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Lifestyle Intervention Program with Calcium Supplementation to Promote Weight Loss and Body Fat Reduction in Overweight Individuals.

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Lifestyle Intervention Program with Calcium Supplementation
to Promote Weight Loss and Body Fat Reduction in Overweight Individuals

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by
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ABSTRACT

Lifestyle Intervention Program with Calcium Supplementation
to Promote Weight Loss and Body Fat Reduction in Overweight Individuals

By

Candee M. Spence

The purpose of this study was to determine if there was a significant difference in weight loss, body fat, waist circumference, or diet quality among participants taking calcium or placebo supplements in a lifestyle intervention program. Three participants ages 52-55 completed the 14-week program. Two participants took 1,000 milligrams calcium while one participant took a placebo. Changes in diet were analyzed by Nutribase IV and self perception. Anthropometrics were analyzed by analysis of variance, alpha level 0.05. There was significant decrease in weight and waist circumference for the calcium group and decrease in bioelectrical impedance for the placebo group; however, due to small sampling size, results are inconclusive. There was no significant difference between groups in skinfold, diet, or quality of life.

CONTENTS

CHAPTER 1

INTRODUCTION

Statement of the Problem

The rate of obesity in America is rising rapidly, contributing to many diseases and economic problems. According to the National Center for Health Statistics, 64% of U.S. adults age 20 years and older are overweight (BMI greater than or equal to 25) or obese (BMI greater than or equal to 30) with 30% of those being obese (1). Overweight or obese individuals are becoming desperate for a quick and easy solution through medications, supplements, surgery, and/or fad diets. These individuals are often unaware of the health consequences related to these weight loss mechanisms. The purpose of this research is to determine if a lifestyle based program with calcium supplementation will result in weight and body fat improvements.

Significance of the Problem

The significance of this problem is often expressed from the relationship of obesity to the leading causes of death. Among the 10 leading causes of death in the United States, obesity is directly related to a minimum of four diseases including #1 heart disease, #2 cancer, #3 cerebrovascular disease, #6 diabetes mellitus, and may potentially be linked to #4 respiratory diseases, #7 influenza/pneumonia, and #9 nephritis/nephrotic syndrome/nephrosis (2). According to the surgeon general, "Individuals who are obese (BMI greater than or equal to 30) have a 50% - 100% increased risk of premature death from all causes compared to individuals with a BMI in the range of 20 to 25" (3). In addition to the health risks already mentioned, obesity has been associated with an increased risk of gallbladder disease, osteoarthritis, sleep apnea, asthma/breathing difficulties, pregnancy complications, menstrual irregularities, stress

incontinence, increased surgical risk, psychological disorders such as depression and difficulties due to social stigmatization (3).

Economic consequences are another major area of concern for the obese population. Overweight and obesity have both indirect and direct costs. The direct costs associated with healthcare are preventive, diagnostic, and treatment services specifically related to the weight problem and associated diseases, while the indirect costs refer to the wages lost from being unable to work due to illness or disability from weight-related diseases. The economic cost of obesity in the year 2000 was estimated at $117 billion with $61 billion as direct costs and $56 billion indirect (3). The main three costs were related to type 2 diabetes, coronary heart disease, and hypertension. Other economic concerns related to obesity treatment are the purchasing of supplements that are usually ineffective as a means for weight loss, expensive medications that may have adverse complications, and the cost of surgery.

Much of the overweight and obese population is unaware of safe and effective strategies for weight loss. Most healthcare practitioners would suggest a combination of diet therapy (decreasing total caloric intake) and exercise for optimal weight control, but most obese/overweight individuals are not following these recommendations (4). Some of the popular fad diets have been gaining much attention in the news recently. Without adequate research, however, it is difficult to determine the full efficacy of these diets. For example, the Adkins diet has been studied by various researchers who have concluded that individuals may effectively lose weight from this diet. However, the concerns that many health professionals are expressing are for the long term effects on the health of individuals consuming a high fat and high protein diet with low grains, vegetables, and fruits which have all been shown to be preventive for certain diseases such as cancer, cardiovascular disease, and diabetes. Another concern with these

typical fad diets is the weight gain associated with returning to a normal diet. Research should focus on how to get individuals away from potentially harmful diets/supplements, etc, and allow them to focus on the problem of weight and ways to avoid overeating.

Null Hypothesis

There will be no significant difference in the amount of weight lost, body fat percentage, waist circumference, or ability to follow dietary guidelines by choosing nutrient dense lower calorie balanced meals as indicated on diet records over a 14-week period among participants who use and do not use calcium supplements when combined with a comprehensive lifestyle intervention program which focuses on healthy eating, exercise, behavior modification, and spiritual motivation.

Assumptions

- It is assumed that the overweight or obese individuals will be motivated to make appropriate changes and follow recommendations of the lifestyle intervention program.

- Compliance to the diet and exercise program is of concern, but because these individuals are volunteering to participate in this program simply on the basis of improving their health status, they will be more compliant.

- The participants will be honest when reporting on the diet and exercise records.

Limitations

- Only patients with the ability to pay the program fee would be able to participate in the lifestyle intervention program.

- Patients must be able to attend weekly classes in the evening to get the full effect of the program, so those individuals without adequate transportation, job flexibility, or those who will be out of town may not benefit from full 14-week participation.

Delimitations

- The demographics of this patient population may affect the results, thus making it not applicable to others due to the nature of the environment. This physician's office often attracts individuals who are more concerned with alternative, complimentary, or preventive medicine, and thus may be more receptive as a whole compared to a patient population from a different outpatient setting.

