

INFLUENCES OF A HEALTHY LIFESTYLE PROGRAM ON BODY COMPOSITION AND MARKERS OF CARDIOVASCULAR AND METABOLIC HEALTH*

Holly R. Wyatt², Lorraine G. Ogden², Kristen S. Cassic², Emily A. Hoagland², Toni McKinnon¹, Natalie Eich¹, Vasilii Chernyshev¹, Brian Dixon¹, Tim Wood¹, John Cuomo¹ and James O. Hill²

¹USANA Health Sciences, Inc., Salt Lake City, Utah ²Center for Human Nutrition, University of Colorado Denver, Denver, CO

INTRODUCTION

Metabolic syndrome involves a cluster of risk factors for diabetes and cardiovascular disease. These factors include abdominal obesity, elevated blood pressure, atherogenic dyslipidemia, and insulin resistance or glucose intolerance. Metabolic syndrome has become increasingly common as rates of overweight and obesity have risen in the United States (1). In fact, it is now estimated that over 50 million Americans have metabolic syndrome.

Recent research indicates metabolic syndrome may be completely reversible, in large measure, through lifestyle change. Given the rising rates of type 2 diabetes, there is an urgent need to develop lifestyle intervention programs for people with metabolic syndrome to prevent the progression of their disease.

Weight loss is an indicated treatment for both obesity and metabolic syndrome. Even modest weight loss (5–10%) slows the progression of metabolic syndrome to type 2 diabetes (2). The challenge lies in designing and implementing programs that can effectively help large numbers of people with metabolic syndrome achieve modest weight loss. The Internet provides one avenue to easily and inexpensively deliver weight-loss interventions to large numbers of people. In one study, overweight individuals receiving either human email counseling or computer-automated feedback lost more weight than individuals receiving no counseling at all (3). That said, success to date in using this tool has been modest.

The intent of this trial was to determine whether a 12-week, Internet-based lifestyle modification program prescribing a low-glycemic diet, vitamin and mineral supplements, and modest exercise could lower body weight and reduce disease risk factors in a group of subjects diagnosed with metabolic syndrome.

MATERIALS AND METHODS

Sixty subjects (25 males, 35 females) with metabolic syndrome (defined as having abdominal adiposity combined with at least two other risk factors) were enrolled in this study (see Table 1 for baseline characteristics).

TABLE 1. DEMOGRAPHIC AND SCREENING CHARACTERISTICS OF ENROLLED PARTICIPANTS

CHARACTERISTIC	MEAN OR NUMBER	RANGE
Female Gender (%)	36 (60%)	-
Caucasian (%)	45 (75%)	-
Latino/Hispanic (%)	12 (20%)	-
Age, years	52.4 ± 7	33 - 62
Weight, lbs	222.5 ± 38.7	145 - 320
Body Mass Index, kg/m ²	34.5 ± 4.2	27 - 41
Waist Circumference, in	44.5 ± 4.2	36 - 65
Systolic Blood Pressure, mmHg	133.9 ± 14.5	101 - 163
Diastolic Blood Pressure, mmHg	92.8 ± 8.3	74 - 110
Fasting Glucose, mg/dL	101.1 ± 14.7	81 - 162
Total Cholesterol, mg/dL	217.7 ± 33.4	131 - 326
HDL Cholesterol, mg/dL	42.3 ± 9.1	26 - 65
LDL Cholesterol, mg/dL	132.9 ± 30.0	69 - 199
Triglyceride, mg/dL	219.2 ± 121.5	67 - 593

Means ± SD, N=60

Enrolled subjects were asked to participate in a 12-week Healthy for Life Internet Program developed by Dr. Ray Strand. The program involved daily emails from a lifestyle coach on approaches to maintaining a low-glycemic diet and improving exercise habits. The coach would also provide weekly feedback on the subject's food and activity diary. As part of the prescribed diet, subjects were provided with vitamin and mineral supplements (USANA® Essentials), low-glycemic meal replacement shakes (USANA Nutriméal), and low-glycemic snack bars (USANA Nutrition Bars) (see Table 2 for study design).

