, M.D. Arlington. American Psychiatric Publishing, Inc., 2006.

2. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. Arlington. American Psychiatric Publishing, Inc., 2000.

3. Brownley KA, Berkman ND, Sedway JA, Lohr KN, Bulik CM. Binge eating disorder treatment: a systemaic review of randomized controlled trials. *Int J Eat Disord.* 2007; 40:337-348.

4. Braun DL, Sunday SR, Huang A, Halmi KA. More males seek treatment for eating disorders. *Int J Eat Disord.* 1999;25:415-124.

5. Schmidt U. Epidemiology and aetiology of eating disorders. *Psychiatry*. 2005;4:5-9.

6. Vohs KD, Heatherton TF, Herrin M. Disordered eating and the transition to college: a prospective study. *Int J Eat Disord.* 2001;29:280-288.

7. Greenleaf V, Brundage K. NEDA announces results of ED poll on college campuses across nation. 2006. National Eating Disorders Association (NEDA; in press).

8. Garner DM, Olmsted MP, Bohr Y, Garfinkel PE. The eating attitudes test: psychometric features and clinical correlates. *Psych Med.* 1982;12:871-878.

9. Fingeret MC, Warren CS, Cepeda-Benito A, Gleaves DH. Eating disorder prevention research: a meta-analysis. *Eat Disord.* 2006;14:191-213.

10. Stice E, Shaw H, Marti CN. A meta-analytic review of eating disorder prevention programs: encouraging findings. *Annu Rev Clin Psychol.* 2007;3:207-231.

11. Winzelberg AJ, Taylor CB, Sharpe T, Eldredge KL, Dev P, Constantinou PS. Evaluation of a computer-mediated eating disorder intervention program. *Int J Eat Disord.* 1998;24:339-349.

12. Winzelberg AJ, Eppstein D, Eldredge KL, Wiffley D, Dasmahapatra R, Dev P, Taylor CB. Effectiveness of an internet-based program for reducing risk factors for eating disorders. *J Couns and Clin Psychol.* 2000;68(2):346-350.

13. Mitchell KS, Mazzeo SE, Rausch SM, Cooke KL. Innovative interventions for disordered eating: evaluating dissonance-based and yoga interventions. *Int J Eat Disord*. 2007;40:120-128.

14. Dietary Guidelines for Americans, 2005. 6th Edition. Washington, DC: U.S. Department of Health and Human Services and U.S. Department of Agriculture. U.S. Government Printing Office, 2005.

CHAPTER 2: LITERATURE REVIEW

Prevalence

The college environment presents a unique blend of environmental factors which influence students in a variety of ways. Unfortunately, it seems that many of these factors link to the development or exacerbation of eating disorder (ED) behaviors. The sheer transition from high school and home to the freedom of a university setting is enough to alter eating pathology, defined as the deviation from healthy, normal eating habits (1). Adjustments in social support and identity occur as students attempt to fit in amidst a new environment. Much emphasis is placed on academic achievement and stress often arises out of desires to fare well amongst peers. All of these issues, in addition to ever-powerful societal norms for thinness and beauty as portrayed by the media, are risk factors for the development of disordered eating (1).

In addition to the changes encountered upon entering college, students face a variety of population subgroups from which to immerse themselves. Some such subgroups have been shown to present a higher risk for the development of ED, specifically sororities and collegiate athletics (2,3). A survey of female sorority members revealed that female groups who demonstrated certain eating behaviors for a period of time eventually embraced such behaviors as norms (4). An inner drive for thinness has also been shown to differ significantly ($p<0.05$) between Greek and non-Greek women, as Greek women tend to maintain high levels of a drive for thinness while non-Greek women's drive trend downward (5). In a study by Hoerr et al., females in sororities reported significantly greater use of diet pills ($p<0.001$) and incidence of weight concerns interfering with social relationships ($p<0.05$) when compared to non-Greek females (6).

Self-perception often changes as one enters a new environment, dense with peer interaction. In fact, when asked to classify themselves as underweight, average or overweight, females' self-classification changes significantly upon entering college, as compared to their responses in high school (1). The same trend is true for body dissatisfaction, as females report greater feelings of body dissatisfaction post-entry to college relative to high school (1). Self-perception has a greater effect on eating pathology than does objective weight, thus a negative body image does not depend on actual appearance but on one's acceptance of his or her appearance (7).

A cascade-like effect takes place as feelings of body dissatisfaction increase. Extreme discontent with body image has been strongly correlated with maladaptive eating behaviors and is a central risk factor for the development or intensification of ED (7). As a result of body dissatisfaction, dietary restraint has been shown to increase in college female freshmen from the beginning of the year to the end of the year (7). Increased sensitivity to the opinions of others also increases concurrently as body dissatisfaction and dietary restraint increases (7). Thus, body dissatisfaction leads to dietary restraint and increased sensitivity to the opinions of others, which may further heighten one's low self-perception. Based on this research, college is a high risk time for the development or worsening of an ED (8).

In the 1980s, researchers began detecting extreme body dissatisfaction, frequent dieting, and disordered eating behaviors among college females. As research efforts increased, the data revealed that such behaviors were leading to a national ED epidemic within this population. An early 80's study by Hawkins et al. demonstrated that 79% of undergraduate women reported some sort of symptomatology of an ED (9). A later sample from Mintz et al. revealed that 61% of undergraduate women exhibited ED pathology, based on results from Ousley's (1986) Weight

Management, Eating, and Exercise Habits Questionnaire which is formulated from ED diagnostic criteria found in the Diagnostic and Statistical Manual of Mental Disorders (10,11).

Prevalence trends remained steady as the new millennium approached. Research in 1990 by Striegel-Moore et al. (12) revealed that nearly 80% of women dieted and 50% participated in binge eating during their freshman year in college. A 1995 survey on a college campus revealed that 91% of women had dieted to control their weight, with 22% reporting they dieted "often" or "always" (13). The research of the 1990's demonstrated the confounding evidence for the prevalence of ED, leading to wide gaps in the literature and conflicting data. Therefore, the literature continued to postulate that the epidemic was growing at relatively unknown rates. The recent addition of the Eating Disorders Not Otherwise Specified (EDNOS) category has made obtaining accurate population wide statistics even more difficult. EDNOS diagnostics include some, but not all, of the diagnostics for both AN and BN (10). Often, the symptoms of EDNOS are combinations of AN and BN behaviors but not the complete set of diagnostics such that one would be diagnosed as either AN or BN. This EDNOS subclass, which includes binge eating disorder (BED) and sub-threshold levels of AN and BN, accounts for roughly 60% of all outpatient ED cases, compared to just 14.5% for AN and 25.5% for BN (14). This indicates that the EDNOS category is the most prevalent of the three, while also the hardest to pinpoint.

Schwitzer et al. sampled 130 college females who had participated in a multidisciplinary ED intervention program offered on their campus (15). Using the Eating Disorder Inventory screening tool, researchers determined that 83% of participants reported concerns about diet or weight management. Seventy-nine percent of the women reported binge eating behaviors, 13% severely restricted their diet, and 22% participated in some form of compensatory behavior, such as vomiting or diuretic use. Participants saw positive results in some ED behavior areas from

their previous intervention experiences but not in others, placing them in the EDNOS category. If symptoms fall along a continuum, then it would follow that many individuals, no matter their previous relationship to an ED diagnosis, would fit this sub-threshold category. Thus, it seems that the EDNOS diagnosis is indicated in this population. While this was a sample of women who had previously admitted to ED behaviors and sought help to change them, these results indicate that many women exhibit the complex set of symptoms diagnosed as EDNOS (15).

The most recent prevalence data revealed similar increasing trends in the ED epidemic. In a 2003 review of the literature, Hoek and van Hoeken found that 40% of newly diagnosed AN cases are within girls aged 15-19 (16), showing incidence rates increasing since the 1930s and remaining the highest in this age group. The average prevalence of diagnosable AN for college aged women ranged from 0.1 to 0.3%. For BN, 20-24 year old females had the highest risk with approximately 4% of college women meeting BN diagnostics. Statistics for BED and EDNOS were less certain and covered larger age ranges in this review, but prevalence approximations for BED were around 2.6% for women ages 18-40 (16).

Until recently, estimated prevalence of ED among males has remained fairly low. The latest reports, however, indicate that ED incidence in college-aged males is slowly rising. Causal factors again stem from various factors found in the university setting, including changes to social support and identity roles, high levels of stress, acute influence of peers, and powerful social norms, presented by the media, culture, and social environments. In a convenience sample of 2000 college students surveyed using the 26-item Eating Attitudes Test (EAT-26), Hoerr et al. found striking gender differences in the incidence of ED (6). In general, 4.5% of females and 1.4% of males reported having previously sought treatment for an ED and three times as many women (10.9%) as men (4.0%) were at-risk for an ED (6). At-risk males tended to be those that

participated in inter-collegiate sports. Weight cycling trends were similar between men and women, and one-third of both genders also reported having lost and/or regained ten pounds within the last two years (6). Interestingly, rates of body dissatisfaction and weight frustrations tend to peak after college for men, while such issues tend to culminate during college for women (17).

Explicitly, prevalence data from the previous decades remains hard to both obtain and decipher. Various discrepancies in research studies have made synthesizing study data relatively complex. Inconsistencies stemmed from the use of different screening tools, widely diverse population samples, measuring a variety of ED constructs, and differing study formats.

Screening

As the prevalence of ED has risen, several theories were developed in an attempt to explain the origin of this ED epidemic. Until the 1970's, the influence of culture was trivialized (18). Garner and Garfinkel postulated that culture in fact was the culprit and discovered that role models of physical attractiveness were shrinking, putting cultural pressures on those in high-risk population groups (18). Garner and Garfinkel thus developed the Eating Attitudes Test (EAT) as a screening tool designed to assess ED symptom severity.

This once lengthy, self-report measure gained popularity and has since been shortened to a twenty-six item questionnaire, now called the EAT-26. Individuals who score at least a twenty out of twenty-six are considered at-risk for an ED. A follow-up interview is administered to complete a two-step screening process. The purpose is to determine whether the American Psychiatric Association's (APA) diagnostics for any one of the three ED categories are met. EAT-26 is one of the most commonly used screening tools to identify ED risk and classify individuals as "at-risk" (AR) or "not-at-risk" (NAR) (19).

In addition to the EAT-26, Garner and colleagues also developed the Eating Disorder Inventory (EDI), now on its third edition, EDI-3. This screening tool is a self-report measure of AN and BN related symptoms (20). Like the EAT-26, it is a screening tool and simply aides in the formation of a diagnosis. It is divided into twelve subscales, three of which are ED-specific and nine of which are psychological in nature but highly relevant to ED (20). These twelve components of the EDI-3 can be used together, as a whole, or separately, to measure specific constructs of ED. The subscales include: Drive for Thinness, Bulimia, Body Dissatisfaction, Eating Disorder Risk Composite, Low Self-Esteem, Personal Alienation, Interpersonal Insecurity, Interpersonal Alienation, Interoceptive Deficits, Emotional Dysregulation, Perfectionism, Asceticism, Maturity Fears, Ineffectiveness, Interpersonal Problems, Affective Problems, Over control, and General Psychological Maladjustment (20).

Population Samples

Another factor contributing to the variance in ED prevalence data is the difference in populations targeted. The samples vary from study to study as some have targeted specific age groups, genders, races, or those of a certain profession, etc.

Constructs Measured

The data also differ significantly in regards to the constructs measured in each research study. Some studies only target specific constructs, while others address the whole gamut. These constructs include, but are not limited to: dieting behaviors, drive for thinness, thin-ideal internalization, body dissatisfaction, negative affect, AN or BN symptomology as defined by the APA. Therefore, each study is unique in its measuring of ED behaviors and this makes for very inconsistent and ungeneralizable prevalence data.

Research Design

Finally, the format of each individual research study greatly influences the data collected. There is much debate over the usefulness of various formats, such as untargeted versus universal programs, single-session versus multi-session programs, voluntary programs versus those with incentives, and/or epidemiological versus record-based. As such, studies may range from stringent experimental trials to those without comparison groups to simple cross-sectional time series studies. Strict experimental design for ED prevention research is difficult to carry out and makes it difficult to obtain valid and interpretable results. Study format can have a large effect on population and thus make for differences in research data across studies.

Program design also varies from study to study. This is the area of greatest debate in regards to ED prevention. Earlier programs were primarily didactic, but later research studies have made use of psychoeducational and cognitive therapies. More recent studies have made use of an array of newfound techniques, of which the efficacy has yet to be determined. In fact, overall prevention efficacy and effectiveness is just as tenuous as prevalence data, making the research on ED extremely difficult to interpret and apply.

Risk Factors

The pathology of ED reveals that the root of these illnesses is inherent to the psychological realm. The general aim of ED prevention programs is to reduce the risk of developing an ED by reducing the existence of the various risk factors that preclude one to this illness. A host of empirically validated psychological factors have been established through previous research trials which can be viewed in Appendix B. Factors such as elevated perceived pressure to be thin from family, peers and the media, internalization of the thin-ideal defined by

western culture, body mass, negative body image, low self-esteem, distorted thinking, negative affect, and perfectionism are major risk factors in the development of any ED (21).

Schmidt identifies several broad categories of risk factors for ED (22). Sociocultural pressures such as perceived pressure to be thin, modeling of body image, thin-ideal internalization (the belief that being thin is desirable), comparison in social groups (team sports, friendships, organizational involvement) and self-reported dieting lead to an ED mindset and/or belief system. The onset of puberty brings with it an increase in body fat percentage, often traumatizing young girls whose body shape drastically changes. In addition, changes in hormones and sexual maturity also preclude one to a higher risk for an ED. Genetics have recently been shown as a causal link in the etiology of ED. Relatives of ED individuals tend to have a higher risk of developing a disorder themselves, due to heritable ED symptoms, ED personality traits, and genes related to weight control, feeding and energy expenditure (22).

Perinatal factors also play a role in the risk of developing an ED (22). Complications during pregnancy, shorter gestation, very premature birth, and feeding difficulties can increase risk for ED behaviors. There are a variety of personal vulnerability factors, such as perfectionism, negative self-evaluation, extreme compliance, and the variety of constructs measured via the EAT-26 and EDI screening tools. Lastly, environmental factors have been shown to play a major role in ED onset. Things such as life adversity, familial behaviors and beliefs, access to food, and familial expectations and/or attitudes to weight lead to maladaptive food-related behaviors. Schmidt also notes that life stresses, in the presence of any of the aforementioned risk factors, may hasten ED onset (22).

Overview of Prevention Strategies

While it seems that ED prevention is widely acknowledged as a rapidly advancing health issue within the college population, the ED epidemic growth has surpassed efforts to thwart it. Though some prevention programs have been attempted on college campuses, there remains much uncharted territory as the complexity of this widespread issue unfolds. Many research trials have chosen the university setting as a prime location to target the high-risk population presiding there. Unfortunately, various studies indicate that some prevention programs have further spurred the development of ED amongst participants (21). Researchers speculate that such instances may be due to iatrogenic effects. The data to prove such effects are limited and conflicting, but the possibility of intervention-induced ED behaviors deserves careful consideration when designing an educational ED prevention program.

Early prevention efforts began in the 1980's and focused mainly on education. Purely didactic studies have resulted in insignificant effects on most, if not all, of the aforementioned risk factors. These approaches generally show an increase in knowledge regarding ED but not a change in behavioral risk factors (23). Further educational efforts took on a more psychoeducational approach, thereby targeting behavioral issues through educational counseling. Preventions employing such strategies saw greater effects than those that are solely didactic. More up to date research has shown greater intervention efficacy through the use of new methods that are psychologically based. Such attempts focus on cognitive-dissonance-based (CDB) strategies in which a conflict of cognitions is believed to encourage a change in attitudes and thus behaviors. Numerous research studies by Stice et al. have validated that CDB prevention attempts can have significant effects on ED risk factors (21,24,25). The latest prevention efforts have implemented technology-based methodologies (26) and mindfulness

meditation techniques (27), yet the data are limited and inconclusive as to the efficacy of such strategies.

As colleges and universities began to formulate ED prevention plans, emphasis was placed on both primary and secondary prevention. Primary prevention involves preventing those without an ED from developing one. Secondary prevention is that which motivates those with an ED to seek help and/or decrease ED behaviors. In the first empirical evaluation of an ED prevention program aimed at college students, Mann et al. (28) analyzed the effectiveness of an awareness-raising prevention program set on a college campus that focused on simultaneous primary and secondary prevention. Individuals who had or currently struggled with an ED served as the program presenters by offering general information about their ED experience and reviewing the various ED treatment processes. A group of 350 freshman females heard this presentation while another group of the same size did not (28).

Researchers discovered that the program did not achieve primary or secondary prevention but in fact may have increased participant risk upon program participation. Results showed that healthy individuals exhibited greater ED behaviors post-presentation based on Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994) responses, as compared to the control group (28). In regards to secondary prevention, only three high-risk participants sought help, demonstrating weak prevention effects. The investigators presumed that such efforts may fail due to their dual-purposed design and recommended further research on programs which focused solely on primary or secondary prevention (28).

The latest meta-analytic review of ED prevention programs from the last twenty-six years showed promising results. Stice et al. (21) reviewed sixty-six published and unpublished studies meeting a variety of inclusion criteria that utilized an array of prevention strategies. Twenty-six

of the prevention programs reviewed (51%) yielded significant reductions in at least one established ED risk factor, while fifteen of the prevention programs (29%) significantly reduced ED pathology. In fact, the results showed that within that 29%, prevention programs resulted in both reduced extant ED pathology and prevention of increases in ED pathology. This could be considered success on the basis of both primary and secondary prevention (21).

With such a large review sample, a wide range of program effects were noted, thus moderating factors were also analyzed. The authors found that targeted programs produced more significant results than universal programs, especially when focused only on females over the age of fifteen. In regards to program format, interactive programs yielded more significant results than those that were purely didactic and/or psychoeducational. Larger program effect sizes were also noted when trained interventionists delivered program components as opposed to novice volunteers. The same was true for multisession programs as compared to single-session programs. Also of note is that the most effective studies in the review made use of media and advertising to publicize their program specifically "for people with body image concerns" (21).

Program content was also a critical influence on program effects. Psychoeducational content produced the least significant effects, while programs with dissonance-induction content saw the greatest significance in effect sizes. The authors also noted that programs emphasizing content on body acceptance saw greater effect sizes than those that did not. In summary, the success in reducing current and future ED symptoms, replication of positive ED prevention program effects and the empirical establishment of newer, improved ED programs gives hope for the future of ED prevention and intervention. Gaps in the literature still exist in regards to mediating and moderating factors that affect program influence. The authors pushed for the

development of more general prevention techniques that can be applied universally to all content areas (21).

The various prevention strategies found within the literature can be grouped into general categories. The timeline of research efforts presents an orderly sequence of expansion in the prevention field, thus imparting the following four prevention program categories: simple screening paired with didactic and/or educational strategies, psychoeducation and/or cognitive behavioral therapy (CBT) strategies, computer and/or internet-based strategies, and miscellaneous strategies, such those that are mindfulness/meditation programs and those that employ a combination of the aforementioned strategies.

Screening and Education Prevention Programs

The first wave of ED prevention programs focused primarily on screening and educational efforts. The thinking was that through screening, one may be alerted to risk or diagnosis of an ED and thus seek help upon recognition of a problem. Concurrent education on the significance and severity of ED would further promote the cessation of maladaptive eating behaviors and the seeking of help. Some study results, however, revealed iatrogenic effects amongst program participants as a result of ED education (29). The research on screening and education-based ED prevention programs is at odds, but does indicate some positive uses for such processes.