Definition of Terms

Adipocyte- fat cell (5)

Body Mass Index (BMI)- a number that evaluates weight status in relation to height for the purpose of assessing body fat/obesity, calculated by dividing a person's body weight in kilograms by the square of his/her height in meters (1)

Cancer- any malignant tumor including carcinoma and sarcoma that arises from the abnormal and uncontrolled division of cells that invade and destroy surrounding tissues (5)

Cardiovascular Disease- disease of the heart and blood vessels, may be called coronary heart disease with the two most common forms of atherosclerosis and hypertension (6)

Cerebrovascular Disease- a disorder of the brain's blood vessels and meninges (covering membranes) causing a rupture in blood vessels or inadequate blood supply to the brain (often called stroke, a cerebrovascular accident) (5)

Diabetes Mellitus- carbohydrate metabolism disorder in which sugar is not oxidized to produce energy due to lack of insulin (pancreatic hormone) production or cellular resistance to insulin (5)

Nephritis- inflammation of the kidney (5)

Nephrosis- degeneration in the tubules of the kidney (5)

Nephrotic Syndrome- condition of protein loss in urine, low serum albumin, and edema (swelling of tissues) (5)

Obesity- condition of excess storage of fat in the body characterized by greater than 20% above recommended body weight for height or a body mass index of greater than or equal to 30 (5)

Overweight- greater than ideal body weight; usually due to the accumulation of fat in the tissues characterized by a body mass index greater than 25 (6)

Satiety- satisfaction of appetite or feeling of fullness during eating which eventually results in cessation of eating (6)

CHAPTER 2

REVIEW OF LITERATURE

Obesity management is a growing component of healthcare organizations due to the sharp

increase in the number of obese and overweight individuals and the many complications related

to the problem. Multiple studies have been conducted to determine the consequences of obesity

and discover how it can best be managed. As mentioned previously, obesity has been directly

related to many causes of death in the U.S. A recent study published in the New England Journal

of Medicine determined that increased body weight was related to increased death rates for all

cancers (52% higher for men and 62% higher for women than individuals with normal weight),

and some specific types of cancer which were previously thought to be unrelated to weight (7).

It has also been well known for many years that overweight individuals have a higher risk for

cardiovascular disease and diabetes (3,7).

Low Fat vs. Moderate Fat Diets

Much of the research has focused on manipulating diet components such as carbohydrate,

protein, and fat to determine which method is most appropriate to facilitate weight loss. Typical

diet prescriptions given to overweight individuals include either low fat, low carbohydrate/high

protein, high carbohydrate, or low calorie in general (8). According to a report in the British

Journal of Medicine, a diet low in fat without caloric restriction produces weight loss in

overweight subjects and prevents weight gain in normal weight subjects (9). This is contrary to

much research that suggests low fat diets cause weight loss from yielding lower caloric intake

considering the caloric composition of fats (fat equals 9 kilocalories per gram whereas protein

and carbohydrate equal 4 kilocalories per gram) (10). Other professionals suggest that low fat

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diets are more appropriate because of the tendency to overeat when consuming high fat palatable foods (11). The Hawaii diet consisting of high carbohydrate and low fat foods was shown to have a significant positive effect on weight loss and cardiovascular risk factors (12). On the contrary, some recent research suggests that higher fat diets that consist mainly of monounsaturated fatty acids (MUFA) may also be beneficial in a weight loss plan due to the risk reduction for cardiovascular disease (13). This same study, found in the International Journal of Obesity, showed that a high MUFA diet had a beneficial effect on serum triglycerides whereas the carbohydrate rich diet did not and there was no significant difference between the two groups in weight lost (13).

Low Carbohydrate, High Protein Diets

The role of carbohydrates in weight control has also been studied by various researchers. Advocates of the low carbohydrate diets propose that high carbohydrate foods promote high energy intake through overeating, while opponents to this diet suggest that carbohydrate foods are protective against high energy intake. The winning argument between these two sides depends on the type of carbohydrate consumed (11,14). When consuming a high fiber complex carbohydrate, a feeling of fullness is exhibited, whereas when consuming simple carbohydrates, this fullness feeling is absent and higher calories can be consumed (14,15). Meal satiety has also been shown from consuming lower glycemic index foods (14). In addition to increased satiety, low glycemic foods may lower the insulin response to glucose which is beneficial not only for individuals who have diabetes mellitus but others as well due to the effect of hyperinsulinemia from high glycemic index diets promoting weight gain. The method by which this weight gain occurs is by causing nutrients to be stored as fat rather than oxidized in the muscle (15). The

very low carbohydrate, high protein, high fat diets, such as the Atkins' diet, challenge the carbohydrate satiety theory. A study published in the New England Journal of Medicine recently concluded that subjects lost more weight on the low carbohydrate diet compared to a traditional diet at six months, but there was no significant difference in weight at one year (16). In this same journal, another study compared low carbohydrate to low fat diets in severe obesity and found a more significant weight loss at six months in the low carbohydrate group, but the study did not continue after this time period (17). Both studies showed some improvement in various cardiovascular risk factors, but they concluded that long-term outcomes and safety are unknown; thus, the low carbohydrate diet cannot be endorsed for this reason (16,17). The improvements seen may also have been due to the actual weight lost and not the type of diet. The use of a high protein, moderate carbohydrate, and low fat energy restricted diet was shown to be beneficial on body composition in a recent study published in the American Journal of Clinical Nutrition (18). Total lean mass was preserved, a lower glycemic response was shown, and reduced serum triacylglycerol levels were all seen with the high protein diet (18).

Lifestyle Intervention

Many health professionals and researchers have concluded that a combined treatment of diet, exercise, and behavior change is necessary for weight loss in obese or overweight patients (19). Using only one component such as diet or exercise instead of combining the two has had poor results on weight loss (19, 20). Results of lifestyle intervention groups often prove to have beneficial effects on more than weight loss. A lifestyle change program for obese women resulted in reduced vascular inflammatory markers and decreased insulin resistance (21). Lifestyle modifications for weight control including diet and exercise have shown in several

studies to improve blood pressure (22, 23). There are not, however, many studies that use religion or a spiritual aspect in the lifestyle intervention programs. One study using African American women in a church-based program to promote cardiovascular health showed significant decreases in risk factors associated with cardiovascular disease (24). The study included prayer and scripture along with other typical intervention strategies of diet and exercise (24). An article published in the International Journal of Obesity studied the effects of religion on BMI and found that religion involvement was associated with a greater BMI in men (25). This study, however, proposed that various components of religion may contribute to decreased body weight (25). Lower stress and anxiety levels, social support, increased healthy behaviors such as exercising and smoking cessation may all play a role in the relationship between religion and body weight (25). Other spiritual based weight loss programs including The Thin Within, Weigh Down Workshop, and Overeaters Anonymous have all had positive results on behavior modification; however, it is unclear how much this factor plays a role in the actual weight loss and maintenance (26).

