men (M) and women (F) were randomized in a 2x2 design to 20% or 40% fat and 15% or 25% protein. REE was measured using a Deltatrac ventilated hood system for measuring O2 and CO2 at baseline as part of the estimation of energy need from which the 750 kcal/day reduction in energy expenditure was calculated. It was measured again at 6 and 24 months. Results: The baseline REE was 1,831 + 250 in males and 1,385 + 183 in females and was positively correlated with body weight and inversely correlated to age in both sexes ($P < 0.0001$). At the end of 6 months, REE had fallen significantly more in males −99 + 171 kcal/day) than in females (−55 + 123 kcal/day). From month 6 to 24 there was a further small fall in REE which was not significantly different between females (−67 + 173 kcal/day) and males (−55 + 225 kcal/day). Both baseline weight and waist circumference predicted the decrease in REE over the first 6 months. However, there were no significant differences in changes in REE between diets. Conclusion: REE falls significantly with weight loss and is predicted by both baseline weight and waist circumference, but there was no evidence that dietary macronutrient composition influences the degree of REE change during weight loss.

791-P
One-Year Results from a Multi-Site Randomized Trial of a Commercial Weight Loss Program

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In addition to promoting weight loss, healthy weight loss interventions should result in improved diet quality and favorable changes in metabolic risk factors for chronic disease and quality of life (QOL) in overweight or obese individuals. The Jenny Craig (JC) program, which involves individualized diet and exercise counseling, prepackaged foods and a low-energy density diet, provided either in-person at community-based sites or by telephone. The aims of this study are (i) to test, in a multi-site randomized controlled trial, whether the JC Centre-based and/or Jenny Direct (telephone-based) interventions promote greater weight loss in overweight or obese women at 6 and 12 months and maintenance of that loss over a 24-month period compared to control conditions; and (ii) to describe the effect of the program (vs. usual care conditions) on selected biochemical factors (lipids, insulin, glucose, leptin, C-reactive protein[CRP]), nutritional factors (carotenoids, vitamin D), and cardiopulmonary fitness. Additional measures include QOL and eating attitudes and behaviors. At randomization, participants ($n = 442$) were 44 (10) (mean[s.d.]) years, with BMI 33.8 (3.4) kg/m², weight 92.1 (10.7) kg, and waist circumference 108.6 (9.6) cm. One-year data are available for 92% of study participants ($n = 406$), and weight loss is −10.7 (7.1), −9.1 (8.0), and −2.8 (6.8) kg for the JC Centre-based, JC Direct, and usual care groups, a relative weight loss of −11.6%, −9.8%, and −3.1%, respectively. Total plasma cholesterol and CRP decreased significantly from baseline in both JC groups ($P < 0.05$). The proportion at lowest risk (CRP < 2 ng/ml) increased significantly from 29% to 45%, and from 25% to 41%, in the JC Centre-based and JC Direct arms, respectively, but was unchanged in the usual care arm. Plasma carotenoids increased significantly by 6 mos in both JC arms (but not in the usual care arm), reflecting increased vegetable and fruit intake. In all study arms, plasma vitamin D increased from baseline (winter) to 6 mos (summer), as expected, but the JC Centre-based arm remained significantly higher than baseline at 12 mos ($P < 0.05$). At one year, physical QOL improved from baseline in the JC Centre-based arm, was unchanged in the JC Direct arm, and declined in the usual care arm. Findings from this study suggest that this commercial program can effectively promote weight loss with an improvement in diet composition and accompanied by favorable changes in risk factors for chronic disease.

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Efficacy of Three Different Weight Education Programs in Middle-Aged Taiwanese: A Randomized Controlled Trial in Taichung Community Health Study

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Background: Dietary control and exercise intervention have been recognized as the fundamental methods to treat obesity. We aimed to assess the efficacy of three different weight control education programs using these methods in middle-aged adults in Taiwan. Method: The target population