TABLE 2. STUDY DESIGN FOR NUTRITIONAL PRODUCTS, EXERCISE AND COACHING

	Weeks 1-4	Weeks 5-12
Lifestyle Coaching	Subjects received daily/weekly emails and kept an online log of food intake and physical activity	
Supplements (a.m.)	2 USANA Mega Antioxidant Tablets & 2 USANA Chelated Mineral Tablets	
Breakfast	1 USANA Nutriméal Shake	
Snack	1 USANA Nutrition Bar	
Lunch	1 USANA Nutriméal Shake	low-glycemic meal
Snack	1 USANA Nutrition Bar	healthy snack
Dinner	Low-glycemic Meal	Low-glycemic Meal
Supplements (p.m.)	2 USANA Mega Antioxidant Tablets & 2 USANA Chelated Mineral Tablets	
Exercise	Moderate exercise 3-5 days/week (≥30 min walking recommended)	

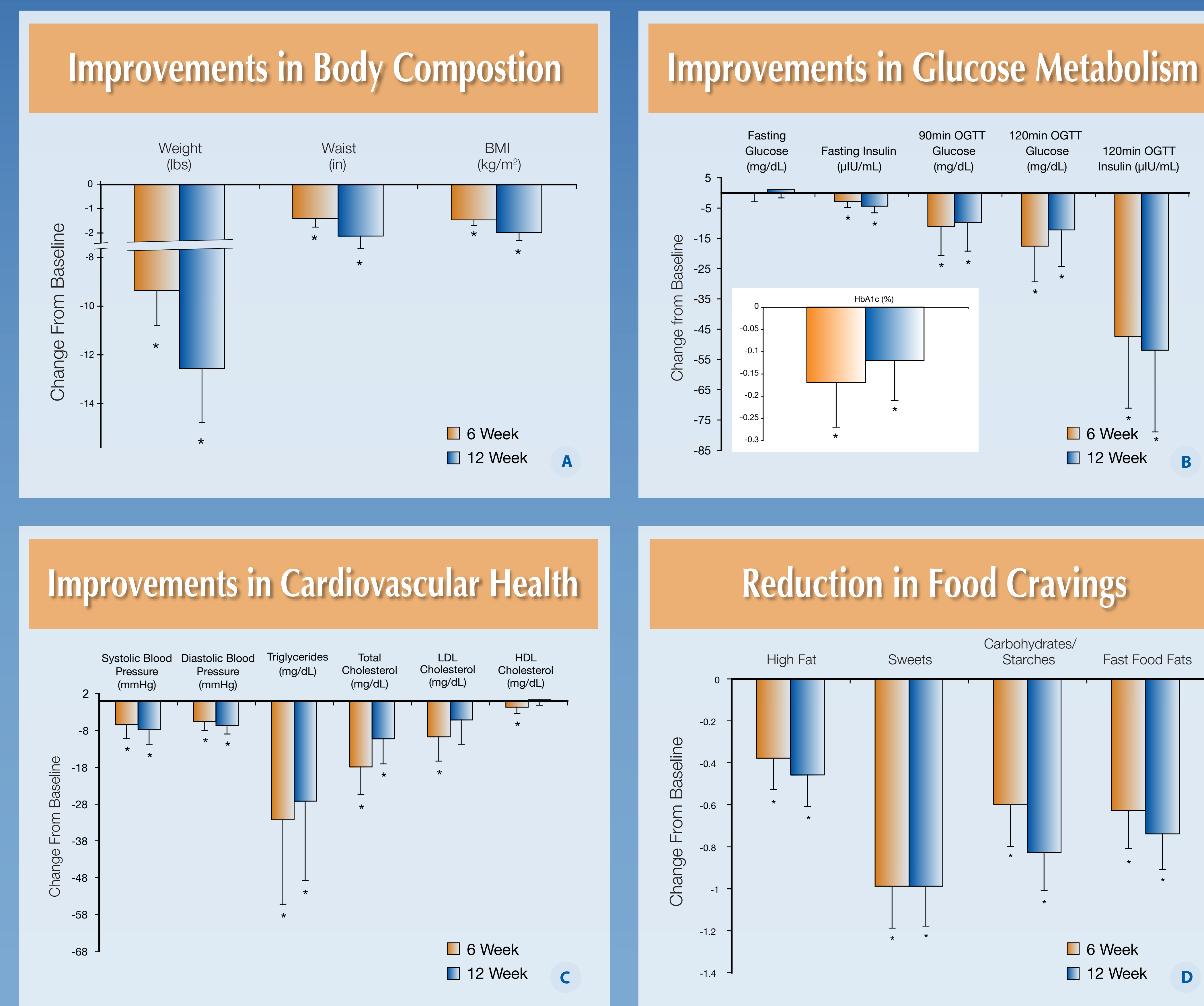


Figure 1. Clinical measurements of overall health, all available data (n=60). Mixed model estimates (95% CI). Asterisks (*) denote statistical significance (p<0.05) from baseline. **A.** Reduction in weight, waist circumference, and BMI. **B.** Improvement in glucose metabolism. **C.** Improvement in cardiovascular health. **D.** Reduction in food cravings.