<div align="center">Calcium Supplementation and Dietary Calcium (Dairy) Intake</div>

Dietary calcium has been shown in recent studies to exhibit a pivotal role in the regulation of metabolism (27). More specifically, calcium intake has been related to a decrease in fat mass (28, 29). Studies from the University of Tennessee, Knoxville exhibited this effect with both mice and humans (27,29,30). High calcium diets by either supplementation of calcium carbonate or nonfat dry milk dairy products in mice resulted in reduced energy storage and increased thermogenesis during calorie restriction; however, adipocytes were unaffected by calorie restriction alone (30). In the human subjects, a high calcium diet consisting of dairy products

showed a greater effect on fat loss than calcium supplements, but the supplements still had a

greater effect than no calcium intervention at all (29). Calcium supplementation is important

during weight loss also to inhibit decreases in bone mineral density (31).

CHAPTER 3

DESIGN AND METHODOLOGY

Participants

The (subject) criteria for inclusion in the study were male and female between the ages of 18 and 70 with a BMI greater than or equal to 23. Subjects were patients of the Center for Integrative Medicine, Castle Clinic, Johnson City, Tennessee, United States of America, who volunteered to participate after either being referred from a physician or seeing the advertisements throughout the facility. Subjects were randomized into two groups in a double blind design. Eleven participants started the program (9 female, 2 male), five completed one month of the program (4 female, 1 male), four completed two months (4 female), and three finished the entire three-month program. The ages of the three remaining participants were 52-55. Of those who finished the program, one group (2 subjects) took a calcium carbonate supplement to achieve 1,000 milligrams per day which has been shown in previous studies to enhance weight loss, while the other group (1 subject) took a placebo.

Instrumentation

Anthropometric measurements were obtained every four weeks for weight, body fat percent, and waist circumference. Height was measured by a stadiometer only initially to assess calorie needs and calculate BMI. A standard die-cast beam scale was used to measure weight. Body composition was analyzed by a bioelectrical impedance method and 3-point skinfold calipers. The bioelectrical impedance method using an Omron handheld analyzer was shown to be a valid measurement of change especially for weight loss and fluid retention (32, 6). Triceps skinfold thickness is recognized as a good indicator of lean body mass (6). Waist circumference

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was measured by using a standard tape measure in centimeters. It is suggested that waist circumference decrease in a weight loss program to decrease risk of various diseases related to abdominal obesity. A sphygmomanometer was used to determine systolic and diastolic blood pressures only at the initial assessment. A rate your diet quiz, weight loss readiness quiz, and quality of life assessment were adapted from the L.E.A.R.N. program (33). The rate your diet quiz assessed levels of fruit and vegetable intake, meat, poultry, seafood, fats, oils, and beverages. The quality of life assessment used a ranking scale of 1 to 9 from extremely dissatisfied to extremely satisfied. Other assessments included daily diet records and exercise logs which were analyzed by the Nutribase IV computer program. The rate your diet quiz and quality of life assessment can be seen in Appendix A.

Procedures

The 14-week lifestyle intervention program was developed by combining several different programs including the LEARN program, the Project Joy Faith Based Cardiovascular Health Promotion for African American Women, and other sources (24, 33). See Appendix B for an outline of classes. The program emphasized healthy lifestyle changes including nutrition, exercise, behavior modification, and spiritual motivation. An informed consent document was signed by all participants before beginning the program.

The nutrition therapy focused on a variety of topics including the Food Guide Pyramid, fiber, energy balance, fat, food labels, portion sizes, cooking tips, healthy snacks, dining out, holidays, disease prevention, nutrition myths and fad diets, with a focus on each food group (grains, vegetables, fruits, dairy, meat/meat alternatives, and fat/sugars). Cooking demonstrations and taste testing were also used to enhance learning. Each individual's diet was

evaluated weekly to identify areas for improvement and recognize achievements. Nutrient content was analyzed to find problem areas as well. Some of the nutrition goals were consumption of at least five servings of vegetables and fruits per day and minimum of three nonfat or low-fat dairy products (mainly milk and yogurt), substituting fish for other meats a minimum of twice per week, substituting low fat meat alternatives or lean meats in place of fatty meats, and a minimum of 25 grams of fiber per day with fat consumption of less than 30% total calories with less than 10% saturated fat and approximately 15% monounsaturated fat. A goal deficit of 500-750 calories per day minimum from estimated original intake was recommended to achieve 1 to 2 pounds weight loss per week.

The topics of exercise discussed were benefits of exercise, walking, lifestyle activity, aerobics, calculating heart rate, fun exercises, realistic exercises, distractions, safety and minor injuries, climate control, videos, group exercise, and yoga. Each class consisted of 20 to 30 minutes of exercise including walking, beginner's aerobics, weight lifting and gym equipment, and pilates. Recommendations for exercise included a minimum of walking or more intense activity for 30 minutes four days per week and increasing to five to seven days per week by the seventh week of the program. Current recommendations for preventing weight regain and/or continuing weight loss are exercising at moderate intensity for a minimum of 150 minutes per week (10). An exercise specialist was available to develop exercise prescriptions for each individual based on availability of exercise tools, living area, access to outdoors and gyms, and medical conditions that may limit various exercises.