(aged 40–74 years) was from the Taichung Community Health Study in 2006–2007. Subjects with overweight or central obesity (body mass index (BMI) ≥ 24 kg/m² and/or waist circumference (WC) ≥ 90 cm in men or WC ≥ 80 cm in women) were selected to participate in this study. Two hundred and forty subjects (men = 99, women = 141, mean age (±s.d.) = 52.62 ± 7.03) agreed to join this study and were randomized into three groups: (i) individualized weight control education ($N = 79$), (ii) grouped weight control education ($N = 81$), and (iii) mail-delivered weight control education ($N = 80$). The interventions were 12 sessions over 6 months and all subjects were followed for another 6 months. Anthropometrics and metabolic parameters were measured at baseline, 3 months, 6 months, and 12 months. Results: Improvements of BMI from baseline after the 6 months interventions in individualized and/or grouped weight control education groups (−3.92% and −3.19%) were superior to the mail-delivered weight control education group (−2.16%; P value = 0.04 using ANOVA test). At 12 months, BMI, body weight, hip circumference, and fat mass were significantly reduced from baseline (all P values < 0.001) but were not different among the three groups. Improvements of BMI and WC at 12 months were −3.52% and −2.59%, −2.75% and −2.53%, and −2.05% and −1.94% in the individualized-, grouped-, and mail-delivered weight control education programs, respectively. Systolic blood pressure, diastolic blood pressure, blood glucose, total cholesterol, and low-density lipoprotein cholesterol were significantly reduced from baseline only in the individualized- weight control education group at 3, 6, and 12 months (all P values < 0.05). Conclusions: Individualized- or grouped- weight control education programs can effectively reduce BMI better than a mail-delivered weight control education program after a 6 months intervention. All of these three weight control education programs improved obesity-related anthropometric indices at 1 year of follow-up.

793-P
Higher Protein Intake Preserves Lean Body Mass During Weight Loss in Pre-Obese and Obese Men

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The objective of this study was to examine the effects of dietary protein on energy-restriction induced changes in body weight and whole body and regional body composition. Forty-three men, ages 24–75 years, BMI 25.0–39.9 kg/m², followed a 12-week 750 kcal/day energy deficit diet containing higher protein (HP, $n = 22$, 25% energy from protein) or normal protein (NP, $n = 21$, 15% energy from protein). The HP diet, an omnivorous diet, contained 25% of protein from lean pork and 15% from egg, while the NP diet was void of all striated tissue and eggs. Both diets contained 25% of energy from fat. Subjects were retrospectively subgrouped according to obesity status [preobese (POB), BMI = 25.0–29.9 kg/m², $n = 17$; obese (OB), BMI = 30.0 or higher, $n = 26$]. Blood urea nitrogen (BUN), a crude marker of dietary protein intake, was not different between HP and NP at baseline, but trended higher ($P = 0.1$) in HP and was lower ($P < 0.05$) in NP over time (ΔBUN 1.27 ± 0.82 vs. −1.74 ± 0.68; resulting in a group × time interaction: $P < 0.01$). All subjects lost body weight (−9.8 ± 0.5 kg, −10%), fat mass (−7.4 ± 0.3 kg, −21%), and lean body mass (LBM; −2.4 ± 0.3 kg, −4%; all responses $P < 0.0001$). Independent of obesity status, protein intake did not influence body weight and fat mass responses, while LBM loss was less in HP vs. NP (−1.9 ± 0.3 vs. −3.0 ± 0.4 kg; $P < 0.05$). The differential loss of total LBM occurred predominately in the legs, which accounted for about 60% of total LBM loss in both the HP and NP groups. Independent of protein intake, OB subjects lost more weight, fat mass and LBM than the POB subjects ($P < 0.05$). Fat loss occurred mainly in the legs (~ 23%) and trunk (~ 68%). Protein intake and obesity status did not influence where the changes in fat mass and LBM occurred (i.e., arms vs. legs vs. trunk). The main effects of dietary protein and obesity status on LBM changes were independent and additive: POB-HP lost less LBM vs. OB-NP ($P < 0.01$). There were no changes in total body bone mineral density or bone mineral content over time. In conclusion, a higher-protein diet can help preserve lean body mass during energy-restriction-induced weight loss in preobese and obese men. Support: National Pork Board; American Egg Board-Egg Nutrition Center; Purdue University Ingestive Behavior Research Center.