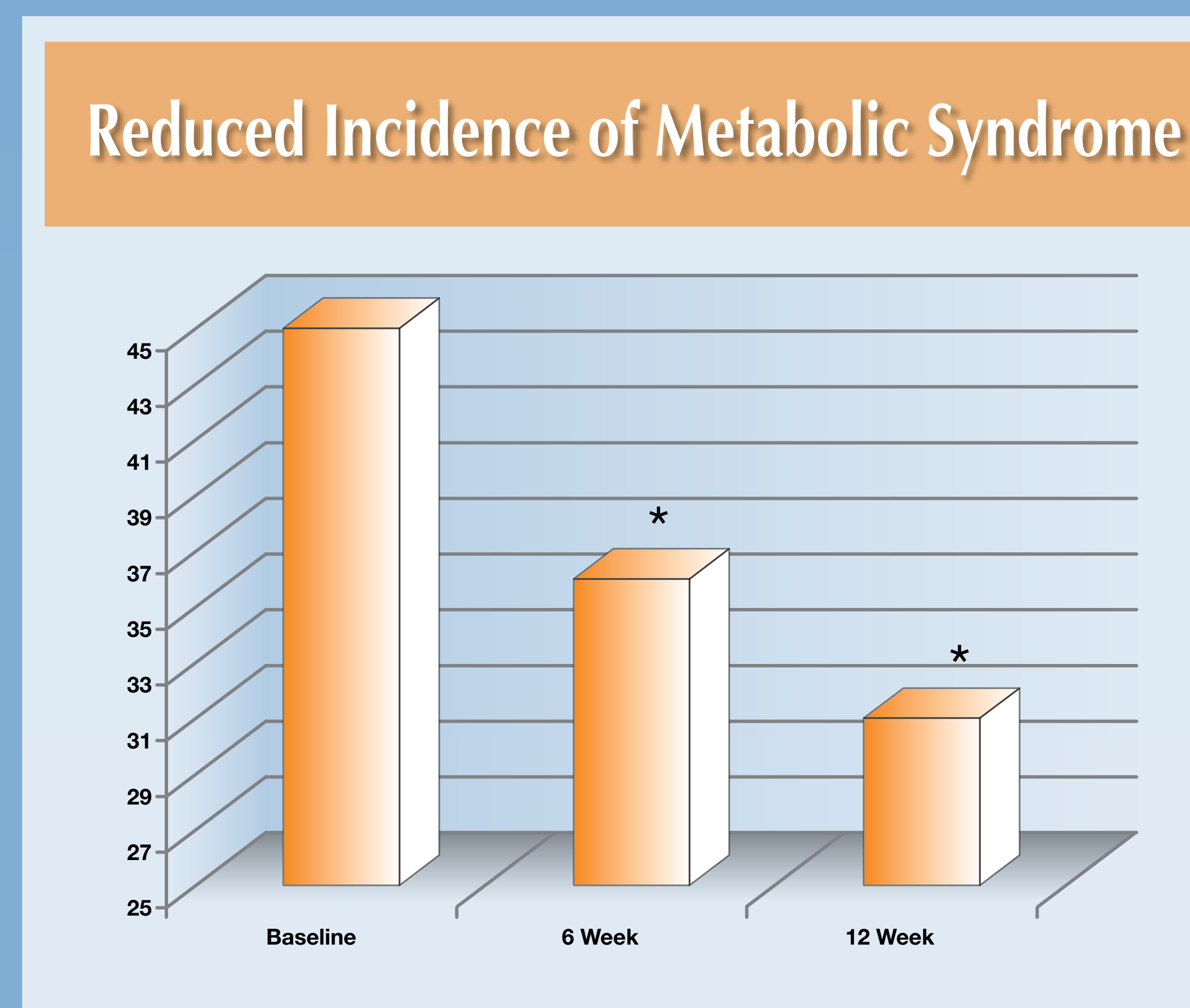


Figure 2. Number of participants with metabolic syndrome at baseline, 6-weeks, and 12-weeks. Asterisks (*) denote statistical significance (p<0.05) from baseline.



The following health measurements were obtained at baseline, week 6, and week 12: weight; waist circumference; blood pressure; and fasting blood measures of glucose, insulin, hemoglobin A1c (HbA1c), triglycerides, total cholesterol, LDL cholesterol, HDL cholesterol, high-sensitivity C-reactive protein, vitamin E (alpha and gamma), plasma induced isoprostanes, and urinary isoprostanes. An oral glucose tolerance test (OGTT) was also administered at each visit. Indices of insulin sensitivity were calculated from these results.

RESULTS

- On average, subjects lost 12.1 lbs (5.4% of their starting weight) during the 12-week intervention (Figure 1A).
- Measures of glycemic control improved significantly during the study (Figure 1B):
 - Fasting insulin was reduced by 32.3%.
 - 120-minute insulin during an OGTT was reduced by 43.6%.
 - Insulin sensitivity was increased as evidenced by a significant reduction in the HOMA index (31.6%) and the Insulin Sensitivity Index increased an average of 0.03 points (data not shown).
- Measures of cardiovascular health such as triglycerides, total cholesterol, LDL, and blood pressure improved significantly (Figures 1C).
- Subjects experienced significant reductions in cravings for unhealthy foods including foods high in fat, sweets, carbohydrates/starches, and fast food fats (Figure 1D).
- Significant changes in antioxidants and inflammatory markers were also noted (data not shown):