Other topics related to the behavior aspect included reasons for being overweight, quality of life issues, clarifying unrealistic goals and body image, motivation, behavior ABC's (antecedents, behavior, consequences), identifying barriers and problem solving rather than

punishment for setbacks, social implications and support, attitude traps, stress relief, meditation, and self-esteem. Stimulus control was a major focus of the program. Some examples for these strategies include consciously avoiding high risk situations, having healthy food available and high fat/calorie foods unavailable, slowing eating rate, eating in specific locations, and having immediate consequences of going against plan (i.e. walking around house five times if decide to eat a candy bar).

Spiritual intervention included weekly scriptures for motivation and support. A spiritual counselor was also available for anyone needing additional support. One class was instructed by a Christian counselor (all participants were of the Christian faith) who discussed issues such as spiritual wellness, nourishing the spirit through scriptures and prayer, as well as worship as a way of life. Faith based programs show positive results in increasing healthy behaviors like exercise and eating nutritiously dense foods (24).

Data Analysis

Data for each group being studied were collected and organized for entry into a data file to test the hypothesis. Means for weight loss, skinfold loss, bioelectrical impedance loss, and waist circumference loss were calculated for each group. Data were analyzed using ANOVA with an alpha level of .05 on the SPSS computer program. The statistical results were used to reject the null hypothesis. Other analyses included changes in perceived diet choices and quality of life as well as nutrient analysis via Nutribase IV computer package using three day diet record averages.

CHAPTER 4

RESULTS

Weight Loss

Changes in weight were found to be significant with a mean decrease of 13.25 pounds for the calcium group and 1.25 pounds for the placebo group. The highest weight loss for the calcium group was 21 pounds and lowest was 5.5 pounds. Data analysis using ANOVA with a 0.05 level of significance resulted in a significant difference between groups in weight loss. Results for weight loss are seen in Table 1.

Table 1	Mean Anthropometrics			
Group	Weight Loss (pounds)	Skinfold Loss (cm)	Fat Loss (Bioelectrical Impedance) (%)	Waist Circumference Change(cm)
Calcium	13.25	0.1	1.75	+0.25
Placebo	1.25	2.6	2.7	+1.5

Skinfold Change

The mean loss of skinfold in millimeters was 0.1 for the calcium group and 2.6 for the placebo group. Analysis of variance resulted in no significant difference between the calcium and placebo group for skinfold decreases. Results for skinfold change are seen in Table 1.

Bioelectrical Impedance Change

The mean decrease in bioelectrical impedance for the calcium group was 1.75 and 2.7 for the placebo group. There was a significant decrease in bioelectrical impedance changes for the placebo group compared to the calcium group using ANOVA with 0.5 alpha level. Table 1 shows the results for bioelectrical impedance change.

Waist Circumference Change

The mean change in waist circumference for the calcium group was an increase of 0.25 centimeters and 1.5 centimeter increase for the placebo group. There was a significant difference between groups for changes in waist circumference using ANOVA with an alpha level 0.5. The results for waist circumference change are shown in Table 1.

Perceived Diet Quality Changes

Both groups made significant changes in diet according to results from the Rate Your Diet Quiz which was taken at the beginning and end of the program. The placebo group improved 20 points while the calcium group improved an average of 55 points. Results for perceived diet quality changes are seen in Table 2.

Table 2 Scores for Perceived Diet Quality Change			
Group	Week 1	Week 14	Difference
Calcium Subject 1	-19	62	81
Calcium Subject 2	19	48	29
Placebo	-23	-3	20
Mean Calcium	0	55	55
Mean Placebo	-23	-3	20
Total Mean	7.67	35.67	28

Diet Analysis

Diet analysis using the Nutribase IV clinical nutrition program resulted in improvements for several categories. Results for each subject broken down into selected nutrients for week 1 and week 13 are seen in Table 3. The calcium group improved levels of intake for calories, total fat and saturated fat, omega 3 fats, fiber, thiamin, niacin, pantothenic acid, vitamin B-6, folate,

vitamin C, calcium, magnesium, potassium, sodium, and zinc. The placebo group improved

levels of intake for calories, cholesterol, vitamin C, vitamin D, and sodium. The desired protein,

carbohydrate, and fat ratio for both groups was 15-55-30. The calcium group had an average

ratio of 16-55-29 while the placebo group had a ratio of 10-46-44 for the last diet records.

Table 3 Nutrient Analysis										
Group	Calories	Protein (g)	Carbs (g)	Fat (g)	Sat.fat (g)	Monounsat (g)	Omega 3 (g)	Cholesterol (mg)	Fiber (g)	Calcium (mg)
Calcium Subject 1										
Week 1	1887	74	249	71	27	6	0	122	11	722
Week 13	1523	58	217	51	8	3	0	332	17	734
Calcium Subject 2										
Week 1	1108	46	158	32	10	6	0	83	13	559
Week 13	1146	48	158	38	14	9	1	109	18	675
Placebo										
Week 1	1156	39	157	42	15	9	0	157	8	434
Week 13	1088	28	128	54	18	5	0	56	8	166

Perceived Quality of Life Changes

Changes in quality of life according to the self assessment which was taken at the

beginning and compared to the results at the end of the program improved in most categories.

Results for the quality of life categories are seen in Table 4. Areas that improved in the calcium

group include mood, energy, health problems, body image, leisure time, physical activity, eating

habits, spiritual life, and overall quality of life. Areas that did not improve or decreased for the

calcium group include self-esteem, confidence, and social life. Areas of improvement for the

placebo group include mood, self-esteem, confidence, body image, social life, eating habits,

spiritual life, and overall quality of life. Areas that did not improve were energy, health

problems, leisure time, and physical activity.