A late 1990's study done by Mann et al. (28) surveyed 788 college freshmen at the beginning of their first year. Students completed a questionnaire on body image and eating habits, including the Eating Disorder Examination Questionnaire (EDE-Q) to screen for ED symptoms. Three months later, half of the respondents were invited to participate in an ED prevention program, while half were not. The program was a simple 90-minute panel discussion

given by two students who had previous histories of an ED and sought treatment. Groups of 10 to 20 participants attended the discussion each time it was given. The panelists first provided general background information about ED and then shared their personal experiences with an ED, including the causes, how they learned about ED, their symptoms/behaviors, how and why they sought help, their treatment process, and what they learned from their experience. Four weeks and twelve weeks after the program was completed, program participants and control participants were surveyed again (28).

Baseline EDE-Q results indicated that 20% of the study sample participated in binge eating, 21% fasted, 3% vomited and 2% admitted to laxative misuse, resulting in an overall ED prevalence of 46% within this population (28). All three surveys were completed by just 113 participants, thus intervention effects were on these subjects. Across the three surveys conducted, no significant differences in EDE-Q scores were detected between program and control participants, suggesting effect on ED symptomology. In fact, analysis revealed that program subjects' EDE-Q scores increased after participation in the panel discussion. These effects were small and did disappear within several months but nonetheless suggest the possibility of iatrogenic effects from psychoeducational prevention programs (28).

In 2003, Becker et al. reported promising results on the use of a screening and education ED prevention program (30). This study utilized the National Eating Disorders Screening Program (NEDSP) developed by Screening for Mental Health, Inc. as a means of screening college campuses across the US for ED individuals with hopes of it facilitating help-seeking for participants found to be AR for an ED. The NEDSP consisted of a two-stage screening in which participants completed a self-report screening questionnaire and a follow-up face-to-face evaluation done by a trained counselor, who would determine an individual's need for referral by

identifying ED risk. Subjects were then categorized as no referral needed, professional evaluation needed, and professional evaluated needed-urgent. Of the 289 subjects evaluated, 50% of acknowledged participating in the NEDSP for personal concerns, 20% participated for concerns another had for them, and 24% participated due to concerns regarding a friend or family member. After completing the self-reported questionnaire, 188 subjects met with a counselor for a follow-up evaluation to determine referral need and 109 (58%) were referred for further evaluation based on presentation of ED symptoms (30).

Participants noted several positive effects of the NEDSP in follow-up evaluations (30). The severity of ED and the availability of treatment were made aware to 81% of participants and 38% acknowledged that the program confirmed that an ED was present. In addition, 32% of participants stated that the NEDSP facilitated their admission of having an ED, while 28% revealed that the NEDSP enabled them to receive help for their ED. Of the 109 subjects who were referred for a second professional evaluation, 47.7% kept their first appointment, thus indicating a positive result from the screening program. It is important to note that only 3% of participants claimed the program had a negative or iatrogenic effect on them. Overall, 74.3% of participants said that the program had a positive impact on their eating/weight concerns or symptoms. Therefore, a screening and general education ED prevention program such as the NEDSP can facilitate the process of addressing risk for or development of an ED with subsequent seeking of help. By facilitating the process of identifying risk and available sources for help, such programs can possibly prevent the development of or exacerbation of an ED (30).

A traditional education program was attempted in 1998 by Springer et al. through the implementation of an undergraduate body image course entitled “Body Traps: Perspectives on Body Image” (31). Two academic credits were offered for course participation and 24 female

undergraduate students enrolled. The class met for two hours weekly over ten weeks and topics covered included media, history of beauty, biological/evolutionary aspects of attractiveness, adolescent development, disability, aging, body building, cosmetic surgery, anorexia and bulimia risk factors and consequences, obesity, and cultural difference. The presentation of information was in the format of guest lecturers, panel discussions, and multimedia programs. A class-wide discussion closed out each of the meeting times. Students were also required to write a two to three-page response incorporating their feelings, thoughts and criticisms of assigned readings related to body image. Baseline and post-course assessments of body image and eating attitudes were conducted using the Eating Disorder Inventory (EDI) Drive for Thinness and Bulimia subscales and the EDE-Q (31).

Significant improvements in EDI and EDE-Q scores were detected from baseline to post-program (31). Such significant results were most notable amongst students at most risk for an ED, based on EDE-Q baseline scores. The success of this purely didactic prevention program stands out from the failures previous educational attempts. This may be due in part to the academic and nonpersonal perspective of its format. Instead of focusing on an individual's need to change, the course evaluated the various external forces (biology, culture, developmental process, history, psychology) which influence risk for an ED. Another noteworthy difference from previous educational strategies was the lack of instruction on healthy eating and weight management. Results are limited, however, by the absence of a comparative control group. These findings nevertheless suggest that an academic setting may in fact be appropriate and efficacious in reducing one's risk for an ED (31).

In 2001, Stice et al. also tested the efficacy of an academically based ED prevention program for college students (24). Seventeen female undergrads enrolled in a class entitled

"Eating Disorders" and were matched to 71 undergraduates enrolled in psychology seminar classes. Both groups completed baseline and post-class surveys measuring thin-ideal internalization, body dissatisfaction, dieting and eating pathology, each measured by empirically validated instruments. The "Eating Disorders" class met twice weekly for 1.5 hours at a time over a 15-week semester. Each meeting consisted of didactic presentations and group discussions, focusing on descriptive pathology, epidemiology, etiologic models, empirically documented risk factors, preventive interventions and treatments for eating disorders and obesity. Students completed a 10-page paper and class presentation on a topic of their choice, in addition to three essay exams. Post-class survey responses showed significant improvements from baseline in body dissatisfaction, thin ideal internalization, dieting and eating pathology for class participants as opposed to controls. While this study's sample size is small, its results indicate significant reductions in ED risk factors and point to the usefulness of a classroom environment to achieve such outcomes (24).

In 2006, Stice and colleagues conducted a replication and extension trial of their "Eating Disorders" college course (25). Study components remained the same, with the addition of a six-month follow up survey to assess whether or not study effects lasted beyond class participation. A larger sample of twenty five undergraduate women was used and matched to 70 students in psychology seminars. Similar to the first controlled trial of "Eating Disorders," class participants experienced significantly greater reductions in thin-ideal internalization, body dissatisfaction, dieting and eating pathology than the matched controls and these results were maintained at six-month follow up. The replication of the first study's findings is highly noteworthy, as is the maintenance of effects. Such positive results reiterate the possible practicality of administering ED prevention programs through formal university courses (25).

Cognitive Behavioral Therapy Prevention Programs

In an effort to improve educational methodologies, many ED researchers have made use of psychoeducation. The Center for Mental Health Services defines psychoeducation simply as health education paired with behavioral counseling. A growing number of studies have employed cognitive dissonance (CD) and/or cognitive behavior therapy (CBT) strategies that have elicited more positive results than the strictly educational approaches. CD is defined as a general sense of discomfort as a result of holding two or more conflicting cognitions and/or as a result of performing an action that goes against one's routine (32). CBT uses the ideas of cognitive dissonance and applies them to specific behaviors with the intention of changing attitudes and beliefs, leading to a change in harmful behaviors. These ED prevention programs use counterattitudinal activities to generate instances of inconsistent cognitions amongst subjects so as to create psychological discomfort in hopes of spurring them to adopt more healthy beliefs and attitudes (33).

In 1999, Stice and colleagues (34) began a series of research trials investigating the effects of CD prevention programs. A sample of 30 undergraduate women invited to participate in a body image improvement intervention were randomly assigned to a CD program group and a control group. Those in the CD group participated in three one-hour, group sessions that involved activities such as group discussions on body image/acceptance, the origin of the thin-ideal and how it has evolved, the effect of societal messages on the thin-ideal, and benefits received and costs incurred from adopting the thin-deal. In addition, counterattitudinal role-playing exercises forced participants to mimic healthy attitudes and behaviors. Participants were evaluated on the following ED constructs using respective empirically validated screening tools for each: thin-ideal internalization, body dissatisfaction, dieting, negative affect, and bulimic

symptoms. Those in the control condition simply completed the screening process and did not participate in group classes. Results revealed significant decreases in the CD group for thin-ideal internalization, body dissatisfaction, negative affect, and bulimic symptoms as compared to the control group. All results were maintained at one-month follow-up except for negative affect. While the sample size was relatively small, Stice et al. postulated that this was the first CD program of its kind to produce such significant reductions in ED symptomology (34).

In further developing their 1999 study, Stice et al. (33) tested their CD prevention program against a placebo control condition with a larger sample size. Study design was relatively similar to their previous format, with random assignment to a CD group (n=48) or a placebo control group (n=39) that participated in group education classes focused on health weight management via didactic means. The same ED constructs from the previous study were measured and evaluated for both groups. Similar to the 1999 data analysis, CD program participation resulted in significantly greater decreases for thin-ideal internalization and body dissatisfaction as compared to the control group, while decreases noted in both the CD and control group for negative affect and bulimic symptoms were not significantly different (33). This suggests that there is some usefulness for educational strategies in prevention attempts.

In 2004, Matusek et al. (35) built upon the 1999 Stice et al. model by comparing the results of a CD-based prevention program and a didactic healthy behavior (HB) program to a group of wait list controls (WL). Eighty-four undergraduate participants, the majority being freshmen, were randomly assigned to one of the three previously mentioned groups. Researchers measured individuals' body image and body dissatisfaction, thin ideal internalization, eating behaviors and their influence on psychosocial functioning, and self-esteem, hypothesizing that those in the CD group would experience the most significant effects as compared to both the HB

and WL groups. Program format followed a single session model that lasted two hours. Again, focus was placed on defining and discussing the origin of the societal thin-ideal and conditions that perpetuate it, identifying repercussions from internalization of the thin-ideal from messages received through environmental communication channels, discussing who benefits from the thin-ideal, and the costs of society's acceptance of the thin-ideal. Those in the HB program received education on healthy eating and exercise habits, which was reinforced through group discussions (35).

Results showed significant reductions in the drive for thinness, internalization of the thin-ideal, body image dissatisfaction for both the CD and HB groups as compared to the WL controls (35). Interestingly, CD participants did not experience significantly greater effects than those in the HB group as the researchers hypothesized. It is important to note that baseline scores for both experimental groups placed them at high-risk for an ED, thus limiting the results of this study to those who are AR. Also surprisingly was an increased internalization of the thin ideal in WL participants from baseline to follow-up. This was most likely due to increased saliency of the thin-ideal stemming from baseline survey questions (35). Such an effect mimics that found by Stice et al. in their first trial conducted in 2000 (33). Nonetheless, results from this study speak to the potential efficacy of a single-session prevention format using CBD and/or HB tactics.

In 2001, Nicolino et al. (36) evaluated their own CBT model for ED prevention in a sample of 95 nonclinical undergraduate females. Participants were randomly assigned to a CBT group (n=45) or control group (n=40). Measures of body image, dieting, physical appearance anxiety, and "fear of fat" were carried out using each construct's validated screening tool. Both groups participated in a two-hour group session in five separate groups of 7-10 women. The

CBT individuals discussed negative body image and its consequences, emotions connected to negative body image, and triggers of a negative body image. Much focus was placed on the participants' personal body-preoccupying rituals, body image beliefs, and behaviors used to compensate for their body image. In addition, discussions on reducing self-consciousness and high risk situations were paired with practicing relaxation and positive reinforcement techniques. The control group received a brief educational review on body image and ED behaviors. Data analysis revealed no significant decreases in any of the measured constructs for either group (36). This may have been due to the single-session format and small sample size, but nonetheless reiterates the complexity of defining an effective prevention program.

Green et al. conducted a rigorous research study comparing prevention programs various CD levels (37). One-hundred fifty-five female undergraduate students were screened using the Questionnaire for Eating Disorder Diagnoses (Q-EDD; Mintz et al., 1997) and only nonclinical individuals were selected for participation. The women were randomly assigned to one of three experimental conditions: low level dissonance (LLD), high level dissonance (HLD), or no-treatment control. Each experimental group met for two, two-hour sessions consisting of a variety of activities that encouraged body acceptance and discouraged the adoption of society's thin-ideal. Measures of dietary restraint, ideal-body stereotypes, and appearance beliefs were measured using empirically validated screening tools, along with other ED constructs assessed by the Eating Disorder Examination-Questionnaire (EDE-Q) (37).

The HLD and LLD conditions differed by means of experimental manipulation (37). Pointed attempts were made to ensure that HLD participants had higher perceptions of participation being voluntary, paired with an expectation that they would be expressing their views publicly, and that they would be asked to exert much effort in all activities. This

manipulation was done to guarantee that the highest level of cognitive dissonance would be evoked. Manipulations for the LLD participants, on the other hand, fostered low perceptions of voluntary participation, expectations of opinions being kept private, and the belief that participation effort should be kept to a minimum. Controls simply completed the same construct measures without group activity participation (37).

Results of the Q-EDD pre-screen led to groupings of symptomatic, those presenting some but not all of the DSM criteria for an ED, and asymptomatic individuals, those showing no symptomology whatsoever (37). Post-program analysis revealed that symptomatic individuals demonstrated significantly higher EDE-Q scores than asymptomatic individuals. EDE-Q scores for the HLD participants were significantly lower than those of the LLD participants. However, neither the HLD nor LLD EDE-Q scores differed significantly from the control group scores post-program. While no significant effects of prevention strategy were noted, the significant results in regards to symptomology indicate the need for specialized and targeted prevention programs based on one's risk for an ED (37).

A more recent study conducted in 2006 by Roehrig et al. combined CB strategies with psychoeducation in an attempt to reduce thin-ideal internalization and bulimic symptoms in undergraduate college females (38). Participants were randomly assigned to one of two active treatment conditions: a comprehensive approach (CA) employing psychoeducational exercise, counterattitudinal advocacy exercises, and behavioral exposure strategies and a purely counterattitudinal advocacy approach (CATT). Significant reductions in thin-ideal internalization, body dissatisfaction, dieting behaviors, negative affect and bulimic symptoms were found for both the CA and CATT groups from baseline to program completion. With the exception of negative affect in the CATT group, all reductions remained at one month follow up.

Between-group comparisons revealed greater decreases in body dissatisfaction in the CATT group than the CA group, suggesting that counterattitudinal exercises are an essential component of CDB methodologies (38).

Computer and Internet-Based Prevention Programs

Recently, researchers have made use of computer technologies to deliver ED prevention programs. A number of benefits are found with such methodology, including a reduced cost, wider reach, streamlined evaluation and data collection, low participant burden, and relative confidentiality. Some speculate that internet-based programs facilitate help seeking as they enable individuals to remain in the privacy of their own home and thus avoid face-to-face contact and social stigma. The results of computer and internet-based programs, as with other strategies, are positive but require further attention and investigation.

A team of researchers led by AJ Winzelberg at Stanford University developed a computer-based ED prevention program, *Student Bodies,* prototype in 1997 (39). *Student Bodies* began as a multimedia software package paired with a computer-mediated, email-based support group. The overall goals of this program were to reduce maladaptive ED attitudes and behaviors amongst participants. The content of the *Student Bodies* software focused on body image dissatisfaction, excessive weight concerns, dieting and restrained eating patterns presented through audio and video media. In its trial run, *Student Bodies* was tested on a group of 57 healthy, undergraduate females who were randomized to a *Student Bodies* group or a delayed intervention control group (control participants would be given the option to complete *Student Bodies* postintervention). *Student Bodies* participants were further assigned to an anonymous moderated email support group that was to facilitate emotional and social support, monitored by a clinical psychologist. ED-related attitudes and behaviors were measured using the EDI, EDE-

Q and Body Shape Questionnaire (BSQ; Cooper, Taylor, Cooper, & Fairburn 1987). In addition, general knowledge was also assessed using a 16-item quiz generated by the research team (39).

Baseline, immediate postintervention, and 3-month follow-up assessments were conducted for both the *Student Bodies* and control groups (39). Results clearly showed that the intervention group significantly improved their body image as compared to the control group and both experienced significant gains in knowledge, with results maintained at 3-month follow-up. Interestingly, both groups improved similarly on all other measures but this may be explained by a low adherence to the program or other ongoing efforts aimed at boosting self-esteem amongst women on campus (39).

Shortly thereafter, the Stanford research team revised *Student Bodies* to an internet-based format with a primary focus on body image (40). The new 8-week long program utilized text, audio and video tools, interactive online self-monitoring journals and various exercises aimed at behavior change. Assignments included weekly postings to a discussion group forum, comments on other participants' postings, and other tasks. Material emphasized the history of ED, social norms of beauty, the role of the media, and strategies for improving body image. The same outcome measures and tools were used in this revised replication study as its prototype, as was the frequency of measures. Mimicking the first trial, this study of 60 female undergrads revealed significant improvements in BSQ and EDI scores as compared to controls. Intervention participants also continued to improve their scores from postintervention to follow-up, indicating longevity of effect. Thus, these results reiterated the efficacy of *Student Bodies* as determined in the first trial (40).

Low et al. (26) replicated this second *Student Bodies* trial with the inclusion of an unmoderated discussion group in hopes of identifying the effects of a moderator on program

influence. Using the same format as Winzelberg et al. (40), this study randomized participants to one of four groups: *Student Bodies* with a clinically moderated discussion group; *Student Bodies* with an unmoderated discussion group; *Student Bodies* with no discussion group; and a wait-list control. Significant intervention effects were noted for EDI scores, repeating the idea that *Student Bodies* decreases ED risk factors in undergraduate women. In addition, those in the *Student Bodies* group without a moderator had significantly lower scores on several outcome measures as compared to controls. This suggests that clinical moderation of support groups has little effect and may not be necessary, thus saving time and resources in the implementation of *Student Bodies* (26).

To further corroborate their previous findings, Winzelberg et al. (41) compared the *Student Bodies* program to a classroom-delivered educational program entitled *Body Traps* and a wait-list control group (WLC). *Student Bodies* was further modified with the online participant progress reports with feedback, course reader article readings with one-page reflection essays, online readings paired with cognitive–behavioral assignments addressing body image dissatisfaction, excessive weight concerns, dieting, exercise and nutrition, a confidential online body image journal, and three 1 to 2 hour face-to-face sessions led by a moderator. *Student Bodies* participants also received two pass/fail academic credits for completion of all program assignments. The *Body Traps* classroom program emphasized the same topics and objectives as *Student Bodies* but remained purely academic, not incorporating cognitive-behavioral components for the improvement of body image. This class met once a week for two hours and was lecture-based. Participants had assigned readings from the same course reader as the *Student Bodies* group and also completed one-page reflection essays. WLC participants were offered the *Student Bodies* postintervention (41).

Again, the same outcome measures and tools were used to assess participants at baseline, postintervention and at 3-month follow-up (41). *Student Bodies* participants showed significantly greater improvements in EDE-Q and EDI scores as compared to WLC. No significant differences were detected amongst *Body Trap* participants as compared to either the *Student Bodies* group or the WLC. When intervention effects were analyzed for participants considered high-risk, *Student Bodies* participants had significantly lower weight/shape concerns than both *Body Traps* and WLC. This indicates a highly concentrated effect on body image concerns for high-risk individuals (41).