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Predictors of Food Preferences and their Relation to BMI and Weight Loss During a 12-Month Caloric Restriction Trial in Overweight Women and Men

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Changes in food preferences during weight loss and their relation to successful outcome remains uncertain. We studied predictors of food preferences and changes in food preferences during 12 months of caloric restriction (CR) in 43 healthy, overweight men and women (means ± s.d.; 34.9 ± 5.0 years; BMI 27.8 ± 1.5 kg/m²) participating in the first phase of the CALERIE trial. After a 7-week, weight-stable baseline, subjects were randomized to high or low glycemic load diets at 10% or 30% CR; diets were provided for 6 months and self-selected for a further 6 months. Both diets emphasized lower energy-dense (ED)/higher fiber foods and discouraged higher ED/low fiber foods. Outcome variables measured during 12 months of CR included self-reported food preferences and desire to eat 50 common foods and body weight. Mixture models were used to examine how macronutrient content of foods independently predicted food preference ratings. Each macronutrient expressed as a percent of food energy content independently predicted food preference ratings at baseline ($R^2 = 0.14$, $P < 0.0001$) with similar beta coefficients ($P = 0.13$). In addition, in separate multiple regression models, ED and fat (kcal fat/g) significantly predicted food preference ratings ($R^2 = 0.14-0.15$, $P < 0.0001$) at baseline, with similar results found after 6 months of CR, suggesting that the energy density of the food is important. Additionally, the ED of foods rated highly palatable was associated with baseline BMI ($r = 0.35$, $P = 0.03$) but not with weight loss during the 12 months of CR. There was a significant decrease in both preference for ($P = 0.007$) and desired frequency ($P = 0.001$) of study-discouraged foods after 6 months of CR however changes were not related to percent weight loss ($P = 0.19$ and $P = 0.49$ respectively). These results suggest that ED may play a key role in food preferences in overweight adults, and preferences for ED are associated with higher weight status. However, with decreased exposure to these foods, preference and desired frequency of consumption of highly energy dense/lower fiber foods can be significantly decreased over time. Dietary preferences appear to be malleable during adult life and can change to support recommendations for dietary and behavioral patterns consistent with weight loss and prevention of weight regain. Funding Support: NIH grants: NGA-3U01-AG20480 and #H150001 and USDA-No. 1950-51000-061-04S

795-P

Weight Loss with a Behavioral Program Using Meal Replacements, Fruit and Vegetables: A 24-Week Randomized, Controlled Trial

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The efficacy and safety of behavioral programs using meal replacements (MR), fruit and vegetables (F/V) are well documented (Anderson JW, JADA Aug09) but randomized controlled trials (RCT) have not been done. This RCT compared a standardized behavioral program using 5 MR and 5 svg of F/V daily with usual care dietetic counseling. Healthy mildly or moderately obese subjects (BMI 30–40 kg/m²) were randomized to RD counseling or "Healthy Solutions" (HS) utilizing 3 shakes, 2 entrees and 5 svg F/V daily (~1,200 kcal/day). Control (C) subjects received counseling by a RD skilled in weight management counseling at baseline, 8 and 16 weeks. The HS group attended 90 min weekly weight loss classes for 16 weeks and 1 h "Weight Maintenance" classes for 8 weeks. At baseline, 8, 16 and 24 weeks all subjects had: adverse event assessment; triplicate weight, waist and blood pressure measurements; fasting blood for chemistry and lipids. The HS group was instructed to: keep daily records of MR, F/V, food, physical activity; make midweek phone calls. Subject enrollments were: C, 16; HS, 22. Baseline age (47.9 years), % female (76%), race/ethnicity, BMI (35.4) did not differ between groups. Completion rates were: C, 13 (81%), HS, 18 (82%). Reported adverse events were similar in C and HS groups. Adherence to behavioral guidelines were good to excellent: class attendance, 97%; midweek calls, 93%; weekly summaries, 99%; minimum MR use, 88%; no intake of food not prescribed, 88%. Mean food intakes, svg/week, were: shakes (goal 21), 24; entrees (goal 14), 15; bars (optional),