Table 4 Perceived Quality of Life Changes												
Area	1	2	3	4	5	6	7	8	9	10	11	12
Group												
Calcium Subject 1												
Week1	7	8	9	7	5	7	9	4	5	6	6	8
Week13	9	9	9	8	8	9	9	8	8	8	9	9
Improved or remained same	√	√	√	√	√	√	√	√	√	√	√	√
Calcium Subject 2												
Week 1	4	7	7	3	6	2	7	3	5	4	6	6
Week 13	6	6	6	6	9	7	6	4	6	5	7	7
Improved or remained same	√			√	√	√		√	√	√	√	√
Placebo Subject 1												
Week 1	4	4	6	9	9	6	6	9	9	4	6	6
Week 13	7	7	7	8	6	8	8	7	8	6	7	8
Improved or remained same	√	√	√			√	√			√	√	√

CHAPTER 5

DISCUSSION, CONCLUSION, RECOMMENDATIONS

Discussion

Overall, the difference between the calcium and placebo group, as far as changes in anthropometrics, was significant; however, due to the small sample size, the results are inconclusive. Behavior between the groups was very similar and showed no significant differences. The null hypothesis was rejected because there were some significant differences.

The changes in weight vary from each individual due to various circumstances such as beginning weight, level of exercise, and differences in metabolism. The person who lost the most (21 pounds) was highly motivated and made many changes in diet and exercise. The person who lost the least amount of weight (placebo group) was not significantly overweight to begin with and thus was more interested in losing body fat and increasing muscle tone.

Differences in skinfold were not significant between the groups; however, the highest skinfold loss was from the one person who did not need to lose weight, but needed muscle tone improvements in the placebo group. This participant resulted in a 2.6% decrease in skinfold. The lowest skinfold loss was 0%.

Bioelectrical impedance measurements resulted in different readings from the skinfold measurements. The highest change in bioelectrical impedance was 2.7% decrease while the lowest change was 1.1% decrease. Differences in bioelectrical impedance may be due to fluid retention secondary to urine, inadequate fasting, exercising, hormonal changes, sodium intake, etc. Overall, the bioelectrical impedance method proved to be reliable and easy to administer compared to the skinfold measurements.

Changes in waist circumference varied for each individual. A decrease in waist circumference is recommended for prevention of diseases related to abdominal obesity. The significant difference between the groups is not substantial because the number of participants remained small. However, there was a wide range of results indicating differences. The participant who decreased the most amount of waist circumference routinely did abdominal exercises (crunches) while the two who actually increased waist circumference did not. Reasons for increasing waist circumference while still decreasing weight vary from differences in fluid retention in the abdominal region.

Diet analysis showed a significant improvement overall in both groups over the three-month period. This was one of the main purposes of this program, to make healthier diet choices and improve overall nutrition status through education. The perceived diet quality coincided with the actual improvement according to the nutrient analysis. Although several nutrients were lacking, most improved to meet a 75% or above recommended need. One of the main focuses of this study was calcium intake. The average dietary calcium intake overall was 525 milligrams or 44% of the daily requirement for this age group. The calcium group averaged 705 milligrams intake for the last diet analysis in addition to the 1,000 milligram supplements. The improvement was only 5% for the calcium group. The placebo group averaged 166 milligram dietary calcium intake for the last diet analysis. Improvement in calcium intake for the placebo was not seen as the group decreased calcium intake by 22%. Analysis of calcium intake reveals that the average female in this particular population does not consume adequate calcium through the diet and thus a calcium supplement is warranted to prevent osteoporosis and other diseases. Another focus was increasing fiber intake. The calcium group increased fiber intake by 21% average or 5.5 grams. The placebo group, however, did not improve fiber intake. The average

fiber grams at the end of the program for the calcium group were 17.5 grams while the average for the placebo was only 8 grams. Intake of fiber for both groups does not meet recommendations of 20-35 grams per day.

Changes in quality of life improved in most categories including mood, body image, eating habits, spiritual and overall quality of life. Improvement of self-esteem and confidence were lacking in one person in the calcium group. Explanations for this are unknown; however, this could be due to lack of attaining weight loss or fat reduction goals. This also may be an area of the program that needs more focus. Social life did not improve for this participant as well, which may be due to several factors such as time commitment to attendance of the program once per week in addition to daily exercise or fear of temptation to overeat at restaurants or social gatherings. For the participant in the placebo group, energy levels did not improve most likely secondary to inadequate caloric intake. Health problems were another category that did not improve for this participant. This may be related to presence of a kidney stone during the program. Leisure time is another factor that lacked improvement for this participant which was most likely due to the time commitment of the program. The physical activity category did not improve for this participant as well. The self-perceived level of exercise was inadequate for this subject because she was unable to follow the recommendations closely.

The spiritual aspect of this program played a vital role in keeping motivation. The participants stated that they enjoyed reading the scripture passages that they received weekly. They also enjoyed the class on spiritual wellness because it helped them keep things in perspective. Discussions took place regarding the difficulty of reaching full potential with an unhealthy body, mind, or spirit and that the mind, body, and spirit have a synergistic effect on overall health and well being .

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The retention rate for this program was very low as with many weight loss or nutrition related programs. Excuses for dropping out of the program include insufficient money to pay the weekly fee, inadequate time to attend classes, and inadequate self motivation. Others probably dropped out when they found out there was no magical cure for being overweight and that they would actually have to devote time and effort in choosing healthier foods and exercising. Most people have difficulty keeping the level of motivation high enough to reach their goals and maintain them. This is part of the reason why most people regain weight only a short time after the initial weight loss. A lifestyle-based program such as this one requires individuals who are not only interested in losing weight, but interested in making healthier choices in their lives in order to prevent diseases and have more energy. These prevention-minded types of people are the ones who succeed in keeping weight off and the ones who are successful in completing programs such as this one.

Conclusion

A lifestyle program with the focus on making healthier choices in eating, exercise, behavior, and spiritual life proves to be advantageous for multiple reasons. Improvements were seen in diet, behavior, and physical activity. The use of spiritual motivation was also beneficial to the group because all were of the Christian faith and desired a mind, body, and spirit approach to health. The use of calcium supplements in a lifestyle-based program is necessary for most to achieve adequate calcium intake; however, due to the small sample size in this study, the use of calcium for changes in weight and fat mass cannot be determined.