Similar results in high-risk individuals were found by Zabinski et al. (42) in a *Student Bodies* program targeted at undergraduate women who scored ≥ 110 on the BSQ, thus designating them as "high-risk. This study utilized the prototype *Student Bodies* program and obtained outcome measurements at baseline, postintervention, and at 10-week follow-up. Zabinski et al. reproduced results found by Winzelberg et al. as the *Student Bodies* group experienced greater reductions in body image dissatisfaction than the controls, with results maintained at follow-up. Zabinski et al. further investigated the usage of *Student Bodies* through a second study in which they evaluated the addition of synchronous support groups (43). The *Student Bodies* prototype had simply utilized asynchronous support groups through electronic message boards. In this study, researchers incorporated an interactive chat room, much like Winzelberg et al. did in their second trial of *Student Bodies* via an online discussion group forum. Chat room participation consisted of 60-minute online discussions amongst group members, answering questions related to body image and ED as posted by the moderator, an advanced graduated student in clinical psychology. Yet again, *Student Bodies* participants

experienced significant improvements in EDE-Q and weight/eating concern scores as compared to WLC. Results were again maintained at follow-up (43).

Taylor et al. (44) utilized the modified, internet-based version of *Student Bodies* among high risk undergraduate females in a 2006 study. Participants were considered high-risk if they scored a 50 or above on the Weight Concerns Scale (WCS), a tool with high reliability and good predictive validity. Following a study design similar to Winzelberg and Zabinski et al., Taylor and colleagues found that intervention participants had significantly improved scores on the WCS, EDE-Q, and EDI subscales from baseline to postintervention and from baseline to one year follow-up as compared to controls. Thus, Taylor et al. demonstrated greater longevity of *Student Bodies* positive effects. While no overall reduction in the onset of ED was noted, there was a reduction in ED onset for two subgroups: those who had baseline compensatory behaviors and those with elevated baseline BMIs. These individuals constituted approximately half of the study sample, thereby suggesting specific identifiable risk factors for the onset of ED (44).

Several other adaptations of the *Student Bodies* program have been developed and tested in the last decade. Programs such as *Food, Mood and Attitude* (45), the Australian *Set Your Body Free Group Body Image Program* (46), and a German version of *Student Bodies* (47) have all produced similar results as compared to Winzelberg et al. and Zabinski et al.'s findings. Another interesting approach was investigated by researchers at Wellesley University (48). While not a randomized controlled trial, this study observed the usefulness of a university-wide, online, public bulletin board for the discussion of political, social and personal body image issues. Feedback was generally positive and participation was active. Acknowledgement of unforeseen ED issues was noted and bulletin board discussions and interactions facilitated disclosure of certain individuals ED struggles, potentially suggesting its usefulness as a help-

seeking tool (48). Clearly, the evidence suggests that the use of computer and/or internet-based strategies for the prevention of ED is efficacious.

Miscellaneous Prevention Programs

While the majority of ED prevention programs fit into the three aforementioned categories, a few methodologies require a miscellaneous classification. Schwitzer et al. (49) present such a case with a review of a collaborative program implemented at James Madison University (JMU). The applied program model in this study emphasized collaboration amongst health educators, the student health and counseling centers, dining services, residence life and Greek life programs. The program was organized and led by a task force consisting of a health center physician, nurses, a health educator, various psychotherapists, a dining services dietitian, wellness center staff members, and the health center's consulting psychiatrist. The program format took on a three-pronged approach of preventive, developmental and psychotherapeutic intervention efforts (49).

Preventive intervention targets those with normal eating pathology who might be at-risk for developing maladaptive behaviors, such as sorority members, athletes, or perfectionists (49). Preventive efforts focused on raising ED awareness and understanding, promoting positive body image attitudes and healthy behaviors. Developmental intervention targets individuals with a budding or pre-existing need of assistance, such as a normal-weight individual who compulsively exercises and experiences weight anxiety or an EDNOS candidate. Focus is placed on developing normal psychosocial skills to curb progressing ED risk factors and developmental shortcomings. Psychotherapeutic interventions are aimed at individuals with an elevated sense of urgency and motivation for change, such as those with diagnosed ED. Both individual and group psychotherapy strategies are used to monitor and treat recurring ED behaviors (49).

The JMU program addressed this three-pronged approach to ED prevention through a variety of ways (49). Efforts were marketed so as to increase program awareness on campus. Preventive measures were carried out by peer educators, trained by the task force team, who organized and conducted workshops for residence halls, Greek organizations and sports teams to address the topics of nutrition and weight management, early signs of disordered eating and other student-requested issues. Targeting EDNOS individuals, developmental intervention components, such as dining center education programs and free appointments with a registered dietitian, aimed to improve self-perceptions and weight management skills. In addition, one-on-one and group CBT was offered with an emphasis on positive self-assessment and behavior change strategies. (49)

A major limitation of this program is a built-in lack of opportunity for outcome data collection as the efforts rely heavily upon student initiative and interest (49). Thus, a thorough evaluation of outcome measures is not provided in the literature; however, the methodologies and planning processes behind this program model present interesting concepts to consider in designing an ED prevention program for the college population. James Madison University has since maintained this program model with an Eating Disorders Prevention Team and an interdisciplinary treatment team entitled Stop Eating and Exercise Disorders, which meets weekly to evaluate school progress in addressing the ED epidemic on that campus (49).

Another interesting approach to the prevention of ED was investigated by Mitchell et al. (27). A sample of 93 undergraduate females was randomly assigned to one of tree ED prevention programs, an interactive dissonance-based program, a yoga/meditation-based program or a control group. All three groups completed baseline and post-intervention measurements, assessing general ED symptomology, binge eating behaviors, drive for thinness,

body dissatisfaction, and dietary restraint. At baseline, a number of subjects presented various ED behaviors but groups did not differ significantly. Both the yoga and dissonance groups met once weekly for 45-minute sessions over a period of six weeks. Yoga sessions consisted of various standardized yoga exercises, with the intent of promoting mental heath and relaxation thereby positively affecting any ED symptomology. The dissonance group participated in an adaptation of the Stice cognitive dissonance-based program model (33,34). Control group participants simply completed outcome measures (27).

Results showed that dissonance group members had significant reductions in body dissatisfaction and drive for thinness as compared to controls (27). No significant reductions in ED behaviors were detected for those in the yoga group. The only previously published study evaluating a yoga-based program utilized subjects who had chronically practiced yoga. This study's subjects, however, had never done yoga and this may have led to lack of significant effects (27).

With the ever-increasing complexity of this epidemic comes an increasing need for more innovative and empirically validated and effective ED prevention programs. Thus far, the research has yielded both positive and negative findings. Programs that combine and/or make use of the most efficacious strategies may prove to be most effective. A random sample of female undergraduates and graduates at a public university was surveyed to identify what services and resources students thought were most helpful for the prevention and treatment of ED (50). Seventeen percent of respondents scored at or above 20 on the EAT-26, designating them as AR for an ED. Researchers thus subdivided the sample into ED diagnosable (Dx) and non-diagnosable (Ndx). When asked "to whom would you be most likely to go for help if you were concerned about your weight or eating?" both groups chose a friend as their first pick.

However, second choices differed significantly as Dx women chose dietitians and Ndx women chose physicians. When asked to choose the most helpful resource for obtaining help for an ED (amongst individual therapy, group therapy, family therapy, dietitian consult, and physician consult), both groups chose individual therapy as their primary source for help. Second choices differed significantly, with those in the Ndx group chose a dietitian consult while those in the Dx group chose group therapy (50).

These results lead to a couple of suggestions for prevention efforts. First, the idea of peer education may be well received within this population as respondents indicated that their first attempts at help-seeking would involve a friend. Secondly, collaborative teams of dietitians, counselors and physicians must work together to address ED as an individuals risk and needs will determine to whom they seek professional help from.

Dietary Intake Data

Interestingly, few data exist on the dietary habits and nutritional quality of AR and diagnosed individuals, as compared to NAR individuals. Most nutritional analysis studies focus on energy intake, and macro and micronutrients. Analysis of biochemical levels are commonly conducted as well, which may shed some light on an individual's diet but does not give explicit details as to daily intake patterns. The Dietary Guidelines for Americans (DG) make specific recommendations for various food groups, nutrients, vitamins and minerals (51). The daily recommendations for college students are as follows: two cups of fruits, two and a half cups of vegetables, at least three ounces of whole grains, three cups of fat free or low fat dairy or dairy products, consume less than 10 percent of calories from saturated fatty acids (SFAs), total fat intake between 20-35% of calories, and up to one drink per day for women and two drinks per day for men. These recommendations are based on an averaged estimated daily calorie

requirement of 2000 kcal for a healthy adult. The different behaviors across ED suggest that the dietary habits of ED individuals may be extremely varied.

In a study of hospital in patients, Hetherington et al. (52) compared the eating behaviors and dietary intake of bulimics to those of randomized controls. Bulimic patients were permitted to continue binge-purge cycles upon admittance and were allowed to request specific foods from a list of typical binge foods that they provided the research team. Control subjects simply selected meals from the hospital menu as desired. Both groups' meals were analyzed and weighed for nutrient and energy composition (52).

Binge food choices followed similar patterns among bulimic subjects (52). Intake consisted of primarily sweet, high-fat foods in addition to salty snacks. The average energy intake per day for bulimics over a four day period was 8050 ± 427 kcal, as opposed to 1924 ± 102 kcal for controls. Thus, bulimics consumed significantly more daily energy than control subjects. Protein intake for bulimics was significantly lower than controls while percentage of kcal from fat was significantly higher than controls. Carbohydrate-based energy did not differ between groups. Clearly, calorie consumption far exceeded the DG (51,52).

Gendall et al. (53) compared the dietary records of fifty women with BN to those of a random sample of healthy women and the recommended dietary allowance (RDA). When compared to control intakes, nonbinge eating episodes in BN women consisted of significantly lower energy, protein, carbohydrates, sucrose, total fat, SFA, monounsaturated fatty acids (MUFA), polyunsaturated fatty acids (PUFA), cholesterol, zinc, and vitamin B12, but greater in alcohol ($p<0.05$). The same was true for binge eating episodes, with the addition of fiber, folate, vitamins A and C, and iron also being significantly lower ($p<0.05$). Except for vitamin C, the average intake from binging episodes did not meet at least two thirds of the RDA for all

nutrients. In addition, positive correlations ($p<0.001$) were found between binge energy intake and frequency of both binging and purging, as was total energy intake for both nonbinge periods and binge episodes (53). The low vitamin and mineral intakes during binge episodes indicate low nutrient dense food choices during binges, while lower energy intake during nonbinge periods suggests that between binges individuals attempt to compensate for their bingeing intake by eating less. Thus, overall poor nutrition is achieved with low nutrient dense foods during bingeing and low intake during nonbinge periods.

Milosevic et al. (54) conducted nutritional assessments on 15 bulimics to assess their carbohydrate, fat and protein intakes. Subjects were diagnosed using the DSM-III and voluntarily completed a one-week food intake record upon their first visit with researchers and a second one a month later. Mean daily carbohydrate intake amongst subjects was recorded as 208.5 g, or 47% of total kcal. Average daily fat intake of 76.8 g accounted for 39% of total kcal while protein constituted just 14% of kcal at 61.3 g per day. Average daily caloric intake was 1770 kcal. At recall, caloric intake increased to an average of 2305 kcal. Percentage of calories from carbohydrates and fat rose to 48% and 40%, respectively, while percentage of calories from protein dropped to 12%. Both intake records reveal excess fat intake and insufficient carbohydrate and protein intakes as compared to the DG (54).

Cooke et al. (55) compared the dietary intakes of women with BED to those of non-ED women. Two groups of ten BED women and ten non-BED women ate standardized breakfasts and told not to eat again until returning the lab. They were then offered identical meals in the afternoon and encouraged to "eat as much as [they] wanted." Trays were weighed both before and after consumption. Results showed that those with BED consumed significantly more calories (1515 ± 392.9 kcal) than those without BED (1115 ± 317.6 kcal). Item-by-item meal

analysis revealed that those with BED ate twice as much ice cream and lettuce as controls, while neither of these differences was significant. Those with BED did consume significantly more meat during their meals than controls, with no significant differences found between vegetable, carbohydrate, and dessert categories (55).

In an ED dietary analysis trial, van der Ster Wallin (56) et al. compared the dietary habits of both anorectics and bulimics. Subjects consisted of 12 restricting anorectics, 27 bulimics, and 12 anorectic bulimics. All subjects completed diet histories and dietary habit questionnaires and results for each group were compared. Bulimics reported initiating weight loss through crash dieting and eating at irregular hours via diets made up of mostly fruit, vegetables, dairy, and limited meat. Thus, bulimics indicated eradicating cereals and grains from their diets at ED onset. Anorectics focused primarily on removing visible fat from food and avoided fatty food items. They also noted increasing their fiber intake and their diet consisted mainly of breads/grains, low fat dairy, lean meats and fish, fruits, and vegetables. Anorectics consumed significantly more breads/cereals than bulimics. Macronutrient intake resulted in a two-way comparison as the bulimics and anorectic bulimics did not differ significantly in any dietary aspect. Thus, bulimics (both strict bulimics and anorectic bulimics) were compared to strict anorectics. Average daily energy intake was significantly higher in anorectics compared to bulimics, as were carbohydrate and fiber intakes. While this study gleaned information on the intakes of those with ED, it did not compare their intake to a normal standard, such as the DG (56). Therefore, it is unknown whether or not these individuals received adequate nutrition or not.

The first study comparing diet history to observed intake in AN patients and healthy control matches was conducted by Hadigan et al. (57) in which they compared the macro and

micronutrient intakes of women with AN. Results showed that 50% of both AN subjects and control subjects failed to meet the RDA for vitamin D, calcium, folate, vitamin B12, zinc, magnesium and copper based on reported intake. Controls, however, reported adequate total energy intake while AN subjects did not. Those with AN reported significantly greater energy intake (1602 ± 200 kcal) as opposed to observed intake (1289 ± 150 kcal), when compared to control subjects ($p = 0.01$). The macronutrients followed similar trends. In regards to protein, AN subjects reported consuming significantly more protein than they actually ate (63.1 ± 7.1 vs. 53.9 ± 5.3g; $p<0.05$) and their consumption was significantly less than control subjects ($p<0.05$). The same significance was true for carbohydrates, with 265.5 ±25.3g reported versus only 210.3 ±20.2g consumed, and significance remained when compared to control subjects. Fat consumption was also significantly less ($p<0.05$) amongst AN subjects as compared to controls, and they reported consuming significantly more (36.1 ±10.0g) than they were observed eating (31.1 ± 7.7g; $p<0.05$). Overall, Hagidan et al. discovered that significant micronutrient deficiencies exist with the AN population, most likely due to significantly low total energy intakes. This data reiterates previous research done by Rock and Curran-Celentano which indicated that AN women were at-risk for vitamin and mineral deficiencies (57,58).

A 2004 study conducted by Alpers et al. (59) compared the energy and macronutrient intake of bulimics to those of healthy, matched controls. Forty female BN patients and 40 female controls recorded all eating behaviors in detail over two consecutive days. Analysis revealed that 29 of BN patients reported at least one binge-eating episode, and analysis of all binge eating episodes demonstrated a mean of 2415 ± 1584 kcal consumed per episode. The large standard deviation resulted from a reported binge episode of 10479.4 kcal from one patient. If binge episodes are included in overall average energy intake, bulimics reported significantly

higher energy intake (4274.79 ±3942.44 kcal) than healthy controls (2227.98 ± 469.90 kcal). When only nonbinge meals are considered, however, bulimics consumed significantly less calories than controls (1117.91 ±668.59 kcal and 2227.98 ± 469.90 kcal, respectively). Macronutrient intake comparisons of nonbinge meals showed that healthy controls and bulimics did not differ in their protein intakes. Differences were noted for fat and carbohydrates, however. Healthy controls consumed significantly more fat, 36.8 ± 6.7g, than did bulimics, 29.5 ± 9.3g. In regards to carbohydrates, bulimics consumed an average of 55.5 ± 10.2g which was significantly greater than the average 49.3 ± 7.0g consumed by healthy controls. When the macronutrient composition of bulimics' nonbinge and binge meals were compared, researchers found that a higher proportion of calories from fat were consumed during binges than during regular meals. Other macronutrient consumptions did not differ significantly between conditions (59).

A recent study done by Misra et al. (60) analyzed the nutrient intake of anorectic and healthy adolescent girls. Two groups of 39 anorectics and 39 healthy controls were assessed during outpatient visits to a clinical research center, upon which a registered dietitian aided subjects in the completion of a four day food record. Nutritional analysis depicted that anorectics consumed significantly fewer average daily calories (1649 ± 110 kcal) than healthy controls (1970 ± 91 kcal). Percentage of calories from fat was significantly lower among anorectics, while carbohydrate and protein intakes contributed significantly higher percentages of total calories in anorectics than in healthy controls. Anorectic girls also reported significantly higher soluble dietary fiber intake (6.6 ± 0.5g) as compared to healthy controls (5.3 ± 0.4g). The same was true for insoluble dietary fiber, as anorectics consumed an average 14.0 ± 1.1g compared to just 9.4 ± 0.6g in healthy controls (60).

Thus, the ED dietary intake data suggest a number of things. In regards to bulimics, research shows that they consume significantly more average meal calories during binge episodes than healthy controls. This finding is reversed, however, when comparing regular meals of healthy controls to nonbinge meals of bulimics. The majority of calories in a bulimic's diet tend to come from protein and fat sources, with reductions in calories from carbohydrates. Anorectics tend to consume fewer calories than healthy matched control and receive most of their caloric intake from carbohydrate and protein sources, avoiding fat. Anorectics also tend to consume greater amounts of fiber than their bulimic and healthy control counterparts. It is apparent that the various subpopulations within the realm of ED have differing food values and phobias, thus causing significant discrepancies in their dietary intakes.

Lack of Food Group-Based Intake Data

There is a lack of data on the intake of specific food groups in the ED population. Both the DG and MyPyramid.gov encourage consumption of specific food groups more so than specific nutrients (51,61). This is an easier way for the public to understand and meet the various dietary recommendations. With such categorical recommendations, it is of great interest to analyze the dietary food group habits within the ED population. The literature on this topic is diverse and conflicting, but suggests some general observations. Bulimics tend to consume more fat and sugar than anorectics, whose diets are more calorie-restricted and comprised of carbohydrates, fruits and veggies. The diet of a bulimic, however, fluctuates between binge/purge episodes. Most of the dietary habit data that is available is for those who have been diagnosed with an ED. Data for those considered AR are not as readily available. In addition, the data are typically comparisons between various groups of diagnosed ED individuals without a comparison to healthy controls, especially for the AR group. Therefore, little is known in

regards to whether or not ED individuals meet the DG. Another limitation in the literature is the lack of dietary intake data broken down by population group. Most studies do not target specific population groups or age groups, but instead cover a widely varied population sample. It is vital to obtain dietary intake data on various populations and age groups considered high-risk for developing ED such as the college population.

Potential Strategies and Avenues for Addressing Eating Disorders in the College Population

As discussed in the risk factors section, various cognitive factors play into one's risk for developing an ED. One such cognitive process is perfectionism, which has been linked to the development and propagation of ED as it is associated with extreme levels of dieting (62). Bardone-Cone et al. (63) found that individuals with high levels of self-oriented perfectionism showed extreme self-imposed dietary standards which brought on rigid dietary restraint. Another common cognitive trait found in those AR for an ED is a tendency towards obsessive thoughts and rigid thinking patterns, which are both linked to perfectionism (64). The dietary intake data from the literature indicates that ED individuals do not get the necessary nutrition recommended by the DG or MyPyramid (51,61). In the context of perfectionism, this could be deemed failure. Future research could evaluate this by observing reactions of highly perfectionistic AR or ED individuals in light of realizing a failure to meet the DG. A prevention model that positively encourages the standards set by the DG might make effective use of these individuals' perfectionism to induce healthier attitudes toward eating, thus reducing risk for ED. Instead of focusing on the negatives effects of ED, this type of model would be driven by positive messages that offer education and encouragement for eating a well balanced, healthy diet. Dietary habits and their underlying motivations may be easier to influence, in and of

themselves, when not discussed in the context of an ED but in the context of overall nutrition and health.