 - C-reactive protein levels, a measure of vascular inflammation, were reduced by 26.5%.
 - Vitamin E levels increased 30.4%.
 - Plasma Antioxidant Reserve increased by 17.7%.
 - Urinary 8-isoprostanes were reduced by 27.0%.
- Importantly, at the completion of the study, one-third of those originally diagnosed with metabolic syndrome no longer met the criteria for metabolic syndrome (Figure 2).

CONCLUSIONS/DISCUSSION

This study demonstrates that a comprehensive lifestyle change program involving Internet coaching, a low-glycemic diet, nutritional supplementation, and moderate exercise can successfully promote weight loss, significant improvements in glycemic control, and significant reductions in risk factors for heart disease in individuals with metabolic syndrome. In addition to promoting healthy clinical outcomes, the program helped participants reduce their cravings for unhealthy foods, likely further aiding in the success of the program. Moreover, by the end of the study, the number of subjects that met the criteria for metabolic syndrome had dropped by one-third, adding more support to the clinical significance of lifestyle modification in reducing the risk of the progression of certain disease states and in promoting overall health.

*This study has been published in Obesity and Weight Management. Wyatt et al. Successful internet-based lifestyle change program on body weight and markers of metabolic health. Obesity and Weight Management 2009 August; 5(4): 150-153.

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