Recommendations

A weekly session of lifestyle group education for three months is a useful program to any adult wishing to lose weight, increase muscle tone, or simply make healthier lifestyle choices. Reinforcement of the behaviors presented in this study is necessary to promote weight management and prevent weight/fat gain. Follow up meetings are suggested to ensure that the lifestyle changes made during the program become habits and part of daily living. It is recommended that a similar study as this one be repeated with more participants to determine if there are significant differences between calcium and placebo groups.

Calcium supplementation is a beneficial part of a weight loss program not only due to inadequate dietary intake but for overall disease prevention. Use of calcium supplements is inexpensive and worthwhile to prevent bone loss during weight reduction. Calcium may also prove to be a significant factor in weight reduction.

To increase retention of participants, several factors should be taken into consideration. If paying a weekly fee for classes, individuals are more likely to decrease attendance. However, if paying a monthly fee or total fee at the beginning, retention of participants should increase because they have made a monetary commitment. This would eliminate any financial excuses preventing attendance. Possibly having the participants sign a goal sheet that they will remain with the program to the end would lower the attrition rate. Offering rewards for completing the program would also enhance retention. Possible rewards may include discounts for special services at the facility, gift certificates, and free memberships to gyms. It is also suggested to follow-up with participants who dropped out to determine individual reasons for withdrawing from the program.

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APPENDICES

APPENDIX A

Testing Tools

Part I

RATE YOUR DIET QUIZ

The following questions will give you a rough sketch of your typical eating patterns. The quiz focuses on fat, saturated fat, cholesterol, sodium, sugar, fiber, and fruits and vegetables. It doesn't attempt to cover everything you eat, however it does help you identify problem areas (-) and areas you are doing well at (+). Circle the number that corresponds to the answer you choose and write that score (e.g., +1) in the space provided in front of each question. If two or more answers apply, circle each one and then average them to get your score for the question. Be sure to pay attention to serving sizes. For example, a serving of vegetables is ½ cup, so if you usually eat one cup of vegetables at a serving, then count that as two servings.

FRUITS, VEGETABLES, GRAINS, and BEANS

____ 1. How many servings of fruits or 100% fruit juice do you eat per day? (OMIT fruit snacks like fruit roll ups. One serving of fruit = one piece or ½ cup, or 6 oz fruit juice).

-3	None	+1	2 servings
-2	Less than 1 serving	+2	3 servings
0	1 serving	+3	4 or more servings

____ 2. How many servings of non-fried vegetables do you eat per day? (One serving= ½ cup)

-3	None	+1	2 servings
-2	Less than 1 serving	+2	3 servings
0	1 serving	+3	4 or more servings

____ 3. How many servings of vitamin rich vegetables do you eat per week (One serving= ½ cup. Only count broccoli, Brussels sprouts, carrots, collards, kale, red pepper, spinach, sweet potato, winter squash).

-3	None	+2	4 to 6 servings
+1	1 to 3 servings	+3	7 or more servings

____ 4. How many servings of leafy green vegetables do you eat per week? (One serving= ½ cup cooked or 1 cup raw. Only count collards, kale, mustard greens, romaine lettuce, spinach, or Swiss chard).

-3	None	+2	3 to 4 servings
-2	Less than 1 serving	+3	5 or more servings
+1	1 to 2 servings		

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_____ 5. How many times per week does your lunch or dinner contain grains, vegetables or beans, but little or no meat, poultry, fish, eggs, or cheese?

-1	None	+2	3 to 4 times
+1	1 to 2 times	+3	5 or more times

_____ 6. How many times per week do you eat beans, split peas, or lentils? (Omit green beans.)

-3	None	+1	2 times
-1	Less than 1 time	+2	3 times
0	1 time	+3	4 or more times

_____ 7. How many servings of grains do you eat per day? (One serving= 1 slice bread, 1 oz crackers, 1 large pancake, ½ cup pasta or rice, oatmeal, granola, or bulgur, 1 cup cereal. Omit heavily sweet cold cereals.)

-3	None	+2	5 to 7 servings
0	1 to 2 servings	+3	8 or more servings
-1	3 to 4 servings		

_____ 8. What type of bread, rolls, etc. do you eat?

+3	100% Whole wheat	+1	Rye, Pumpernickel, or oatmeal
+2	Whole wheat flour as $1^{st}/2^{nd}$ flour	0	White, French, or Italian

_____ 9. What kind of breakfast grains do you eat?

+3	Whole grain (oatmeal, Wheaties)	-1	Sugary low fiber (Frosted flakes)
0	Low fiber (cornflakes) or Nothing	-2	Regular granola

MEAT, POULTRY, and SEAFOOD

_____ 10. How many times per week do you eat high fat red meats (hamburgers, pork chops, ribs, hot dogs, pot roast, sausage, bologna, steaks other than round steak, bacon)?

+3	None	-2	2 times
+2	Less than 1 time	-3	3 times
-1	1 time	-4	4 or more times

_____ 11. How many times per week do you eat lean red meats (hot dogs or lunch meats with no more than 2 grams of fat per serving, round steak, or pork tenderloin)?

+3	None	-1	2 to 3 times
+1	Less than 1 time	-2	4 to 5 times
0	1 time	-3	6 or more times

_____ 12. After cooking, how large is the serving of red meat you eat? (To convert from raw to cooked, reduce by 25%. For example, 4oz raw meat shrinks to 3oz cooked. 16 oz = 1 pound).