Considering the high prevalence rates of AR individuals within the college population, the university setting is an appropriate location to implement intervention programs. Positive changes in overall eating behaviors were noted by O'Connor et al. in college students who had viewed a slide-show presentations on basic nutrition (65). Students also demonstrated improved dietary concern scores and reported a reduction in compulsive eating. In fact, an acceptability study of ED prevention programs by Varnado-Sullivan et al. revealed that healthy male and female subjects rated a psychoeducational ED prevention program as most the acceptable of delivering ED prevention efforts (66). Thus, it seems the high-risk college population deems psychoeducation a worthy means of addressing the ED epidemic.

Specific Aims of this Study

The primary aim of this study was to evaluate and compare the diets of AR and NAR, individuals from a college population. Dietary intake of fruits, vegetables, whole grains, fiber, and protein were assessed along with total daily caloric intake. In addition, these dietary intakes were compared to recommendations made by the DG and MyPyramid.gov. A secondary aim of this study was to investigate the potential use of general health and nutrition education as a preventative measure for development of ED symptomology. Changes in EAT-26 scores from baseline to post-health education were evaluated to determine whether risk for an ED increased or decreased with exposure to nutrition education over one academic year.

REFERENCES CITED

1. Vohs KD, Heatherton TF, Herrin M. Disordered eating and the transition to college: a prospective study. *Int J Eat Disord.* 2001;29:280-288.

2. Schulken ED, Pinciaro PJ, Sawyer RG, Jensen JG, Hoban MT. Sorority's women's body size perceptions and their weight related attitudes and behaviors. *J Am Coll Health.* 1997;46:69-74.

3. Depalma M, Koszewski WM, Case JG, Barile RJ, Depalma BF, Oliario SM. Weight control practices of lightweight football players. *Med Sci Sport Ex.* 1993;25:694-701.

4. Crandall C. Social contagion of binge eating. *Journal of Personality and Social Psychology.* 2988;55:588-598.

5. Allison KC, Park CL. A prospective study of disordered eating among sorority and nonsorority women. *Int J Eat Disord.* 2004;35:354-358.

6. Hoerr SL, Bokram R, Lugo B, Bivins T, Keast DR. Risk for disordered eating relates to both gender and ethnicity for college students. *J Am Coll Nut.* 2002;21:307-314.

7. Cooley E, Toray T. Disordered eating in college freshman women: a prospective study. *J Am Coll Health.* 2001;49:229-235.

8. Schwitzer A, Bergholz K, Dore T. Eating disorders among college women: prevention, education, and treatment responses. *J Am Coll Health*. 1998;46:199-207.

9. Hawkins RC, Clement PF. Development and construct validity of a self-report measure of binge eating tendencies. *Addict Behav*. 1980; 5:219-226.

10. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition. Arlington. American Psychiatric Publishing, Inc., 2000.

11. Mintz L, Betz N. Prevalence and correlates of eating disordered behaviors among undergraduate women. *J Couns Psychol* 1988;35:463-471.

12. Striegel-Moore RH, Silbestein LR, Grunberg NE, Rodin J. Competing on all fronts: achievement orientation and disordered eating. *Sex Roles.* 1990;23:697-702.

13. Kurth CL, Krahn DD, Nairn K, Drewnowski A. The severity of dieting and bingeing behaviors in college women: interview validation of survey data. *J Psychiatr Res.* 1995;29:211-225.

14. Fairburn CG, Bohn K. Eating disorder NOS (EDNOS): An example of the troublesome ''not otherwise specified'' (NOS) category in DSM-IV. *Behav Res Ther*. 2005;43:691–701.

15. Schwitzer AM, Rodriguez LE, Thomas C, Salimi L. The EDNOS Diagnostic profile among college women. *Coll Health*. 2001;49:157-166.

16. Hoek HW, van Hoeken D. Review of the prevalence and incidence of eating disorders. *Int J Eat Disord.* 2003;34:383-396.

17. Heatherton TF, Striepe M, Mahamedi F, Field AE, Keel P. A 10-year longitudinal study of body weight, dieting, and eating disorder symptoms. *J Abnorm Psychol.* 1997;106:117-125.

18. Garner DM, Olmsted MP, Polivy J. Development and validation of a multidimensional eating disorder inventory for anorexia nervosa and bulimia. *Int J. Eat Disord*. 1983;2:15-24.

19. Dowson J, Henderson L. The validity of a short version of the body shape questionnaire. *Psychiatry Res.* 2001;102:263-271.

20. Cumella EJ. Review of the eating disorder inventory-3. *J Pers Assess.* 2006;87:116-117.

21. Stice E, Shaw H, Marti CN. A meta-analytic review of eating disorder prevention programs: encouraging findings. *Annu Rev Clin Psychol.* 2007;3:207-231.

22. Schmidt U. Epidemiology and aetiology of eating disorders. *Psychiatry*. 2005;4:5-9.

23. Stewart DA, Carter JC, Drinkwater J, Hainsworth J, Fairburn C. Modification of eating attitudes and behavior in adolescent girls: a controlled study. *Int J Eat Disord*. 2001; 29:107-118.

24. Stice E, Ragan J. A preliminary controlled evaluation of an eating disturbance psychoeducational intervention for college students. *Int J Eat Disord.* 2002;31:159-171.

25. Stice E, Orjada K, Tristan J. Trial of a psychoeducational eating disturbance intervention for college women: a replication and extension. *Int J Eat Disord.* 2006;39:233-239.

26. Low KG, Charanasomboon S, Lesser J, Reinhalter K, Martin R, Jones H, Winzelberg A, Abascal L, Taylor CB. Effectiveness of a computer-based interactive eating disorders prevention program at long-term follow-up. *Eat Disord.* 2006;14:17-30.

27. Mitchell KS, Mazzeo SE, Rausch SM, Cooke KL. Innovative interventions for disordered eating: evaluating dissonance-based and yoga interventions. *Int J Eat Disord.* 2007;40:120-128.

28. Mann T, Nolen-Hoeksema S, Huang K, Burgard D, Wright A, Hanson K. Are two interventions worse than none? Joint primary and secondary prevention of eating disorders in college females. *Health Psychol.* 1997;16:215-225.

29. Fingeret MC, Warren CS, Cepeda-Benito A, Gleaves DH. Eating disorder prevention research: a meta-analysis. *Eat Disord.* 2006;14:191-213.

30. Becker AE, Franko DL, Nussbaum k, Herzog DB. Secondary prevention for eating disorders: the impact of education, screening, and referral in a college-based screening program. *Int J Eat Disord.* 2004;36:157-162.

31. Springer EA, Winzelberg A, Perkins R, Taylor CB. Effects of a body image curriculum for college students on improved body image. *Int J Eat Disord.* 1999;26:13-20.

32. Aronson E, Wilson T, Akert R. *Social Psychology.* New Jersey: Prentice Hall, 2005.

33. Stice E, Chase A, Stormer S, Appel A. A randomized trial of a dissonance-based eating disorder prevention program. *Int J Eat Disord.* 2001;29:247-262.

34. Stice E, Mazotti L, Weibel D, Agras WS. Dissonance prevention program decreases thin-ideal internalization, body dissatisfaction, dieting, negative affect, and bulimic symptoms: a preliminary experiment. *Int J Eat Disord.* 2000;27:206-217.

35. Matusek JA, Wendt SJ, Wiseman CV. Dissonance thin-ideal and didactic healthy behavior eating disorder prevention programs: results from a controlled trial. *Int J Eat Disord.* 2004;36:376-388.

36. Nicolino JC, Martz DM, Curtin L. Evaluation of a cognitive-behavioral therapy intervention to improve body image and decrease dieting in college women. *Eat Behav.* 2001;2:353-362.

37. Green M, Scott N, Diyankova I, Gasser C. Eating disorder prevention: an experimental comparison of high level dissonance, low level dissonance, and no-treatment control. *Eat Disord.* 2005;13:157-169.

38. Roehrig M, Thompson JK, Brannick M, van den Berg P. Dissonance-based eating disorder prevention program: a preliminary dismantling investigation. *Int J Eat Disord.* 200;39:1-10.

39. Winzelberg AJ, Taylor CB, Sharpe T, Eldredge KL, Dev P, Constantinou PS. Evaluation of a computer-mediated eating disorder intervention program. *Int J Eat Disord.* 1998;24:339-349.

40. Winzelberg AJ, Eldredge KL, Eppstein D, Wilfley D, Dasmahapatra R, Dev P, Taylor CB. Effectiveness of an internet-based program for reducing risk factors for eating disorders. *J Consult Clin Psychol.*2000;68(2):346-350.

41. Celio AA, Winzelberg AJ, Eppstein-Herald D, Wilfley DE, Springer EA, Dev P, Taylor CB. Reducing risk factors for eating disorders: comparison of an internet and a classroom-delivered psychoeducational program. *J Consult Clin Psychol.* 2000;68(4):650-657.

42. Zabinski MF, Pung MA, Wilfley DE, Eppstein DL, Winzelberg AJ, Celio A, Taylor CB. Reducing risk factors for eating disorders: targeting at-risk women with a computerized psychoeducational program. *Int J Eat Disord.* 2001;29:401-408.

43. Zabinski MF, Wilfley DE, Calfas KJ, Winzelberg AJ, Taylor CB. An interactive psychoeducational intervention for women at risk of developing an eating disorder. *J Consult Clin Psychol.* 2004;72:914-919.

44. Taylor CB, Bryson S, Luce KH, Cunning D, Doyle AC, Abascal LB, Rockwell R, Dev P, Winzelberg AJ, Wilfley DE. Prevention of eating disorders in at-risk college-age women. *Arch Gen Psychiatry.* 2006;63:881-888.

45. Franko DL, Villapiano M, Davidson MM, Hamilton E, Mintz LB, Green TC, Mainelli D, Folensbee L, Butler SF, Little D, Kearns M. Food, mood and attitude: reducing risk for eating disorders in college women. *Health Psychol.* 2005;24:567-578.

46. Gollings EK, Paxton SJ. Comparison of internet and face-to-face delivery of a group body image and disordered eating intervention for women: a pilot study. *Eat Disord.* 2006;14:1-15.

47. Jacobi C, Morris l, Beckers C, Bronisch-Holtze J, Winter J, Winzelberg AJ, Taylor CB. Maintenance of internet-based prevention: a randomized controlled trial. *Int J Eat Disord.* 2007;40:114-119.

48. Gleason NA. A new approach to disordered eating: using an electronic bulletin board to confront social pressures on body image. *J Am Coll Health.* 1995;44:78-80.

49. Schwitzer AM, Bergholz K, Dore T, Sallimi L. Eating disorders among college women: prevention, education, and treatment responses. *J Am Coll Health.* 1998;46:199-208.

50. Prouty AM, Protinsky HO, Canady D. College women: eating behaviors and help-seeking preferences. *Adolescence.* 2002;37:353-363.

51. Dietary Guidelines for Americans, 2005. 6th Edition. Washington, DC: U.S. Department of Health and Human Services and U.S. Department of Agriculture. U.S. Government Printing Office, 2005.

52. Heatherington MM, Altemus M, Nelson ML, Bernat AS, Gold PW. Eating behavior in bulimia nervosa: multiple meal analyses. *Am J Clin Nutr.*1994;60:864-873.

53. Gendall KA, Sullivan PE, Joyce PR, Carter FA, Bulik CM. The nutrient intake of women with bulimia nervosa. *Int J Eat Disord.* 1997;21:115-127.

54. Milosevic A, Brodie DA, Slade PD. Dental erosion, oral hygiene, and nutrition in eating disorders. *Int J Eat Disord.* 1997;21:195-199.

55. Cooke EA, Guss JL, Kissileff HR, Devlin MJ, Walsh BT. Patterns of food selection during binges in women with binge eating disorder. *Int J Eat Disord.* 1997;22:187-193.

56. van der Ster Wallin G, Anderson M, Hambraeus L. Nutritional aspects amenorrhoea in eating disordered patients. *Eur Eating Dis Rev.* 1997;5;241-257.

57. Hadigan CM, Anderson EJ, Miller KK, Hubbard JL, Herzog DB, Klibanski A, Grinspoon SK. Assessment of macronutrient and micronutrient intake in women with anorexia nervosa. *Int J Eat Disord.* 2000;28:284-292.

58. Rock CL, Curran-Celentano J. Nutritional disorder of anorexia nervosa: a review. *Int J Vit Nutr Research.* 1987;57:447-452.

59. Alpers GW, Tuschen-Caffier B. Energy and macronutrient intake in bulimia nervosa. *Eat Behav.* 2004;5:241-249.

60. Misra M, Tsai P, Anderson EJ, Hubbard JL, Gallagher K, Soyka LA, Miller KK, Herzog DB, Klibanski A. Nutrient intake in community-dwelling adolescent girls with anorexia nervosa and in healthy adolescents. *Am J Clin Nutr.* 2006;84:698-706.

61. MyPyramid. Alexandria, VA: U.S. Department of Agriculture, Center for Nutrition Policy and Promotion. Available at: "www.mypyramid.gov". Accessed Nov. 26, 2007.

62. Flett, G. L., & Hewitt, P. L. Perfectionism: theory, research, and treatment. Washington, DC: APA. 2002.

63. Bardone-Cone AM. Self-oriented and socially prescribed perfectionism dimensions and their associations with disordered eating. *Behavior Research and Therapy.* 2007;45:1977-1986.

64. Johansson L. The role of cognitive processes in eating pathology. *Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Social Sciences.* 2006;16:1-74.

65. Koszewski WM, Newell GK, Higgins JJ. Effect of a nutrition education program on the eating attitudes and behaviors of college women. *J Coll Stud Develop.* 1990;31:203-210.

66. Varnado-Sullivan PJ, Horton RA. Acceptability of programs for the prevention of eating disorders. *J Clin Psychol.* 2006;62:687-703.

67. Godin G, Shephard RJ. A simple method to assess exercise behavior in the community. *Can J Appl Sport Sci*. 1985;10:141-146.

68. A Collection of Physical Activity Questionnaires for Health-Related Research: Godin Leisure-Time Exercise Questionnaire. *Med Sci Sport Med*. 1997; 29 (6) Supplement: 36-38.

69. Thome J, Espelage DL. Relations among exercise, coping, disordered eating, and psychological health among college students. *Eating Behaviors*. 2004; 5: 337-351.

CHAPTER 3

A Comparative Study of Dietary Habits among College Students At-Risk and Not-At-Risk for Eating Disorders and how Such Habits Compare to the Dietary Guidelines

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A Comparative Study of Dietary Habits among College Students At-Risk and Not-At-Risk for Eating Disorders and how Such Habits Compare to the Dietary Guidelines

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ABSTRACT

Objective: To examine associations between eating disorder (ED) risk and dietary habits. Also, to determine if ED risk changes after exposure to nutrition education and to investigate how the dietary habits in both at-risk (AR) and not-at-risk (NAR) college students compare to the Dietary Guidelines (DG).
Design: A longitudinal observational study over one academic year. Self-reported dietary intake was collected via seven-day food records. The Eating Attitudes Test 26 (EAT-26) was used to assess ED risk. Subjects underwent measurements of height, weight, skin fold, waist circumference and hip circumference.
Subjects/Setting: One-hundred ninety-two students enrolled in one of two fall 2005 nutrition/health courses at a land grant university in southwest Virginia were analyzed.
Main Outcome Measures: ED risk, mean daily intake of fruits, vegetables, fiber, whole grains, protein, total calories, and changes in ED risk over one academic year. BMI, weight change, percent body fat, and waist circumference were also evaluated.
Statistical Analysis Performed: Associations between ED risk and mean daily intake of dietary variables were assessed using independent samples t-tests ($p<0.05$). Changes in mean EAT-26 scores were assessed using paired-t tests. Changes in the proportion of subjects categorized as AR and NAR were evaluated using Chi-square analysis.
Results: This study was completed by 192 subjects. Those AR consumed significantly fewer calories than NAR subjects in both September and April. In April, AR subjects consumed significantly fewer fried vegetable servings than NAR subjects. Chi-square analysis in April revealed that the size of the NAR group increased thus reducing the size of the AR group. Overall, subjects' diets failed to meet the DG for fruits, vegetables, whole grains, and dietary fiber.
Conclusion: Overall dietary intake did not vary between AR and NAR subjects, excepting lower caloric intake and fewer fried vegetable servings in those AR. Both groups failed to meet the DG for fruits, vegetables, whole grains and dietary fiber.
Application: Educational interventions emphasizing the DG may improve ED risk but warrant more specific targeting of poor dietary habits in order to increase the college population's compliance with the DG.

Introduction

Eating disorders (ED) have the highest mortality rate amongst all mental illnesses recognized by the American Psychiatric Association (APA) (1). The numbers of people affected by this mental disease have significantly increased over the last few decades and the trend promises to continue. The APA divides ED into three subclasses: anorexia nervosa (AN), bulimia nervosa (BN), and eating disorders not otherwise specified (EDNOS) (2). The various forms of ED affect all races, ages, genders, and societal classes. Nevertheless, women are more commonly affected than men as 0.5% to 3.7% of women have AN while 1.1% to 4.2% of women deal with BN (3). A variety of risk factors, such as sociocultural pressures, biology and genetics, emotions and cognitions, environment, and life stresses, have been acknowledged and defined by the APA for the three categories of ED (4). The overall understanding of risk and the synergism between risk factors continues to grow as more clinical studies are conducted.

Individuals between the ages of ten and twenty-four are at a higher risk for the development of ED (5). Many researchers have deemed the university setting as an environmental risk factor for ED and the onset of ED typically peaks during the early adult years, the age range of most individuals found on America's college campuses (5). Many professionals attest that ED are some of the most difficult mental illnesses to treat due to a complex etiology. Therefore, an effective screening tool helps to identify at-risk populations before any prevention efforts are carried out. The EAT-26, a self-report survey that rates individuals scoring at least twenty out of twenty-six as at-risk (AR) for an ED is frequently used as an effective, economical screening tool for identifying high risk populations.

Malnutrition is one of the most damaging consequences of ED however it presents itself differently for each ED subclass. Therefore, nutritional status is often unclear and few data exist

regarding the average nutritional status for ED individuals, not to mention those considered AR. In order to develop effective prevention programs with which to tackle the ED epidemic, a thorough understanding of the dietary behaviors and daily intakes, eating attitudes, and risk factors of AR individuals is needed. Intake of particular food groups, however, has not yet been evaluated. The DG place much emphasis on whole grains, fruit and vegetable intake, low fat dairy and healthy fats, straying from the older recommendations based on particular macronutrients (6). A prevention approach focused on meeting general food group guidelines may prove to be an effective strategy to use in ED prevention programs.

The purpose of this study was two-fold. First, the diets of both not-at-risk (NAR) and AR individuals were analyzed by evaluating daily intake of fruits, vegetables, whole grains, fiber, and total calories, hypothesizing that those NAR would have poorer dietary habits in regards to fat intake and fewer servings of vegetables and fruits. Comparisons were drawn to determine whether one group was more successful at meeting the Dietary Guidelines (DG) than the other, under the hypothesis that those AR would come closer to meeting the DG for fruits, vegetables, and whole grains than the NAR group. Second, the changes, if any, in EAT-26 scores over one academic year were evaluated to determine whether risk for ED changed with exposure to health education, presuming that health/nutrition education would improve EAT-26 scores and thus decrease the subject pool categorized as AR.

Methods

Study Design

This study followed a longitudinal observational design to evaluate the dietary habits and body weight changes over one academic year, conducted in 2005-2006. A convenience sample of college students enrolled in one of two fall semester college courses were recruited at a land

grant university in southwest Virginia. The university's Institutional Review Board approved this study.

Subjects

College students enrolled in one of two fall semester courses, an introduction to nutrition or a personal health class, participated in the study. Both classes were open to the entire university student body. Only those who were pregnant were excluded from the study due to nongeneralizable expected weight gains. Subjects received an informed consent form that described their specific responsibilities for this study and upon signing it agreed to the risks and benefits involved in their voluntary participation. For the fall semester, the incentive of bonus points worth an additional 2% of total points available in class added to their final grade was offered. In the spring, the option of a twenty dollar gift certificate to a local grocery store or 25% course credit for a one academic credit special studies course was offered for participation and completion of all study data collection.

Measurements

Data collection was carried out on the same cohort at the beginning of the academic year in September and at the end of the academic school year in April.

Demographic Questionnaire

Information was gathered from the demographic questionnaire including basic demographics (age, date of birth, gender, race/ethnicity, major), eating habits, and physical activity patterns. A series of health history questions included prior history of an ED, along with current weight and weight both six and twelve months prior to study participation. In addition, questions regarding frequency of five pound weight loss/gain within the last five years were included, but only at baseline.

EAT-26

Each subject completed the revised EAT-26 test as developed by Garner and Garfinkel at two time points, September and April, to assess ED risk. The EAT was developed as a screening tool designed to evaluate ED symptom severity. Scores range from 0-26, with scores ≥20 categorizing an individual as AR for ED (7).

Diet

Subjects completed seven-day food records. Detailed written instructions were provided, including sample entries and portion sizes. Records were evaluated for completeness, and email messages were sent to subjects to clarify serving sizes, specific foods, etc. as needed. All records were entered into Nutritionist Pro™ (version 2.4.1 diet analysis software, Axxya Systems, Stafford, TX, 2005) for nutrient analysis. Daily servings of whole grains, fruits, and vegetables were determined by recording them from overall daily intake using standard United States Department of Agriculture (USDA) portion sizes (8). Total daily caloric intake was calculated and additionally expressed as calories per kilogram body weight (kcal/kg). Supplementary dietary variables included total daily dietary fiber intake in grams (g), percent of calories from fat, and daily grams of protein consumed (g). Number of meals per day was also calculated, with a meal defined as greater than 50 calories with the exception of sugar-sweetened beverages consumed within 15 minutes of conception of mealtime.

Anthropometric Measurements

A trained researcher measured fasting weight and height which were used to calculate BMI (kg/m^2). Subjects wore light clothing and were prohibited from consuming anything more than one cup of liquid prior to measurement. A Seca™ (Hanover, MD) balance beam scale with stadiometer was used to measure weight and height. Percent body fat was calculated from

skinfold measurements taken at three sites for both males and females: abdomen, suprailiac, and triceps. Skinfold measurements were taken to the nearest mm and were repeated up to three times until measurements agreed within 2 mm. The average of the closest two measurements was taken for calculation of percent body fat. Formulae developed by Jackson and Pollock were used to calculate percent body fat (9). Waist circumference in inches was also measured at the narrowest point between the hip and the bottom of the ribcage. Weight change was determined simply by subtracting weight in April from baseline weight. A positive value indicated weight gain while a negative value revealed weight loss.

Statistical Analysis

Dietary Habit and ED Risk

EAT-26 scores were used to group participants as AR (scoring $\geq$20 on EAT-26) or NAR (scoring <20 on EAT-26) for ED. Mean daily servings of fruits, vegetables, and whole grains, grams of protein, total kcalories, and kcalories/kg were compared between groups using independent samples t-tests ($p<0.05$).

Change in EAT-26 Score Over the Academic Year

Chi-square analysis measured changes in the proportion of study population considered AR or NAR from baseline to end of study. Two additional paired t-test analyses ($p<0.05$) determined if the mean EAT-26 scores changed for both the AR and NAR groups from baseline to post study.

Results

Study Sample

Of the 1050 students in the fall courses invited to participate in the study, 501 (47.7%) agreed to participate. Thirty-eight percent (n=192) of students who began the study in September also completed the study in April, for inclusion in the final analysis. Table 1 displays demographic information about the subjects.

At baseline, mean BMI was with the normal range (18.5-24.9 kg/m^2) but fell along the upper end of the range. Mean body fat percentage and waist circumference were also within a healthy range. Table 2 displays subjects' mean baseline anthropometric measurements.

Table 1: Subject Demographics

Characteristic	Completers (n=192) n(%)	Non-completers (n=501) n(%)
Gender		
Male	58 (30.2)	173 (35)
Female	134 (69.8)	316 (63)
Race		
Caucasian	168 (87.5)	406 (81)
Black/African American	6 (3.1)	27 (5.4)
Asian	13 (7)	45 (9)
Native American	4 (2.1)	25 (5)
Age		
18-19	111 (57.8)	281 (56)
20-24	81 (42.2)	220 (44)
Course Enrollment		
EDHL 1514, Personal Health	129 (67.2)	382 (76.2)
HNFE 1004, Intro to Nutrition	63 (32.8)	132 (26.4)
Major		
Human Nutrition, Foods and Exercise (HNFE)	40 (20.8)	71 (14.2)
Other	152 (79.2)	435 (86.8)
EAT-26 Score (0-26)	11.3±9.8	9.9±9.2

Table 2: Baseline Anthropometric Measures

Variable	Completers Mean	Non-completers Mean
BMI (kg/m^2)	23.6±3.5	23.8±3.9
Weight (lbs)	148.2±30.4	149.5±32.1
Percent body fat (%)	22.3±7.7	21.8±7.9
Waist circumference (in)	29.0±3.5	29.3±3.8

Change in EAT-26 Score, Anthropometric Measures, and Dietary Intake Between September and April

Subjects were categorized as NAR and AR for ED based on their EAT-26 score. The results showed a greater percentage as NAR than AR in both September and April. Table 3 displays this data. Overall, mean EAT-26 decreased from 11.3±9.8 in September to 10.9±10.1 in April.

Table 3: Subjects Categorized as NAR or AR for ED in September and April*

EAT-26 Risk Category	September n(%)	April n(%)
Not-At-Risk	153 (82)	160 (86)
At-Risk	34 (18)	27 (14)
Total	**187**	**187**

*Chi-square=75.34, p=.000

Chi-square analysis revealed a significant correspondence between AR and NAR groups across time periods (chi-square=75.34, p=.000). Of the 153 NAR subjects in September, 147 remained in April. Thus, six NAR subjects at baseline became AR in April. Of the 34 AR subjects in September, only 21 remained in April. Thus, thirteen subjects lowered their EAT-26 scores in April placing them in the NAR group. The September EAT-26 score was significant.

No significant change from September to April occurred with EAT-26 score, BMI, and waist circumference. Mean weight, however, did increase from September to April from 148.2±30.4 to 149.5±32.1, respectively (p=0.014). Very few significant differences between

time periods were noted. Table 4 summarizes subjects' dietary intake for September and April. While none of the food group variables differed significantly, the mean number of meals per day and total caloric intake per day were significantly lower in April. This also translated to a significantly lower mean kcal per kilogram of body weight in April.

Table 4: Dietary Variables in September and April*

Dietary Variable	September	April	p-value
Number of meals/day	4.05±1.05	3.8±1.2	.002*
Kcals/day	1980±600	1826±556	.000*
Kcal per kilogram body weight	29.97±9.57	27.42±8.24	.000*
Protein (g/day)	73.6±26.3	71.3±25.5	.181
Dietary fiber (g/day)	13.9±6.0	14.33±7.0	.393
Percent total kcal from fat	31.2±0.1	31.1±0.1	.874
Total servings of fruits and vegetables/day	2.69±1.61	2.867±1.85	.167
Servings fruit/day	.67±.77	.78±.87	.066
Servings fruit juice/day	.52±.94	.49±1.03	.715
Total fruit (fruit and juice) servings/day	1.18±1.22	1.28±1.34	.305
Non-fried vegetable servings/day	1.21±.94	1.25±1.02	.486
Fried vegetable servings/day	.33±.45	.32±.39	.791
Total vegetable (non-fried and fried) servings/day	1.55±.98	1.58±1.09	.710
Whole grain servings/day	.98±1.02	.93±.94	.379

*paired t-test, $p<0.05$

Associations Between Risk Status, EAT-26 Score, and Anthropometric Measurements

A significant difference in body fat percentage was noted between groups in September (Table 5), indicating that the AR group had a higher body fat percentage than the NAR group. Independent samples t-tests in April revealed that percent body fat was also significantly different between groups. In addition, weight change results in April showed that the AR group lost significantly more weight than the NAR group. Percent body fat was not measured in April. Thus, the September percent body fat value was used for the independent samples t-test in April.

Percent body fat and weight change showed a significantly negative correlation (-0.237, p=0.001), demonstrating that those with a higher percent body fat lost the least weight. A significantly positive correlation was found between percent body fat and BMI in September (0.305, p=0.000) indicating that those with a higher percent body fat also had a higher BMI.

Table 5: Anthropometric Measures by Eating Disorder Risk Category in September and April

Anthropometric Variable	September		April	
	NAR	AR	NAR	AR
BMI (kg/m^2)	23.5±3.5	24.0±3.3	23.7±3.6	23.6±3.8
Waist Circumference (in)	29.0±3.5	28.9±3.5	29.2±3.8	28.4±3.7
Baseline percent body fat (%)	21.6±7.8	25.5±6.0*	21.7±7.5	25.4±7.6*
Weight change (lbs)**	1.4±6.2	1.7±6.3	0.7±1.0	-1.5±9.8*

*Independent samples t-test, $p<0.05$
**weight change calculated as weight in April minus weight in September

Correlations between anthropometric measures and mean total EAT-26 scores in September and April are shown in Table 6. In September, there was a significantly positive correlation between EAT-26 score and percent body fat, indicating that those with a higher EAT-26 score (those more AR for ED) had a higher percentage body fat baseline. No other significant differences were noted in September. There were significant positive correlations between EAT-26 score from April and baseline percent body fat and weight change. Again, the higher the EAT-26 score, the greater baseline percentage body fat and the greater the weight loss from September to April. Percent body fat was not measured in April.

Table 6: Correlation with EAT-26 Score and Anthropometric Measures in September and April*

Anthropometric Variable	Correlation to EAT-26			
	September		April	
	Correlation	p-value	Correlation	p-value
BMI (kg/m^2)	.017	.814	.002	.979
Waist circumference (in)	-.099	.180	.109	.135
Baseline percent body fat (%)	.228	.002*	.302**	.000*
Weight change (lbs)	.014	.850	-.144	.048*

*Pearson's, two-sided, $p<0.05$
**baseline percent body fat

Associations Between Risk Status, EAT-26 Score, and Dietary Measurements

The results for the independent samples t-tests of dietary variables by EAT-26 risk category in September and April are shown in Table 7. The independent samples t-tests for September showed significant differences between AR and NAR groups for both total kcal intake and kcal per kilogram body weight (p=.043 and .035, respectively). All other dietary variables did not differ significantly between groups. However, a few were lower for the AR group, including number of meals per day, mean daily juice servings, and mean daily fried vegetable servings. April results again revealed significant differences between groups for total kcal intake and kcal per kilogram body weight. In addition, mean daily protein intake and mean daily fried vegetable servings differed significantly between the AR and NAR groups.

The results from correlational analyses of dietary variables and EAT-26 scores for both September and April are displayed in Table 8. Significant negative correlations in September were found between EAT-26 score and mean total kcal intake, kcal per kilogram of body weight, and mean daily servings of fried vegetables. Thus, those with a higher EAT-26 score ate significantly fewer total daily calories, calories per kilogram of body weight, fried vegetables at baseline. In April, mean total daily kcal, kcal intake per kilogram body weight, and fried

vegetables were significantly correlated to EAT-26 score yet again. Mean total daily kcal intake and kcal per kilogram body weight were both negatively associated with EAT-26 score. Mean servings of fried vegetables was also negatively associated with EAT-26 score. In addition, April analysis showed significant negative correlations between EAT-26 score and mean daily protein intake and number of meals. All other dietary variables showed no significant correlations with EAT-26 score in April.

Table 7: Dietary Variables by Risk Category in September and April

Dietary Variable	September		April	
	NAR	AR	NAR	AR
Number of meals/day	4.1±1.1	3.7±.9	3.9±1.2	3.5±1.1
Kcals/day	2000±572*	1773±629*	1882±548*	1458±458*
Kcal per kilogram body weight	30.3±8.9*	26.7±8.0*	28.1±7.9*	22.9±8.4*
Protein (g/day)	74.3±25.9	67.0±28.9	73.3±26.0*	57.8±17.6*
Dietary fiber (g/day)	13.8±6.1	13.9±6.0	14.4±6.9	13.6±7.6
Percent total kcal from fat	0.3±0.1	0.3±0.1	0.3±0.1	0.3±0.1
Total servings of fruits and vegetables/day	2.7±1.6	2.7±1.7	3.0±2.1	2.7±1.9
Servings fruit/day	0.6±0.7	0.8±0.9	0.8±1.0	0.8±0.9
Servings fruit juice/day	0.6±1.0	0.3±0.6	0.5±1.1	0.3±0.5
Total fruit (fruit and juice) servings/day	1.2±1.3	1.1±0.9	1.4±1.5	1.1±1.1
Non-fried vegetable servings/day	1.2±0.9	1.4±1.0	1.2±1.0	1.4±1.2
Fried vegetable servings/day	0.4±0.5	0.2±0.3	0.3±0.4*	0.2±0.3*
Total vegetable (non-fried and fried) servings/day	1.2±1.3	1.6±1.0	1.4±1.5	1.6±1.2
Whole grain servings/day	1.0±1.0	1.2±1.3	0.9±1.0	0.8±0.7

*Independent samples t-test, $p<0.05$

Table 8: Correlation with EAT-26 Score and Dietary Variables in September and April*

Anthropometric Variable	Correlation to EAT-26			
	September		April	
	Correlation	p-value	Correlation	p-value
Number of meals/day	-.097	.220	-.161	.037*
Kcals/day	-.201	.006*	-.342	.000*
Kcal per kilogram body weight	-.191	.010*	-.262	.000*
Protein (g/day)	-.107	.145	-.288	.000*
Dietary fiber (g/day)	.023	.751	-.040	.586
Percent total kcal from fat	-.082	.268	-.098	.183
Total servings of fruits and vegetables/day	-.034	.651	-.082	.280
Servings fruit/day	.079	.291	.010	.889
Servings fruit juice/day	-.144	.053	-.138	.064
Total fruit (fruit and juice) servings/day	-.066	.380	-.092	.214
Non-fried vegetable servings/day	.125	.091	.040	.589
Fried vegetable servings/day	-.171	.021*	-.151	.042*
Total vegetable (non-fried and fried) servings/day	.033	.658	-.015	.841
Whole grain servings/day	.056	.449	-.028	.704

*Pearson's, two-sided, $p<0.05$

Discussion

The hypothesis that NAR subjects would have poorer eating habits than AR subjects was rejected as few significant differences in dietary variables were found between groups. This differed from what the literature suggested in that ED individuals, especially those with AN, consume more fruits, vegetables, dietary fiber and less fat than non-diagnosed individuals. Those with BN, however, do consume foods higher in fat and sugar and fewer fruits and vegetables during binges. The lack of significance between groups may have been confounded by the fact that the AR group may have included both AN and BN prone individuals, whose mean dietary intake as a whole may mimic that of the NAR group. While the hypothesis that both groups would not meet the DG was accepted, neither groups seemed farther from the recommendations than the other. Lastly, while the NAR group grew from September to April, we can not associate

this change with exposure to nutrition education as other confounding variables were present, such as simultaneously receiving some other sort of nutrition education or counseling, decreased stress levels, and/or decreased exposure to the media.

Overall, subjects' diets did not greatly differ from September to April, except for total number of meals, daily caloric intake, and kcal per kilogram of body weight. The reduction in total daily calories in April may have been due to a number of factors. Participation in this study may have alerted subjects to an excess of weight or percentage body fat, thus spurring them to reduce calories in an effort to lose weight. In addition, the practice of writing down what is eaten every day for a diet record may or may not lead to a lower intake, as it brings to attention the amount of food eaten on a daily basis. Interestingly, the mean daily total caloric intake was still less than the DG recommendation of 2000 kcal per day for this population. Considering that the majority of the subject pool was female may account for the low caloric intake, as females require fewer calories than males.

When the subjects were grouped based on ED risk, a few intriguing results appeared. In regards to anthropometrics, AR individuals displayed significantly higher percent body fat than NAR subjects at both time periods. No other anthropometric variables differed significantly, with the exception of weight change for subjects categorized as AR based on EAT-26 score in April. Those considered AR for ED, therefore, seemed to have recognized this elevated body fat percentage and attempted to correct for it by losing weight. This is also made apparent in Pearson's correlational analysis of EAT-26 score and percent body fat. Those with a higher EAT-26 score in April tended to have a higher baseline percent body fat and tended to lose more weight. Quite possibly, these subjects disliked the distribution of this excess body fat and developed low self-esteem, body dissatisfaction, and distorted thinking as a result thus putting

them at a greater risk for developing an ED (10). Body dissatisfaction has been linked to greater dietary restraint and increased sensitivity to the opinions of others, which exacerbates one's negative self-perception (11). These factors synergistically heighten risk for an ED and produce maladaptive eating behaviors.

The dietary intake analysis reiterates the conclusions drawn from the anthropometric analyses. AR subjects consumed significantly fewer daily calories than NAR subjects in September and April. This translated to significantly fewer kcal per kilogram of body weight for the AR group as well. In addition, AR subjects also consumed significantly less daily protein and servings of fried vegetables than did the subjects in the NAR group. This is consistent with findings from previous research in which ED subjects ate consistently lower amounts of energy, protein, and fat (12,13,14). Fat avoidance was especially noted in the research as a practice of those with an ED, especially in those with anorexia (15). This behavior was evident in our results as it seems that AR subjects avoided fried vegetables more than NAR subjects. Also of note, but not quite significant, AR subjects consumed less fruit juice than NAR subjects, possibly as an attempt to remove excess calories from the diet. As shown with the anthropometric analysis, the AR subjects took considerable measures to lose the excess body fat revealed in September.

Correlational analysis of these dietary variables also supports these findings. At both time periods, those with a higher EAT-26 score displayed lower daily caloric intake, lower kcal per kilogram of body weight, and fewer servings of fried vegetables. In addition, subjects with higher EAT-26 scores showed a significantly lower number of meals per day and daily protein intake in April. A higher EAT-26 score was also correlated with less fruit juice intake, again reiterating the removal of excess calories from the diet amongst AR subjects. Thus, subjects

considered at the greatest risk tended to make significantly greater changes to their diet, possibly in an effort to lose weight.

The mean EAT-26 score did decrease from 11±9.8 in September to 10.9±10.1 in April, an encouraging decrease. The chi-square analysis revealed encouraging results in regards to the percentage of subjects who were categorized as AR for ED. While some NAR subjects did become AR in April, more subjects considered AR in September became NAR in April. This is important because a decrease in ED risk, based on EAT-26 score, indicates some sort of healthy change, possibly in behavior, internal attitudes/beliefs towards food, or self-esteem. It is unclear whether or not these changes were a result of nutrition and health education as provided in the fall semester courses that these subjects were enrolled in. Subjects' risk could have decreased for a number of other reasons, including decreased academic problems/stress, less frequent exposure to the thin-ideal of the media, or progress in dealing with a variety of personal issues such as depression, anxiety, or obsessive compulsive disorder. In addition, the practicality of educational attempts is in question as prior research has shown that simple nutrition and health education has produced mixed results for high-risk ED individuals (10).