-3	6 oz or more	0	3 oz or less
-2	4 to 5 oz	+3	Don't eat red meat

____ 13. If you eat red meat do you trim the visible fat when you cook or eat it?

+1   Yes

-3   No

____ 14. What kind of ground meat or poultry do you eat?

-4	Regular ground beef	-1	Ground turkey
-3	11 to 25% fat ground beef	+2	Ground turkey breast
-2	Ground chicken or 10% fat beef	+3	Don't eat ground meat or poultry

____ 15. What chicken parts do you eat?

+3	Breast	-1	Thigh
+1	Drumstick	-2	Wing
+1	Don't eat poultry	-3	Liver

____ 16. If you eat poultry, do you remove the skin before eating?

+2   Yes

-3   No

____ 17. If you eat seafood, how many times per week? (Omit deep fried)

0	Less than 1 time	+2	2 times
+1	1 time	+3	3 or more times

MIXED FOODS

____ 18. What is your most typical breakfast? (Subtract an extra 3 if you eat sausage also).

-4	Biscuit/croissant sandwich	+1	Egg whites
-3	Croissant, Danish, doughnut	+2	Toast, bagel (no cream cheese)
-3	Regular eggs	+3	Whole wheat waffle/toast with light
-1	Pancakes, French toast, waffles		or no syrup, low fat yogurt or low fat
0	Don't eat breakfast		cottage cheese

____ 19. What sandwich fillings do you eat?

-3	Regular lunch meat, egg salad	+1	Low fat lunch meat or roast beef
-2	Regular tuna/chicken salad, ham	+3	Tuna or chicken salad (nonfat mayo)
	or regular cheese	+3	Turkey breast, hummus, veggie
0	Peanut butter, 2% or nonfat cheese		

____ 20. What do you order on your pizza?

+3	No cheese with at least one veggie	-2	Cheese
+3	Don't eat pizza	-3	Extra cheese, one meat topping
-1	Cheese with at least one veggie	-4	More than one meat topping

____ 21. What do you put on your pasta?

+3	Tomato sauce or red clam sauce	-2	Pesto or oily sauce
+3	Veggies	-4	Alfredo or creamy sauce
-1	Meat sauce or meat balls		

____ 22. How many times per week do you eat deep fried foods (fish, chicken, French fries, potato chips, etc.)?

+3	None	-2	3 times
0	1 time	-3	4 or more times
-1	2 times		

____ 23. At a salad bar, what do you choose?

+3	No dressing, lemon, or vinegar	-2	Regular dressing
+2	Fat free dressing	-2	Regular coleslaw, pasta salad,
+1	Low or reduced calorie dressing		potato salad
	or Olive oil	-3	Cheese, eggs, bacon
-1	Oil and vinegar		

____ 24. How many servings of low-fat, calcium rich foods do you eat per day? (One serving= 8oz skim milk or nonfat yogurt, 1oz low fat cheese, 1 ½oz sardines, 3 ½oz salmon with bones, 1oz tofu, 1 cup collards or kale, or 200 mg calcium supplement or fortified food).

-3	None	+2	2 servings
-1	Less than 1 serving	+3	3 or more servings
+1	1 serving		

____ 25. How many servings per week do you eat canned or dried soups, or frozen dinners? (Omit lower sodium, low fat ones).

+3	None	-2	3 to 4 times
0	1 time	-3	5 or more times
-1	2 times		

____ 26. How many times per week do you eat cheese? (Include pizza, cheeseburgers, lasagna, tacos, nachos, etc. Omit foods made with low fat cheese).

+3	None	-2	3 times
+1	1 time	-3	4 or more times
-1	2 times		

____ 27. How many egg yolks do you eat per week? (Add one yolk for every slice of quiche).

+3	None	-1	3 yolks
+1	1 yolk	-2	4 yolks
0	2 yolks	-3	5 or more yolks

FATS and OILS

____ 28. What do you put on your bread, toast, bagel, or English muffin?

-4	Stick butter or cream cheese	0	Jam, fat free cream cheese, or
-3	Stick margarine or whipped butter		margarine with no trans fats
-2	Regular tub margarine	+3	Nothing
-1	Light margarine, light butter		

____ 29. What do you spread on your sandwiches?

-2	Regular mayonnaise	+1	Nonfat mayo, Mustard, Catsup
-1	Light mayonnaise	+2	Nothing

____ 30. What do you make tuna salad, chicken salad, or pasta salad with?

-2	Regular mayonnaise	0	Nonfat mayo
-1	Light mayonnaise	+2	Nothing, canola oil, olive oil

____ 31. What do you use to sauté vegetables or other food?

-3	Butter, lard	0	Margarine with no trans fats
-2	Margarine	+1	Broth or Cooking spray
-1	Vegetable oil or light margarine	+3	Olive, Canola, Peanut Oil

BEVERAGES and DESSERTS

____ 32. What do you drink on a typical day?

+3	Water or club soda	-2	Regular soda, sweet tea (2 or less)
+1	Green tea (un-sweet)	-3	Regular soda, sweet tea (3-4 per day)
0	Caffeine free coffee or tea	-3	Coffee or tea (5 or more a day)
	(un-sweet, black)	-4	Regular soda, sweet tea (5 or more)
-1	Diet soda, coffee or tea (up to 4)		

____ 33. What kind of fruit beverage do you drink?

+3	Orange, grapefruit, prune, pineapple	0	No juice or cranberry juice blends
	(100% juice)	-3	Fruit "drink, ade, punch"
+1	Apple, grape, pear, cranberry		
	(100% juice)		

____ 34. What kind of milk do you drink?

-3	Whole	+2	1% low fat
-1	2% milk	+3	Skim milk, calcium fortified soymilk
0	No milk		

____ 35. What do you eat as a snack?

+3	Fruits and Vegetables	-2	Cookies, fried chips
+2	Low fat yogurt	-2	Regular granola bars

+1   Wheat crackers, baked chips, nuts   -3   Candy bars, pastries

____ 36. Which of the following "salty" snacks do you eat?

-3	Potato chips, corn chips, popcorn	+2	Unsalted pretzels, baked chips
-2	Tortilla chips	+2	Air-popped popcorn
-1	Salted pretzels, light microwave popcorn	+3	Don't eat salty snacks