While very few of the dietary variables included in this study differed significantly between groups, some interesting observations can be drawn. On average, subjects failed to meet the DG and MyPyramid recommendations for this population in regards to fruits, vegetables, and whole grains. Fiber intake was also lower than the recommended 14 grams per 1000 kcal set by the DG. These results suggest that the college population as a whole fails to meet the guidelines for a healthy diet in a number of areas. It is interesting to note that roughly twenty percent of the students in these classes were in a nutrition related major, thus suggesting that they were already interested in healthy eating behaviors and may have already adopted a

healthier diet than the typical college student. On the other hand, the focus on food and its effects on the body may put these students at risk for ED. In fact, previous research has indicated that individuals in these majors have an increased risk for disordered eating (16). This may suggest the need for stronger prevention and intervention efforts within these majors. That said, it is also quite possible that students in non-nutrition/health-related majors may consume even more unhealthy diets than these subjects.

Studies involving human subjects and self-reported behaviors always present the possibility for skewed results. Self-selection bias may have caused subjects to exclude certain things they ate. Further, prior interest or education in nutrition and health may have presented a subject pool with slightly healthier or maladaptive eating behaviors. A small sample size of homogenous nature reduced the power of findings and limited the conclusions that can be drawn about the more general college population. Limitations aside, the results of this study indicate many things about this population. Most prominently, it shows that college students are not meeting the DG recommendations for most, if not all, dietary variables. In addition, the results revealed that AR individuals may be so due to an excess of body fat and/or a dislike of said body fat. These individuals seemed to try to compensate for excess body fat through dietary restraint such as reduced caloric intake, reduced number of meals, reduced protein intake, and fat avoidance through reduced fried vegetable intake.

REFERENCES CITED

1. Vohs KD, Heatherton TF, Herrin M. Disordered eating and the transition to college: a prospective study. *Int J Eat Disord.* 2001;29:280-288.

2. Schulken ED, Pinciaro PJ, Sawyer RG, Jensen JG, Hoban MT. Sorority's women's body size perceptions and their weight related attitudes and behaviors. *J Am Coll Health.* 1997;46:69-74.

3. Depalma M, Koszewski WM, Case JG, Barile RJ, Depalma BF, Oliario SM. Weight control practices of lightweight football players. *Med Sci Sport Ex.* 1993;25:694-701.

4. Allison KC, Park CL. A prospective study of disordered eating among sorority and nonsorority women. *Int J Eat Disord.* 2004;35:354-358.

5. Hoerr SL, Bokram R, Lugo B, Bivins T, Keast DR. Risk for disordered eating relates to both gender and ethnicity for college students. *J Am Coll Nut.* 2002;21:307-314.

6. Fairburn CG, Bohn K. Eating disorder NOS (EDNOS): An example of the troublesome ''not otherwise specified'' (NOS) category in DSM-IV. *Behav Res Ther*. 2005;43:691–701.

7. Garner DM, Olmsted MP, Polivy J. Development and validation of a multidimensional eating disorder inventory for anorexia nervosa and bulimia. *Int J. Eat Disord*. 1983;2:15-24.

8. MyPyramid. Alexandria, VA: U.S. Department of Agriculture, Center for Nutrition Policy and Promotion. Available at: "www.mypyramid.gov". Accessed Nov. 26, 2007.

9. Jackson AS, Pollock ML. Practical assessment of body composition. Phys Sportsmed 13: 76-90, 1985.

10. Stice E, Shaw H, Marti CN. A meta-analytic review of eating disorder prevention programs: encouraging findings. *Annu Rev Clin Psychol.* 2007;3:207-231.

11. Cooley E, Toray T. Disordered eating in college freshman women: a prospective study. *J Am Coll Health.* 2001;49:229-235.

12. Gendall KA, Sullivan PE, Joyce PR, Carter FA, Bulik CM. The nutrient intake of women with bulimia nervosa. *Int J Eat Disord.* 1997;21:115-127.

13. Hadigan CM, Anderson EJ, Miller KK, Hubbard JL, Herzog DB, Klibanski A, Grinspoon SK. Assessment of macronutrient and micronutrient intake in women with anorexia nervosa. *Int J Eat Disord.* 2000;28:284-292.

14. Misra M, Tsai P, Anderson EJ, Hubbard JL, Gallagher K, Soyka LA, Miller KK, Herzog DB, Klibanski A. Nutrient intake in community-dwelling adolescent girls with anorexia nervosa and in healthy adolescents. *Am J Clin Nutr*. 2006;84:698-706.

15. Van der Ster Wallin G, Anderson M, Hambraeus L. Nutritional aspects amenorrhoea in eating disordered patients. *Eur Eating Dis Rev.* 1997;5;241-257.

16. Worobey J, Schoenfeld D. Eating disordered behavior in dietetics students and students in other majors. *J Am Diet Assoc.* 1999; 9: 1100-1102.

CHAPTER 4: SUMMARY, CONCLUSIONS AND FUTURE RESEARCH

Summary and Conclusions

A higher EAT-26 score was associated with a higher percent body fat, greater weight loss, and a lower intake of kcal, fried vegetables, protein, and total number of meals. Percent body fat, total kcal per day, and kcal per kilogram of body weight differed significantly between groups in September, as AR means were lower than those of NAR means. Results were similar in April, with the addition of significantly greater weight loss and lower intake of fried vegetables and protein amongst AR subjects. Mean EAT-26 score dropped slightly from September to April, but not significantly. This was somewhat surprising as the mean EAT-26 score was expected to increase, based on research stating that ED risk increases upon entering college (1-8). Thus, the decrease in mean score differs from current literature that shows ED risk increasing with the transition to the college environment. The effect of nutrition education on ED risk in high-risk populations warrants further research. Both groups failed to meet the DG for fruits, vegetables and whole grains in both September and April. To our knowledge, this is one of the first studies to compare the dietary habits of those AR for ED to those NAR in a college population.

The self-report nature of this study presents limitations to our findings. In addition, this subject population was largely female, Caucasian and many students were majoring in foods and nutrition. Therefore, this sample does not fully represent the profile of the entire campus population. Only 38% of subjects completed data in both September and April, which suggests the idea that non-completers dropped out because of a realization of poor diet and/or weight gain across time periods, although the baseline characteristics of both groups were similar (Table 1).

In general, the results show a need for improved dietary habits amongst this college population, regardless of ED risk. Sound nutrition education that focuses on the DG and the health benefits of balanced nutrition may raise awareness for many individuals who lack the knowledge and skills necessary to eat healthfully. Those majoring in foods and nutrition may need careful instruction on how to personally avoid the development of an ED in the process of studying foods, nutrition, and health. These individuals, especially females, may or may not benefit from an ED screen as this population tends to exhibit greater risk for ED. An ED-specific course for these types of majors may offer an effective way of targeting high-risk individuals while also equipping future nutrition professionals with the skills necessary to treat other AR individuals.

Implications for Future Research

The results from this study further reiterated the inadequacy of college students' diets. The EAT-26 screening tool showed that in September roughly 18% of the subject pool was AR for an ED. If this is any indication of the campus wide prevalence of AR individuals, it is apparent that the ED epidemic is still rampant. Further research should be done to more closely evaluate the dietary habits of these AR individuals. Most research focuses on individuals with a diagnosed ED. This AR population, however, is a critical group of individuals as they may or may not be on the brink of developing a full blown ED. Unfortunately, there were no significant changes in the consumption of major food groups for either the AR or NAR groups across time periods, even though subjects were enrolled in either a nutrition class or personal health class. It is also unclear as to whether or not the nutrition education provided in the fall semester had any effect on subjects' dietary habits. Future research with larger sample sizes and a

control/comparison group should more closely investigate the effect of general nutrition education, specifically targeting the DG, on risk for ED and dietary habits.

Interesting observations can be made from the data comparing percent body fat of NAR and AR individuals. The AR group had higher percentage body fat than the NAR group, which brings to question whether or not the subjects recognized and disliked their body fat, thereby inducing a negative body image, low self-esteem, and maladaptive eating behaviors. Research investigating the factors which put individuals considered AR for an ED by EAT-26 score may shed light on the effects of certain anthropometric measurements on eating pathology.

Subjects' failure to meet the DG is of great concern and is worthy of additional research into effective means by which to encourage college students to improve their dietary habits. Ideas for consideration may include dining hall interventions in which food and entrée selections for that day have nutritional information posted at the point of purchase. The college environment makes eating healthy incredibly difficult, with all-you-can-eat dining centers, a variety of ready-to-eat high energy/high fat foods and pre-paid meals making money a non-issue (9). Research has indicated that students often adopt unhealthy dietary practices during their college years (10). In addition, most social gatherings in our culture involve food of some sort, especially with college students. The high intake of alcohol during the college years also presents an increase in food consumption during alcohol binges, further adding to poorer food choices and excessive calorie intake (10). On the other hand, social stigmas and the increase of peer interactions in a large university setting also increases one's risk for developing an ED, especially in the Greek system of sororities (2,5). The Greek system is an excellent venue to offer nutrition education and intervention, both in an attempt to improve college students' diets and prevent an increase in ED risk.

While the literature shows conflicting results on the effectiveness of nutrition education in changing maladaptive eating behaviors, be it ED-related or simply failure to meet the DG, some education is better than none (9). Most college students, especially non-nutrition and health-related majors, have very limited knowledge on healthy eating and the DG. Without any knowledge, they are much less likely to have good dietary habits (9). Thus, colleges and universities across the country may be wise to mandate that all freshmen take an introductory nutrition/health course for credit. Their lives just may depend on such knowledge and the college environment is a perfect arena to address the need for improved dietary habits. An emphasis on dietary recommendations as defined by the DG and MyPyramid may alert students to the inadequacy of their dietary habits, whether they are AR for ED or simply not eating enough fruits and vegetables (9). Awareness alone may encourage students to adopt better eating habits once they have a working knowledge of the importance of balanced nutrition and how poor dietary habits profoundly affect their lives. Benefits from such education can improve quality and length of life for the students and their future children, in addition to boosting energy and improving their productivity. The benefits of a healthier student body go beyond just the students themselves. Increased productivity influences school work and grades, which benefits professors and universities alike. More long-term results include reductions in our nation's medical costs from averted diet-related health conditions and reduced potential time off from work that could stem from poor diet-induced health conditions.

As shown by previous research, targeted prevention programs have a much greater effect than non-targeted ones (11). That said, a screening tool such as the EAT-26 may be an effective means of identifying AR individuals in the health and nutrition-related majors, whose risk may or may not be affected by nutrition education. Being in a learning environment which discusses

food, nutrition, and eating behaviors may have negative effects on an individual AR for an ED (12). It might be beneficial to screen for ED in these majors, especially those of dietetics and nutrition, as these individuals may have an increased risk for disordered eating. Post screen, those considered AR for ED could be privately alerted of their risk and offered resources from which to find help. In addition, an ED class may or may not be beneficial for these majors. As the ED epidemic is vast and widely prevalent, students who pursue professional careers in dietetics, health, and/or nutrition will most likely encounter at least one individual with an ED in their professional experience. Thus, a thorough understanding of ED and their pathology may be beneficial for their future profession. Segments of the class could focus on how to prevent oneself, as a dietitian or other health professional, from developing an ED while working in the world of food. Along with that, the class could focus on treating others AR for ED or those with ED.

REFERENCES CITED

1. Vohs KD, Heatherton TF, Herrin M. Disordered eating and the transition to college: a prospective study. *Int J Eat Disord.* 2001;29:280-288.

2. Schulken ED, Pinciaro PJ, Sawyer RG, Jensen JG, Hoban MT. Sorority's women's body size perceptions and their weight related attitudes and behaviors. *J Am Coll Health.* 1997;46:69-74.

3. Depalma M, Koszewski WM, Case JG, Barile RJ, Depalma BF, Oliario SM. Weight control practices of lightweight football players. *Med Sci Sport Ex.* 1993;25:694-701.

4. Crandall C. Social contagion of binge eating. *Journal of Personality and Social Psychology.* 2988;55:588-598.

5. Allison KC, Park CL. A prospective study of disordered eating among sorority and nonsorority women. *Int J Eat Disord.* 2004;35:354-358.

6. Hoerr SL, Bokram R, Lugo B, Bivins T, Keast DR. Risk for disordered eating relates to both gender and ethnicity for college students. *J Am Coll Nut.* 2002;21:307-314.

7. Cooley E, Toray T. Disordered eating in college freshman women: a prospective study. *J Am Coll Health.* 2001;49:229-235.

8. Schwitzer A, Bergholz K, Dore T. Eating disorders among college women: prevention, education, and treatment responses. *J Am Coll Health*. 1998;46:199-207.

9. Kolodinsky J, Harvey-Berino JR, Berlin L, Johnson RK, Reynolds TW. Knowledge of current dietary guidelines and food choice by college students: better eaters have higher knowledge of dietary guidance. *J Am Die Assoc.* 2007;107:1409-1413.

10. Cousineu TM, Goldstein M, Franko DL. A collaborative approach to nutrition education for college students. *J Am Coll Health.* 2004;53:79-84.

11. Stice E, Shaw H, Marti CN, Cespeda-Benito A, Gleaves DH. Eating disorder prevention research: a meta-analysis. *Eat Disord*. 2006;14:191-213.

12. Houston, CA. Eating disorders among dietetics students: an educator's dilemma. *J Am Diet Assoc.* 2008;108:722-724.

APPENDICES

APPENDIX A
Institutional Review Board Approval

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Institutional Review Board

Dr. David M. Moore
IRB (Human Subjects)Chair
Assistant Vice President for Research Compliance
CVM Phase II- Duckpond Dr., Blacksburg, VA 24061-0442
Office: 540/231-4991; FAX: 540/231-6033
email: moored@vt.edu

DATE: July 29, 2005

MEMORANDUM

TO: Kathy Hosig HNFE 0430
Sharon M. Nickols Human Nutrition, Foods, & Exercise 0430
Linda Davis HNFE 0430
Eileen S. Anderson Psychology 0274

FROM: David Moore

SUBJECT: **IRB Expedited Approval:** "Pilot Study: Crush the Freshman 15" IRB # 05-454

This memo is regarding the above-mentioned protocol. The proposed research is eligible for expedited review according to the specifications authorized by 45 CFR 46.110 and 21 CFR 56.110. As Chair of the Virginia Tech Institutional Review Board, I have granted approval to the study for a period of 12 months, effective July 29, 2005.

Virginia Tech has an approved Federal Wide Assurance (FWA00000572, exp. 7/20/07) on file with OHRP, and its IRB Registration Number is IRB00000667.

cc: File
Department Reviewer: William G. Herbert

APPENDIX B
Eating Disorder Risk Factors

Taken from *Practice Guideline for the Treatment of Patients with Eating Disorders, 3rd Edition*

Intrapersonal factors	Interpersonal Factors	Societal Factors
Temperament type	Having a family member who has/had an ED, especially mothers	Sociocultural ideals of health/beauty
Rigidity	Rule-bound behaviors	Thin-ideal internalization
Eating dysregulation	Interpersonal issues	Media exposure
Attachment issues	Childhood abuse	
Deficient self-regulation		
Post traumatic stress disorder		
Participation in certain athletics: • Ballet • Figure skating • Gymnastics • Cheerleading • Body building • Wrestling		
Anxiety		
OCD		
Rule bound-behaviors		
Body regulatory problems		
Perfectionism		
Academic problems		
Compulsive exercise		
Depression		

APPENDIX C

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Participants in Research Projects Involving Human Subjects

Title of Project: Pilot Study: Crush the Freshman 15

Investigators: Kathy Hosig, Ph.D, MPH, RD, Shelly Nickols-Richardson, PhD, RD, Linda Davis, M.S., R.D., Kerry Redican, EdD, Eileen Anderson, PhD, Janet Wojcik, PhD, Tricia Shepard

I. Purpose of this Research/Project

All students enrolled in HNFE 1004 and EDHL 1514 for Fall 2005 will be invited to participate in this study. Parental consent will be required for students under 18 years of age. This is a pilot study, and the purpose of the study is to find out whether an online nutrition and physical activity education program can help college students eat healthier, be more physically active, and maintain a healthy weight. Results will be used to plan larger studies in the future.

II. Procedures

Everyone who agrees to be in this study will be assigned to one of two groups; a comparison group or an intervention group. If you are assigned to the comparison group, you will complete data collection only. If you are assigned to the intervention group, you will complete data collection and have the opportunity to participate as much as you wish in activities provided to help you learn more about eating healthy and being physically active at Virginia Tech.

Data Collection (all subjects)

If you decide to participate in this study, you will be asked to do certain things at two different times during this academic year (2005-2006). The total time commitment for filling out questionnaires and body measurements is about 6 hours (3 hours each time).

Things you will be asked to do twice (once in September and once in early April) include:

1. Complete 7 questionnaires about your health, eating habits, physical activity, sleep habits and stress levels.
2. Keep a record of your food intake and physical activity for 7 days.
3. Come to a faculty office in Wallace Hall to have your weight, height, waist and hip, and skinfold (arm, back and chest for men; arm, abdomen and waist for women, chest for men/ hip for women) measurements taken; you will need to make an appointment to come for these measurements when you have not eaten yet that day and have only had a maximum of 1 cup (8 ounces) of beverage that day. A skinfold is measured by pinching together 2 layers of skin and measuring how thick they are.

You will receive the questionnaires and food/activity via email before your appointment for the body measurements. If you prefer to have printed copies of these forms, you may inform Dr.

Hosig and stop by her office to pick them up. You will bring the completed forms to your body measurement appointment.

Your weight and height and waist/hip circumference measurements will be taken in a faculty office (Dr. Hosig's office in 227 Wallace) by either Dr. Hosig or a graduate research assistant. The door will be partially open. You will keep your clothes on but will be asked to remove any outer clothing such as hat, coat, sweater and shoes. We will measure your hips and waist over light clothing such as a t-shirt and cotton shorts or pants. We will measure skinfolds on bare skin, but we will bare only the section being measured. You may have to loosen the waistband of your pants so that we can get an accurate waist measurement. If you wear clothes that are too thick or tight, we will provide a t-shirt and shorts for you to change into in the restroom down the hall before your measurements are taken.

Intervention Program (only subjects assigned to the intervention group)
If you are assigned to the intervention group, you will have access to a Blackboard™ site that is designed to provide short educational flyers about eating healthy and being physically active. This site will also give you tips on how to eat healthy and be physically active at Virginia Tech, help you find people to eat or exercise with, provide links to other information that you might find helpful, invite you to social events for study participants, and ask you to complete daily checklists about foods you eat and your physical activity. You will sometimes receive emails about the study through the Blackboard™ site. You will not be required to participate in any parts of the intervention. You may choose to do all or none of the things available to you. The study site will show on your Blackboard™ account any time you access the system for your Virginia Tech courses, but you will determine how often you access it by clicking on the link for that site.

III. Risks

Some subjects may be uncomfortable having body measurements taken; we will keep the door to the room partially closed so that you will have privacy during these measurements.

Some subjects may experience minor emotional distress during completion of the questionnaires; you may refuse to answer any questions that make you feel uncomfortable. The questions on the questionnaires are not designed to be about sensitive information.

IV. Benefits

Potential benefits of participation in this study include receiving personal information about your body measurements, nutrient content of your diet, sleep patterns and stress level. You may request a copy of your body measurements, nutrient analysis from your food record, sleep patterns and stress level once they are analyzed by checking the appropriate box(es) on this consent form.

The general public, especially college students, may benefit from this study if the intervention is successful in improving diet and physical activity habits of college students. Researchers can

use results of the study to plan future larger interventions. Results of this study may be distributed in newsletters to college students and in scientific journals.

V. Extent of Anonymity and Confidentiality

All of your information from the study will be confidential. Your name will not be used on the questionnaires, food and activity record, body measurement forms, or any other data collection forms. Instead, you will be given a special code number that will be on these forms. The researchers will keep a list of names and code numbers in a locked file cabinet. This list is to make sure that the correct code number is put on the forms you get so that all of your information has the same code number. Your code number will be put on the forms when you bring them to your body measurement appointment. Published results will not contain results for individual subjects.

VI. Compensation

You will be compensated separately for participation in each data collection period (two periods – beginning of Fall semester; end of Spring semester).

Compensation available for completion of all components for the Fall semester data collection period is 15 extra credit points for HNFE 1004 and/or credit for the applied component (15% of course points) of EDHL 1514. Compensation for partial completion of data collection components will be provided as follows: 5 points (HNFE) or 5% of course points (EDHL) for questionnaires; 5 points (HNFE) or 5% of course points (EDHL) for food/activity record; 5 points (HNFE) or 5% of course points (EDHL) for body measurements. You may earn an equal number of points in these classes by alternate means, even if you decide not to participate in this study.

Compensation available for completion of all components for the Spring semester data collection period is $20. Only subjects who participated in data collection at the beginning of the study will be eligible to participate in subsequent data collection periods, because the researchers need data from each time period for each subject for data analysis. Compensation for partial completion of data collection components will be provided as follows: $5 for questionnaires; $5 for food/activity record; $10 for body measurements.

VII. Freedom to Withdraw

If you agree to participate in this study, you are free to withdraw or stop participation at any time without penalty. You will receive compensation for any part of the study that you have completed, as shown above. If you choose to withdraw during Fall semester, your grade in the course will not be affected. You will not receive compensation for any parts of the study that you did not complete, but the points that you have earned for the course will not be reduced. If you withdraw from the study, you may gain unearned points up to 15 points maximum (HNFE) or 15% of course points (EDHL) – for each 15 extra credit points (HNFE) or 15% of course points (EDHL), you may keep a detailed 7-day food and activity record, enter the information into a nutrient analysis program available online, and turn in the food/activity record, printed

nutrient analysis results, and a one-page paper describing the experience and analyzing your personal results. You will turn in this assignment to your instructor for the class; completion of requirements for compensation will be verified by the researchers and conveyed to your instructor for the course in which you are enrolled (HNFE or EDHL).

If the researchers decide that you should not continue as a subject for any reason, such as missing data or incomplete information on study forms, you may be asked to withdraw from the study. If this happens, you will receive compensation as above for any parts of the study that you completed. Your grade for the course will not be affected. You will not receive points for any parts of the study that you did not complete, but the points that you have earned for the course will not be reduced. You may gain unearned points as described above - for each 15 extra credit points (HNFE) or 15% of course points (EDHL), you may keep a detailed 7-day food and activity record, enter the information into a nutrient analysis program available online, and turn in the food/activity record, printed nutrient analysis results, and a one-page paper describing the experience and analyzing your personal results. You will turn in this assignment to your instructor for the class; completion of requirements for compensation will be verified by the researchers and conveyed to your instructor for the course in which you are enrolled (HNFE or EDHL).

VIII. Subject's Responsibilities

I voluntarily agree to participate in this study. By agreeing to participate in the study, I agree to complete all responsibilities listed above in section II, Procedures. I understand my right to withdraw my participation at any time.

X. Subject's Permission

I am 18 years of age or older have read and understand the Informed Consent and conditions of this project. I have had all my questions answered and have been given a copy of this form to keep. I hereby acknowledge the above and give my voluntary consent to participate:

_____ Date _____
Signature

Subject information:

Printed Name: _____

Phone number: _____ E-mail address:
_____

☐ I would like to receive a copy of my nutrient analysis results when complete.

☐ I would like to receive a copy of my body measurements.

☐ I would like to receive a copy of my sleep questionnaire results.

☐ I would like to receive a copy of my stress questionnaire results.

Should I have any pertinent questions about this research or its conduct, and research subjects' rights, and whom to contact in the event of a research-related injury to the subject, I may contact:

Dr. Kathy Hosig	(540) 231-4900/ khosig@vt.edu
Investigator	Telephone/ e-mail
Dr. William G. Herbert	(540) 231-6565/ wgherb@vt.edu
Departmental Reviewer	Telephone/ e-mail
Dr. David Moore	(540) 231-4991/ moored@vt.edu
IRB Chair	Telephone/ e-mail
Institutional Review Board	
for Human Subject Research Ethics	

APPENDIX D

SUBJECT QUESTIONNAIRE

Pilot Study: Crush the Freshman 15

Your Code Number (entered by staff members when you come to be weighed and measured):_____

General Information About You

Age:_____ **Date of birth:**_____ **Gender** (circle): Female Male

Race/Ethnic background (check all that apply):

_____ White _____ Asian/ Pacific Islander _____ Native American

_____ Black/African American _____ Other (please specify): _____

Are you Hispanic or Latino (circle)? YES NO

Major (if known): _____ **OR** ____ Unknown at this time (check)

Please check **all** courses below that you are currently taking:

_____ Morning section of HNFE 1004 (nutrition, foods and exercise)
_____ Afternoon section of HNFE 1004 (nutrition, foods and exercise)
_____ On-campus section of EDHL 1514 (personal health)
_____ Online section of EDHL 1514 (personal health)

Were you an **athlete in high school** (circle)? YES NO

if yes, what sport(s) did you play: _____

Do you **play sports in college** (circle)? YES NO

if yes, please indicate which which level and which sport(s) you play below:

____ collegiate: _____

____ club level: _____

____ intramural: _____

Please indicate **reasons you are taking the cours(es)** you are taking: (mark all that apply)

Reason for taking	**HNFE 1004**	**EDHL 1514**
Required for major		

Meets university core requirement		
Elective		
Increase GPA		
Interest in topic		
Class was at a convenient time		
Other: please specify:		
Other: please specify:		

HEALTH HISTORY

Medical History
Please indicate any current or previous conditions or problems you have experienced or have been told by a physician that you have had:

	Yes	No
Heart disease or heart problems:	_____	_____
Circulation problems:	_____	_____
Kidney disease or problems:	_____	_____
Urinary problems:	_____	_____
Reproductive problems:	_____	_____
Muscle problems:	_____	_____
Skeletal problems:	_____	_____
Neurological problems/disorders:	_____	_____
High blood pressure:	_____	_____
Low blood pressure:	_____	_____
Diabetes:	_____	_____
Thyroid problems:	_____	_____
Eating disorders (bulimia, anorexia):	_____	_____
Crohn's disease:	_____	_____
Hirsutism (unusual hair growth on face or chest):	_____	_____
Insomnia:	_____	_____
Unusual sleep patterns:	_____	_____
Other (Please list): _____	_____	_____

If "yes" to any of the above please indicate the date, explain, and describe:

_____

_____

_____

Please list any hospitalizations/operations/recent illnesses (Type/Date):_____

_____

_____

_____

Work Schedule and Patterns

Do you engage in night-time work? YES NO

If yes, please explain and indicate your usual work hours (time of day): _____

_____

Limitations on Physical Activity

Are there any physical limitations you have that may restrict your ability to exercise?

YES NO

If "yes" please explain: _____

_____

Medications

Please indicate any current medications that you are taking on a daily or weekly basis:

_____

_____

_____

_____

_____

Please list any nutritional supplements, herbal products, or other medications, (prescription and over-the-counter) you are currently taking on a daily or weekly basis: _____

_____

_____

_____

Weight History

What is your current weight? _____

How much did you weigh six months ago? _____

How much did you weigh one year ago? _____

During the last 2 years, how many times have you lost 5 pounds? _____

During the last 2 years, how many times have you gained 5 pounds? _____

Smoking

Do you smoke (circle)? YES NO

if yes, approximately how many cigarettes do you smoke per day? _____

Godin Leisure-Time Exercise Questionnaire

Considering a **7-Day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your **free time** (write on each line the appropriate number).

Times Per Week

a) STRENUOUS EXERCISE

(HEART BEATS RAPIDLY)

(i.e. running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling, etc.) _____

b) MODERATE EXERCISE

(NOT EXHAUSTING)

(i.e. fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing, etc.) _____

c) MILD EXERCISE

(MINIMAL EFFORT)

(i.e. yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking, etc.) _____

Considering a **7-Day period** (a week), **during your leisure-time**, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

OFTEN	**SOMETIMES**	**NEVER/RARELY**
1. ☐	**2.** ☐	**3.** ☐

Epworth Sleepiness Scale

How likely are you to doze off or fall asleep in the situations described below, in contrast to feeling just tired?

This refers to your usual way of life in recent times.

Even if you haven't done some of these things recently, try to work out how they would have affected you.

Use the following scale to choose the most appropriate number for each situation:

0 = No chance of dozing or sleeping

1 = Slight chance of dozing or sleeping

2 = Moderate chance of dozing or sleeping

3 = High chance of dozing or sleeping

Situation	**Chance of Dozing or Sleeping** (write number in blank)
Sitting and reading…….	_____
Watching TV……..	_____
Sitting, inactive in a public place (e.g. a theater or a meeting)……..	_____
As a passenger in a motor vehicle for an hour without a break…….	_____
Lying down to rest in the afternoon when circumstances permit……..	_____
Sitting and talking to someone……...	_____
Sitting quietly after a lunch without alcohol……..	_____
Stopped for a few minutes in traffic while driving……	_____

PITTSBURGH SLEEP QUALITY INDEX (PSQI)

Instructions:

The following questions relate to your usual sleep habits during the past 6 weeks only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month.

1. During the past six weeks, when have you usually gone to bed at night?

   Usual Bed Time: _____

2. During the past six weeks, how long (in minutes) has it usually taken you to fall asleep each night?

   Number of Minutes: _____

3. During the past six weeks, when have you usually gotten up in the morning?

   Usual Getting Up Time: _____

4. During the past six weeks, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spend in bed.)

   Hours Of Sleep Per Night: _____

*For each of the remaining questions, check the **one best response** for each part of the question.*

5. During the past six weeks, how often have you had trouble sleeping because you…..

   (a) Cannot get to sleep within 30 minutes

Not during the past month ___	Less than once a week___	Once or twice a week___	Three or more times a week ___

   (b) Wake up in the middle of the night or early morning

Not during the past 6 weeks ___	Less than once a week___	Once or twice a week___	Three or more times a week ___

   (c) Have to get up to use the bathroom

Not during the past 6 weeks ___	Less than once a week___	Once or twice a week___	Three or more times a week ___

   (d) Cannot breathe comfortably

Not during the past 6 weeks ___	Less than once a week___	Once or twice a week___	Three or more times a week ___

(e) Cough or snore loudly

Not during the past 6 weeks ___ | Less than once a week___ | Once or twice a week___ | Three or more times a week ___

(f) Feel too cold

Not during the past 6 weeks ___ | Less than once a week___ | Once or twice a week___ | Three or more times a week ___

(g) Feel too hot

Not during the past 6 weeks ___ | Less than once a week___ | Once or twice a week___ | Three or more times a week ___

(h) Had bad dreams

Not during the past 6 weeks ___ | Less than once a week___ | Once or twice a week___ | Three or more times a week ___

(i) Have pain

Not during the past 6 weeks ___ | Less than once a week___ | Once or twice a week___ | Three or more times a week ___

(j) Other reason(s), please describe

_____

_____

How often during the past six weeks have you had trouble sleeping because of this?

Not during the past 6 weeks ___ | Less than once a week___ | Once or twice a week___ | Three or more times a week ___

6. During the past six weeks, how would you rate your sleep quality overall?

Very good ____ Fairly good ____ Fairly bad ____ Very bad ____

7. During the past six weeks, how often have you taken medicine (prescribed or "over the counter") to help you sleep?

Not during the past 6 weeks ___ | Less than once a week___ | Once or twice a week___ | Three or more times a week ___

8. During the past six weeks, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during the past 6 weeks ___	Less than once a week___	Once or twice a week___	Three or more times a week ___

9. During the past six weeks, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

No problem at all ____	Only a very slight problem___	Somewhat of a problem ____	A very big problem ____

10. Does someone usually sleep in the same room with you (roommate, partner, etc.)?

Yes ____ No ____

If someone usually sleeps in the same room with you, ask him/her how often in the past six weeks he/she has observed you have……

(a) Loud snoring

Not during the past 6 weeks ___	Less than once a week___	Once or twice a week___	Three or more times a week ___

(b) Long pauses between breaths while asleep

Not during the past 6 weeks ___	Less than once a week___	Once or twice a week___	Three or more times a week ___

(c) Legs twitching or jerking while you sleep

Not during the past 6 weeks ___	Less than once a week___	Once or twice a week___	Three or more times a week ___

(d) Episodes of disorientation or confusion during sleep

Not during the past 6 weeks ___	Less than once a week___	Once or twice a week___	Three or more times a week ___

(e) Other restlessness while you sleep, please describe:

_____

_____

Not during the past month ___	Less than once a week___	Once or twice a week___	Three or more times a week ___

HEALTH BELIEFS QUESTIONNAIRE

Food Beliefs – Healthier Foods Social Support

Using a scale from 1 to 5, indicate how much you agree with the following statements:

(1 = strongly agree, and 5 = strongly disagree)

My family, and my closest friends…..	**Agree or Disagree (1-5)**	
	Family	**Friends**
1. Don't drink many regular sodas or sugared drinks.		
2. Believe that is it important to eat enough fiber.		
3. Eat whole grain cereal every day.		
4. Eat at least 5 servings of fruits and vegetables every day.		
5. Try to eat low-fat dairy foods.		
6. Eat whole grain bread every day.		
7. Have told me that they want to eat more fruits and vegetables.		
8. Believe that eating breakfast is important for good health.		
9. Eat breakfast every day.		
10. Have told me that they want to eat more whole grain foods.		
11. Believe that drinking too many sodas or sugared drinks is unhealthy.		
12. Eat or drink at least 3 servings of dairy foods every day.		
13. Have told me that they want to eat or drink more dairy foods.		
14. Have told me that they want to cut down on sodas or sugared drinks.		
15. Eat fruits or vegetables for snacks		
16. Eat fruits or vegetables for dessert.		

Food Beliefs – Healthier Foods Strategies

Using a scale from 1 to 5, indicate whether you agree with the following statements:

1= Never 2= Seldom 3= Occasionally 4= Often 5=Repeatedly

In the past 3 months, how often did you…..	**How Often (1-5)**
1. Pay closer attention to eating breakfast.	
2. Remind yourself that eating breakfast is healthy.	
3. Eat more vegetables.	
4. Eat more fruits.	
5. Eat more dairy foods.	
6. Eat more whole grain foods.	
7. Eat low-fat salad dressing when you ate salad.	
8. Remind yourself to drink fewer sodas or sugared drinks.	
9. Plan to eat breakfast.	
10. Plan to eat at least 5 servings of fruits and vegetables every day.	
11. Keep track of how many servings of fruits and vegetables you eat each day.	
12. Plan to drink or eat at least 3 servings of dairy foods every day.	
13. Keep track of how many servings of dairy foods you eat each day.	
14. Plan to eat more whole grain foods.	
15. Keep track of how many servings of whole grain foods you eat each day.	
16. Plan to drink fewer sodas or sugared drinks each day.	
17. Keep track of how many sodas or sugared drinks you drink each day.	
18. Eat breakfast on purpose when you would usually skip breakfast	

Food Beliefs – Healthier Foods Efficacy

These questions ask how CERTAIN you are that you can do different things to eat healthier foods.

You will be asked to decide how certain or sure you are that you can do these things on most days and in lots of different situations. Think about times when it will be easy to do these things and when it will be harder.

When deciding how sure you are that you can do these things, we want you to think about doing them:

ALL or MOST of the time, not just once or twice.

For a long time… until next year…. or even longer!!

In a lot of different situations – like when you are…..

- Eating in a dining center on campus…
- Deciding what to eat when at home, along, watching TV or doing chores….
- Studying late at night
- Eating with your family..
- Eating out with friends or at a party…
- At a fast-food restaurant
- Buying food at the grocery store
- Traveling

Use any number from 0 to 100 on the following scale to tell how certain you are that you can – all or most of the time:

0 ----------50---------- 100

Certain that I CAN NOT ***Somewhat certain I CAN*** ***Certain I CAN***

How certain are you that you can…..	**How certain? (0-100)**
BREAKFAST	
1. Eat breakfast every day?	
2. Eat breakfast on most days?	
3. Eat breakfast before you go to class or work?	
4. Eat breakfast when you have an early class, meeting, etc.?	
DAIRY FOODS	
5. Drink or eat at least 3 servings of dairy foods each day?	
6. Drink 1%, ½%, or fat-free (skim) milk instead of higher fat milk?	
7. Eat low-fat cheese products (such as cottage cheese, sliced cheese, etc.)?	
8. Choose smoothies with less sugary and/or high-fat ingredients?	
FRUITS AND VEGETABLES	
9. Take fruit to school or work for a snack every day?	
10. Eat at least 5 servings of fruits and vegetables every day?	
11. Eat vegetables for a snack?	
12. Eat fruit for a snack?	
13. Have a salad or other vegetable instead of French fries when eating out?	
14. Eat more than one serving of vegetables at a meal?	
15. Find vegetables on campus that you will eat?	
16. Find fruits on campus that you will eat?	
WHOLE GRAIN FOODS	
17. Figure out what foods are whole grain foods?	
18. Eat at least 3 servings of whole grain foods every day?	
19. Eat whole grain bread?	
20. Find whole grain bread on campus?	
21. Eat whole grain cereal?	
22. Find whole grain cereal on campus?	
23. Eat whole grain rice or pasta?	
24. Find whole grain rice or pasta on campus?	
25. Eat whole grain foods for snacks?	
26. Eat whole grain foods for breakfast?	
27. Eat whole grain foods for lunch?	
28. Eat whole grain foods for dinner?	
REGULAR SODAS AND SUGAR-SWEETENED DRINKS	
29. Limit regular sodas and sugar-sweetened drinks to one per day?	
30. Cut back on the size of regular sodas and sugared drinks?	
31. Choose fruit instead of juice when choosing fruits?	

Food Beliefs – Healthier Foods Outcomes

Now, tell us what you expect will happen when you eat healthier foods.

Use this scale to tell us if you agree that the following will happen:

(1 = strongly agree, and 5 = strongly disagree)

If I eat healthier (breakfast, fruits and vegetables, whole grains, dairy, etc.), I expect:	**Do you agree? (1-5)**
1. I will have more energy.	
2. I will lose weight.	
3. I will feel healthier and happier.	
4. I will live longer.	
5. I will feel better in my clothes.	
6. I will be hungrier.	
7. My health will improve.	
8. I will miss eating the foods that I love.	
9. I will be less likely to get cancer or heart disease.	
10. I will be less likely to gain weight.	
11. Finding healthier foods on campus will be a lot of trouble.	
12. I will be bored with what I have to eat.	
13. I will have to change a lot of my favorite foods.	
14. I won't be able to eat the same foods as my friends.	
15. I won't be able to eat the same foods as the rest of my family.	
16. I will have to spend too much time keeping track of what I eat.	
17. The food I eat will not taste good.	
18. It will take too long to prepare meals and snacks.	
19. I will have to plan my meals too far in advance.	
20. I will be more attractive.	
21. I will be doing what I know I should do.	
22. I won't be able to stick with it – I'll just go back to my old habits.	
23. My friends won't want to eat with me.	