____ 37. What kind of cookies do you eat?

+1	Fat free cookies, graham crackers or reduced fat cookies, No cookies	-2	Sandwich cookies (Oreos)
-1	Oatmeal cookies	-3	Chocolate coated, chocolate chip, peanut butter, sugar cookies

____ 38. What kind of cake or pastry do you eat?

-4	Cheesecake	0	Muffins
-3	Pie or doughnuts	+1	Angel food, fat-free cake/pastry
-2	Cake with frosting	+3	Don't eat cakes, pastries
-1	Cake without frosting		

____ 39. What kind of frozen desserts you eat? (subtract one point for each of the following toppings: hot fudge, chocolate candy bars, pieces)

-4	Gourmet ice cream	+1	Nonfat frozen yogurt or fat free ice cream
-3	Regular ice cream		
-1	Frozen yogurt or light ice cream	+3	Don't eat frozen desserts
-1	Sorbet, sherbet, or ices		

____ 40. How often do you eat desserts?

-3	More than 2 times per day	0	1 or less per week
-2	1 to 2 times per day	+2	Never eat sweets
-1	3 to 5 times per week		

_____ **TOTAL SCORE**

Add up your score for each question and write it in the total score line above. If your score is:

Less than 29	Don't be discouraged. Eating healthy will come easier than you think, but you do have several areas you need to work on.
30 to 59	Congratulations. You are doing fine. You may have just a couple of areas to improve.
60 or above	Excellent! You are a nutrition superstar. Give yourself a pat on the back.

<u>Quality of Life Self Assessment</u>

Please use the following scale to rate how satisfied you feel now about different aspects of your daily life. Choose any number from this list (1-9) and indicate your choice on the lines below.

1= Extremely Dissatisfied   **6= Somewhat Satisfied**
2= Very Dissatisfied   **7= Moderately Satisfied**
3= Moderately Dissatisfied   **8= Very Satisfied**
4= Somewhat Dissatisfied   **9= Extremely Satisfied**
5= Neutral

1. _____ Mood (feelings of sadness, worry, happiness, etc)

2. _____ Self-esteem

3. _____ Confidence, self-assurance, & comfort in social situations

4. _____ Energy and feeling healthy

5. _____ Health problems (diabetes, high blood pressure, etc)

6. _____ General appearance and body image

7. _____ Social life

8. _____ Leisure & recreational activities

9. _____ Physical mobility and physical activity

10. _____ Eating habits

11. _____ Spiritual life

12. _____ Overall quality of life

Quality of Life Improvement:

<u>Area to Improve</u>	<u>How to Improve</u>
1. _____	_____
2._____	_____

APPENDIX B

Outline of Classes

Lifestyle Wellness Through Healthy Eating, Exercise, & Behavior Change
Tentative Outline of Activities

Meeting 1:   Nutrition Assessment (Individual meeting with Candee & Dr. Allen)
                Weight loss readiness quiz
                Introduction to program

Session 1:   Introductions and goals
                Reasons why we are overweight
                Rate your diet quiz - take home (bring back next week)
                Quality of Life Assessment
                Food diary & instructions/Food Guide Pyramid handout
                Exercise short term benefits and appropriate exercise attire
                Assignment: Write benefits of losing weight…what is your motivation??
                (Measure height, weight, waist circumference, body fat percentage)

Session 2:   Develop walking program-- Physical activity readiness questionnaire
                Exercise Logs & Target heart rate (Schedule meeting with exercise trainer)
                Lifestyle activity
                Walk break
                Grains and fiber
                Motivation reasons (assignment from last week)
                Review food diary (will analyze nutrient content & bring back next week)
                Open discussion

Session 3:   Review food diary & recognize areas for improvement
                Fat and food labels
                Behavior ABC's
                Exercise break
                Initiate first behavior change: immediate consequences
                Open discussion

Session 4:   Review food diary & exercise logs
                Energy Balance (Calories) ---Fat, Carbohydrates, Protein
                Exercise break/aerobics
                Vegetables!
                Heart Disease
                Open discussion

Session 5:   Turn in food diary & exercise logs

Fruit
Smoothie Taste Testing
Portion Sizes
Exercise/walk break
Long Term Exercise Benefits
Open discussion
(Measure weight, waist circumference, body fat percentage)

Session 6:	Fun exercises
	Rewards
	Social implications/Identifying Barriers/Attitude traps
	Meat and Meat Alternatives + Soy Benefits
Session 7:	Review food diary & exercise logs
	Snacks
	Dairy
	Dining Out & Shopping Food Traps
	Exercise break
	Behavior change: Slow eating rate
	Self-assessment questionnaire
	Open discussion
Session 8:	Spiritual Awareness—Guest Speaker Gloria Baird
	Exercise Safety and minor injuries
	Exercise Break
	Diabetes
	Open discussion
Session 9:	Review food diary & exercise logs
	Stress Relief Techniques & Meditation Guest Speaker Dr. Robert Allen
	5 minute massages from massage therapist: Mary Alice Coleman
	Exercise break (discuss climate control)
	Open discussion
Session 10:	Cooking Class……simple, affordable, and nutritious
	Turn in food diaries & exercise logs
	Alcohol & Holidays
	Open discussion
	(Measure weight, waist circumference, body fat percentage)
Session 11:	Review food diary
	Exercise break--Yoga
	Cancer
	Behavior change: location eating
	Open discussion

Session 12:	Re-evaluate: rate your diet quiz
	Exercise break/Long term exercise
	Exercise Videos
	Nutrition Myths and Fad Diets
	Open discussion

Session 13:	Turn in food diary & exercise logs
	Disease Prevention
	Exercise break
	Re-evaluate Quality of Life Assessment
	Open Discussion

Session 14:	Nutrition Concerns & Common Questions
	Lifestyle change for a *lifetime*..... Celebrate!!!.....Certificates!
	Discuss support & Follow-up meetings
	Recognize improvements!!
	(Measure weight, waist circumference, body fat percentage)

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