Physical Activity Beliefs – Social Support

Using a scale from 1 to 5, indicate how much you agree with the following statements:

(1 = strongly agree, and 5 = strongly disagree)

My family, and my closest friends…..	**Agree or Disagree (1-5)**	
	Family	**Friends**
1. Make time to be more physically active.		
2. Believe that being physically active will keep them healthier.		
3. Believe that being physically active helps them manage their weight.		
4. Are not more physically active because they get too hot or out of breath.		
5. Are not more physically active because they don't have time.		
6. Take short breaks to be physically active during the day.		
7. Use the stairs instead of the elevator.		
8. Enjoy physical activity.		
9. Make excuses for not being more physically active.		

Physical Activity Beliefs – Self-regulation Strategies

Using a scale from 1 to 5, indicate whether you agree with the following statements:

1= Never 2= Seldom 3= Occasionally 4= Often 5=Repeatedly

In the past 3 months, how often did you…..	**How Often (1-5)**
1. Set aside time each day to increase your physical activity?	
2. Take the stairs instead of an elevator?	
3. Write down in your weekly calendar your plans to increase your physical activity?	
4. Plan other places to be physically active if the weather is bad?	
5. Walk instead of drive when doing errands or going out to eat?	
6. Take short breaks to increase your physical activity during the day?	

7. Park farther away from school, work or shopping to increase your physical activity?	
8. Exercise with someone else to increase your physical activity?	
9. Use a facility on campus to exercise (gym, pool, track, etc.)?	
10. Participate in exercise classes on campus (aerobics, swimming, etc.)?	
11. Participate in other opportunities for physical activity on campus (intramural sports, club sports, etc.)?	

Physical Activity Beliefs – Self Efficacy

These questions ask how CERTAIN you are that you can do different things to be more physically active.

You will be asked to decide how certain or sure you are that you can do these things on most days and in lots of different situations. Think about times when it will be easy to do these things and when it will be harder.

When deciding how sure you are that you can do these things, we want you to think about doing them:

EVERY DAY or ALMOST EVERY DAY, not just once or twice.

For a long time… until next year…. or even longer!!

In a lot of different situations – like when you are…..

- At work or school..
- When the weather is bad..
- When you are feeling stressed or depressed..
- When you can't find someone to exercise with..
- When you are busy

Use any number from 0 to 100 on the following scale to tell how certain you are that you can – all or most of the time:

0 ----------50---------- 100

Certain that I CAN NOT ***Somewhat certain I CAN*** ***Certain I CAN***

How certain are you that you can…..	**How certain? (0-100)**
1. Get up early during the week to increase your physical activity?	
2. Get together with someone else to increase your physical activity?	
3. Use the stairs instead of the elevator?	
4. Take small breaks during the day to increase your physical activity?	
5. Begin being more physically active again if you miss a day or two?	
6. Park farther away to be more physically active?	
7. Find a place to be physically active during bad weather?	
8. Keep track of your physical activity?	
9. Change your normal routine to increase your physical activity?	
10. Stay up later to make time to be more physically active?	
11. Make a plan to increase your physical activity?	
12. Find places on campus to be physically active?	
How certain are you that you can be physically active when…	
13. you are feeling stressed?	
14. you are tired?	
15. your family wants more time?	
16. your friends want more time?	
17. your muscles are a little sore?	
18. you get busy at work?	
19. you have too much school work to do?	
20. you have social activities?	
21. you have chores or errands to do?	
22. you are feeling depressed?	
23. you have no one to exercise with?	

Physical Activity Beliefs – Outcomes

Now, tell us what you expect will happen when you increase your physical activity.

Use this scale to tell us if you agree that the following will happen:
(1 = strongly agree, and 5 = strongly disagree)

Use this scale to tell us how much it will matter:
(1 = not at all, and 5 = very much)

If I increase my physical activity I will….	**Do you agree? (1-5)**	**Will it matter? (1-5)**
1. have to change my normal routine.		
2. be doing what is right for me.		
3. be happier.		
4. make new friends.		
5. be less irritable.		
6. experience body pain.		
7. have one more thing to worry about getting done.		
8. feel better about my body.		
9. have less time to spend with my family.		
10. have less time to spend with my friends.		
11. feel refreshed.		
12. not have enough time for other things I want to do.		
13. fit into my clothes better.		
14. be able to maintain or improve my weight.		
15. sleep better.		
16. feel less stressed.		
17. have to give up some of my usual activities.		
18. not have enough time to study.		
19. be uncomfortable because people are watching me exercise.		
20. have more energy.		
21. have to take more time than usual to plan my day.		
22. get too sweaty.		

Eating Attitudes Test (EAT 26)

Please check a response for each of the following statements:		Always	Usually	Often	Some times	Rarely	Never
1.	Am terrified about being overweight.	□	□	□	□	□	□
2.	Avoid eating when I am hungry.	□	□	□	□	□	□
3.	Find myself preoccupied with food.	□	□	□	□	□	□
4.	Have gone on eating binges where I feel that I may not be able to stop.	□	□	□	□	□	□
5.	Cut my food into small pieces.	□	□	□	□	□	□
6.	Aware of the calorie content of foods that I eat.	□	□	□	□	□	□
7.	Particularly avoid food with a high carbohydrate content (i.e. bread, rice, potatoes,etc.)	□	□	□	□	□	□
8.	Feel that others would prefer if I ate more.	□	□	□	□	□	□
9.	Vomit after I have eaten.	□	□	□	□	□	□
10.	Feel extremely guilty after eating.	□	□	□	□	□	□
11.	Am preoccupied with a desire to be thinner.	□	□	□	□	□	□
12.	Think about burning up calories when I exercise.	□	□	□	□	□	□
13.	Other people think that I am too thin.	□	□	□	□	□	□
14.	Am preoccupied with the thought of having fat on my body.	□	□	□	□	□	□
15.	Take longer than others to eat my meals.	□	□	□	□	□	□
16.	Avoid foods with sugar in them.	□	□	□	□	□	□
17.	Eat diet foods.	□	□	□	□	□	□
18.	Feel that food controls my life.	□	□	□	□	□	□
19.	Display self-control around food.	□	□	□	□	□	□
20.	Feel that others pressure me to eat.	□	□	□	□	□	□
21.	Give too much time and thought to food.	□	□	□	□	□	□
22.	Feel uncomfortable after eating sweets.	□	□	□	□	□	□
23.	Engage in dieting behavior.	□	□	□	□	□	□
24.	Like my stomach to be empty.	□	□	□	□	□	□
25.	Have the impulse to vomit after meals.	□	□	□	□	□	□
26.	Enjoy trying new rich foods.	□	□	□	□	□	□

HASSLES ASSESSMENT SCALE FOR STUDENTS IN COLLEGE (HASS/Col)

INSTRUCTIONS:

The items below describe the circumstances you may sometimes find unpleasant if they make you frustrated, irritated, or anxious. Think of them as **events** – they happen and end. For your experiences in the **past month or so**, mark the numbered cells next to each event to describe its **frequency**, the **degree of unpleasantness** it usually produced for you, and the extent to which you **dwelled** on or were bothered by it when the actual event was not present (before or after). Use **all three** rating scales, which are defined below. To mark the number you choose each time, cross through the cell that has that number using an "X", or darken the whole cell.

RATING SCALE DEFINITIONS:

Frequency – rate ***how often*** in the ***past month or so*** the event occurred, using a scale that ranges from **0** = "never" to **5** = "extremely often".

Unpleasantness – rate ***how unpleasant*** the event usually was when it actually happened, using a scale that ranges from **0** = "not at all" to **4** = "extremely unpleasant. Mark **0** if the event didn't occur.

Dwelled – rate the ***extent to which you usually were bothered*** by each event when it was not actually present, before or after it occurred. Use a scale from **1** to **5,** where **1** means you dwelled on it either not at all or very little (thinking about it briefly for less than an hour) and **5** means you dwelled on it very often and for more than a week. Mark **1** if the event didn't occur.

EVENTS	FREQUENCY						UNPLEASANTNESS					DWELLED				
	Never	Rarely	Occasion-ally	Often	Very often	Ex-tremely often	Not at all	Mildly	Moder-ately	Very	Ex-tremely	Very little/ not at all	Some-what	Moder-ately	A lot	A great deal
1. Annoying social behavior of others (e.g., rude, inconsiderate, sexist/racist)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
2. Annoying behavior of self (e.g., habits, temper)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
3. Appearance of self (e.g., noticing unattractive features, grooming).	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
4. Accidents/ clumsiness/mistakes of self (e.g., spilling beverage, tripping).	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
5. Athletic activities of self (e.g., aspects of own performance, time demands)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
6. Bills/overspending: seeing evidence of	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
7. Boredom (e.g., nothing to do, current activity uninteresting.	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
8. Car problems (e.g. breaking down, repairs).	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
9. Crowds/large social groups (e.g., at parties, while shopping).	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
10. Dating (e.g., noticing lack of, uninteresting partner)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
11. Environment (e.g., noticing physical living or working conditions).	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
12. Extracurricular groups (e.g., activities, responsibilities).	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
13. Exams (e.g., preparing for, taking)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
14. Exercising (e.g., unpleasant routines, time to do).	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
15. Facilities/resources unavailable (e.g., library materials, computers).	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
16. Family: obligations or activities.	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5

17. Family: relationship issues, annoyances.	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
18. Fears of physical safety (e.g., while walking alone, being on a plane or in a car).	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
19. Fitness: noticing inadequate physical condition.	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
20. Food (e.g., unappealing or unhealthful meals)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
21. Forgetting to do things (e.g., to tape TV show, send cards, do homework)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
EVENTS	**FREQUENCY**						**UNPLEASANTNESS**					**DWELLED**				
	Never	Rarely	Occasion-ally	Often	Very often	Ex-tremely often	Not at all	Mildly	Moder-ately	Very	Ex-tremely	Very little/ not at all	Some-what	Moder-ately	A lot	A great deal
22. Friends/peers; relationship issues, annoyances.	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
23. Future plans (e.g., career or marital decisions)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
24. Getting up early (e.g., for class or work)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
25. Girl/boy-friend: relationship issues, annoyances	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
26. Goals/tasks: not completing enough	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
27. Grades (e.g., getting a low grade)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
28. Health/physical symptoms of self (e.g., flu, PMS, allergies, headaches)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
29. Schoolwork (e.g., working on term papers, reading tedious/hard material, low motivation)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
30. Housing: finding/getting or moving	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
31. injustice: seeing examples or being a victim of	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
32. Job: searching for or interviews	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
33. Job/work issues (e.g., demands or annoying aspects of)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
34. Lateness of self (e.g., for appointment or class)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
35. Losing or misplacing things (e.g., keys, books)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
36. Medical/dental treatment (e.g., unpleasant, time demands)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
37. Money: noticing lack of	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
38. New experiences of challenges; engaging in	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
39. Noise of other people or animals	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
40. Oral presentations/public speaking	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
41. Parking problems (e.g., on campus, at work, at home)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
42. Privacy: noticing lack of	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
43. Professors/coaches (e.g., unfairness, demands of, unavailability)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
44. Registering for or selecting classes to take	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
45. Roommate(s)/ housemate(s): relationship issues, annoyances	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
46. Sexually transmitted diseases (e.g., concerns about, efforts to reduce risk of STDs/HIV)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
47. Sports team/celebrity performance (e.g., favorite athlete or team losing)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
48. Tedious everyday chores (e.g. shopping, cleaning apartment)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
49. Time demands/deadlines	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
50. Traffic problems (e.g., inconsiderate or careless drivers, traffic jams)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5

51. Traffic tickets: getting (e.g., for moving or parking violations)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
52. Waiting (e.g., for appointments, in lines)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
53. Weather problems (e.g., snow, heat/humidity, storms)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5
54. Weight/dietary management (e.g., not sticking to plans)	0	1	2	3	4	5	0	1	2	3	4	1	2	3	4	5

APPENDIX E

Instructions for Completing Food and Activity Records

It is extremely important that you take this part of the study seriously. We need for you to be as complete and specific as possible.

1. Please don't forget to write down **what time you got up** for the day!!!!

2. Please write down **everything** you eat or drink as soon as possible after you consume it.

3. Include **anything** you "eat", including hard candy, gum, etc.

4. Please fill out each column for each food item

   Time

   We need this to see if timing of eating makes a difference in the things we are looking at

   Amount

   We need this to be able to enter your food intake correctly into the computer. Use your best judgment, and here are some tips:

   a. 1 cup is about the size of a baseball (or a half-pint milk carton from the cafeteria, or your fist if your hand is average size) – also usually 1 scoop of main dish at a cafeteria
      i. ½ cup is about the size of a tennis ball (usually 1 scoop of side dish at a cafeteria)
      ii. 1 teaspoon is about the size of the end of your thumb – 3 teaspoons is 1 tablespoon
      iii. ¼ cup is about the size of a golf ball
      iv. 3 ounces of meat is about the size of a deck of cards
   b. Try to use amounts such as cups, tablespoons, ounces, etc. if possible, but just describe the amount if you are not sure
   c. If the item is a standard size at a fast food restaurant, you can just say exactly what the item was and what size (small/medium/large, 6-inch/12-inch, single/double, etc.) – remember to say WHERE you ate
   d. If you make it yourself, tell us how many pieces/slices of EACH thing on sandwiches, how much of EACH condiment or topping, etc.
   e. For drinks, tell us whether it was regular or diet, sweet or unsweetened, and the SIZE (small/medium/large, 8-oz/12-oz/16-oz./20-oz./24-oz), and anything you added (i.e. cream, sugar, etc.) – **please don't forget to include drinks!!!**
   f. If the item is one "pack" or "package", please tell us the size of the package – should be on the package itself
   g. For any foods that you can, especially bread/cereal/pasta/rice, etc., please tell us the **BRAND NAME and PRODUCT NAME** of the food you ate.]

5. **Examples** of complete entries: **use your own information and serving sizes, of course!!!**

Please email me at khosig@vt.edu if you have any questions about how to enter a food that you ate – I will respond quickly

a. Kellogg's Complete Bran Flakes – 1.5 cups
b. Pepperidge Farms Multi-Grain Bagel – 1 large bagel (12oz per 6 bagels)
c. Entenmann Chocolate Cake Donuts, large – 2 donuts
d. Chips Ahoy Chewy Chocolate Chip Cookies – 4 cookies
e. Quaker Chewy Granola Bars (peanut butter and chocolate chip) – 2 bars
f. Kraft Singles 2% American Cheese – 1 slice
g. Plumrose Deli Ham, baked – 2 slices
h. Kraft Light Done Right ranch salad dressing – 3 tablespoons, ¼ cup, etc.

CONTINUES……..(over)

i. Kroger 2% milk – 1 cup
j. Subway 6-inch turkey/ham with provolone on honey/oat bread with mayo, mustard, pickle, black olives, etc.
k. Firehouse large pepperoni and mushroom pizza, regular crust (or thin crust, etc.) – 4 slices
l. Chef Salad at Dietrick – large with 1 cup lettuce, ¼ cup ham, ¼ cup turkey, 1 egg, ¼ cup cheese, ½ cup croutons, ¼ cup bacon bits, ¼ cup green pepper, ½ cup regular (as opposed to low fat or fat free) French dressing
m. Spaghetti with meat sauce – 2 cups pasta with 1 cup sauce and ¼ cup Parmesan Cheese
n. Mello Yello (regular) – 20oz bottle (or 12oz can, etc.)
o. Dr. Pepper (diet) – 20oz bottle (or 16oz cup, etc.)
p. Hardees 1/3 pound thickburger with mayo, mustard, lettuce, tomato
q. Wendy's single cheeseburger with lettuce, tomato, mayo
r. Krispy Kreme chocolate glazed crème-filled doughnut – 2 doughnuts
s. Sweet tea – Big Gulp at 7-Eleven (indicate ounces if you know it)
t. Beer – indicate how many draft beers, how many cans, name and whether regular or light
u. Extra sugar-free gum – 1 slice
v. Skittles candy – 1 bag (1.15 ounce)
w. Apple – 1 large
x. Banana – 1 medium
y. Broccoli with cheese sauce – ¾ cup
z. Campbell's Chunky Vegetable Beef soup – 1 can
aa. Great Value saltine crackers – 8 squares
bb. Canned peaches in heavy syrup (or light syrup or juice) – ½ cup, or 4 slices
cc. Kraft Easy Mac macaroni and cheese – 2 packages
dd. Kroger macaroni and cheese from mix – 2 cups
ee. Tuna sandwich – 1 can tuna in oil (drained), 3 tablespoons regular mayo, dash salt and pepper, 2 slices Kroger sandwich bread

ff. Peanut butter sandwich – 3 tablespoons Jif peanut butter, 1 tablespoon grape jelly, 2 slices Arnold 7-grain bread
gg. Ramen noodles, oriental flavor – 1 package (3 oz)
hh. Sbarro broccoli and spinach stromboli, small
ii. Sbarro large drink, Dr. Pepper
jj. Casserole with pasta, chicken, carrots, corn, lima beans, peas – 1.5 cups total (could put recipe in "special notes" column if you made it or know the proportions)
kk. Red grapes – 1 cup (or might use number such as 10 grapes, if you count them, or say 1 handful, 2 handfuls, etc.)

6. **Please don't forget to write down your physical activity** for the day on the front of the food/activity record, even if you don't use the back for food

Again, please be specific about what you did, how strenuous it was, and how long

Examples (use actual time, etc.):
a. basketball, full court, 20 minutes
b. jogged, 10-minute mile, 45 minutes
c. cardio machines, 30 minutes
d. walked, 40 minutes total
e. bicycle, outdoor, 1 hour
f. racquetball, 30 minutes
g. land aerobics class, 30 minutes
h. lifted weights, total actual lifting time 20 minutes

APPENDIX F

FOOD AND ACTIVITY RECORD
Crush the Freshman 15 Pilot

Code # (entered when you are weighed)_____ Day of Week _____ Date _____

What time did you get up today? _____ (include am or pm) How many hours did you sleep last night? _____

If you napped today, please list how long you napped: _____

*Remember: Please do not alter your normal activity or diet while keeping this record. Keep the record for 7 consecutive days. Use additional pages for each day if necessary. For foods eaten out, indicate where foods were purchased. For mixed foods, include recipe on a separate page.

Physical Activity
Please list any physical activity you had today, **including walking around campus to and from class**.

Type of Activity	**Time Spent in minutes**	**Special Notes**

Food You Ate Today – (continue on next page)

Time (include am/pm)	Food Eaten - How Prepared	Amount Eaten	Special Notes

Continued on back…….

Page 2 of 2 **Day of week: _____** **Date: _____**

Time	Food Eaten - How Prepared	Amount Eaten	Special Notes

APPENDIX G

Anthropometric Data Collection Form

Pilot Study: Crush the Freshman 15

Subject Code Number: _____ **Project Staff:** _____

Date: _____ Time of day: _____ am / pm

Weight: _____ pounds

Height: _____ inches

Circumferences

Waist – narrowest point
_____(cm)

_____

_____

Waist – above suprailiac crest
_____(cm)

_____

_____

Hip (cm): _____

_____

_____

Abdomen (cm) _____

_____

_____

Skinfold Measurements

Abdominal skinfold: _____

_____

_____

Triceps skinfold: _____

_____

_____

Subscapular skinfold: _____

_____

_____

Suprailiac skinfold: _____

_____

_____