5; F/V (goal 35), 43. Incremental physical activity (goal >2,000 kcal) was 2,234 kcal/week. Weight losses for available cases at 8, 16 and 24 weeks were: C group-- 1.7% (se 0.7), 1.5% (1), 1.4% (1.1) or 3.1 pounds; and HS group—8.7% (0.9), 14.3% (0.8), 16.3% (0.9) or 37 pounds. Mean weight loss at 24 weeks for intention-to-treat and completer analyses, respectively, were: C, 0.7 (se 1.1)%, 0.6 (1.2)% or 1.3 pounds; HS, 13.8 (1.1)%, 15.4 (1.0)% or 33.5 pounds ($P < 0.0001$ vs. C). Reductions in waist circumference, fasting serum glucose, cholesterol, and LDL-cholesterol were significantly greater in HS vs. C group. This RCT documented that a behavioral program with low-energy diets including MR and F/V was well tolerated and associated with significantly greater weight losses, reductions in waist circumference, reductions in serum glucose, and reductions in serum cholesterol values than usual care RD counseling.

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Measurement of Weight in Clinical Trials: Is One Visit Enough?

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Background: Within-person weight variability reduces precision and may potentially increase sample size. Objectives: To compare the precision of measuring weight on one vs. 2 days and determine if the precision of weight measurement varies by baseline body mass index (BMI). Methods: Data were collected as part of the Weight Loss Maintenance (WLM) trial. After losing ≥ 4 kg during an initial 6-month weight loss phase, 1,032 overweight or obese adults with treated hypertension and/or dyslipidemia were randomized to one of three weight maintenance arms: 1. monthly personal contact, 2. an interactive technology-based intervention, or 3. a self-directed control arm. Trained, masked staff measured weight in duplicate on 2 separate days at baseline, 12 months, and 30 months. We included only control participants with complete data and restricted analyses to those with 2 baseline visits within 21 days of each other. With adjustment for temporal drift, the mean weight change from baseline was calculated for the 12- and 30- month visits using (a) the first and (b) both daily weights from each visit. We also conducted similar analyses stratified by sex and BMI level (≥ 25 kg/m² and ≥ 30 kg/m²). Results: Of 342 participants randomized to the control group in WLM, the mean age (s.d.) was 55.8 years (8.5 years), mean BMI (s.d.) was 34.0 kg/m² (4.8 kg/m²), 37% were black, and 65% were women. At 12 months, mean weight change (s.d.) was 8.5 lb (11.2 lb) using a single weight measure and 8.6 lb (11.0 lb) using 2 separate weight measures for each visit among control participants ($n = 309$). Similarly, at 30 months, mean weight change (s.d.) was 13.1 lb (13.8 lb) using one weight measure and 13.1 lb (13.8 lb) using 2 separate weight measures among control participants ($n = 281$). The s.d. of mean weight change at 12 and 30 months was stable within sex-BMI subgroups using either a single or 2 weight measure(s). Conclusion: The s.d. of mean weight change varies little with the number of measurement days. In the setting of a well-standardized weight measurement protocol, measurement of weight at 2 visits has no advantage over measurement at one visit.

797-P

Diacylglycerol-Oil Consumption Improves Abdominal Obesity in Japanese Adults: A Meta-Analysis of Individual Patient Data from Randomized Controlled Trials

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Objectives: To precisely estimate the effect of diacylglycerol (DAG)-oil consumption on abdominal obesity and serum lipids using a valid statistical model. Methods: A literature search was performed to find clinical trials that met the following selection criteria: (i) measurements of abdominal fat area and related items, and serum lipids; (ii) Japanese adult subjects; (iii) randomized controlled trials; and, (iv) intervention with DAG-oil consumption for the treatment group and triacylglycerol (TAG)-oil consumption for the control group. A meta-analysis was performed on individual patient data. Results: Six clinical trials ($N = 701$) were selected. Based on the combined studies, DAG-oil consumption significantly decreased (mean [95% confidence interval]) visceral fat area (−6.04 [−8.69, −3.38] cm²), abdominal subcutaneous fat area (−8.57 [−14.85, −2.28] cm²), abdominal total fat area (−11.74 [−18.08, −5.41] cm²), body weight (−0.84 [−1.19, −0.49] kg), body mass index (−0.31 [−0.44, −0.18] kg/m²), and waist circumference (−1.04 [−1.69, −0.40] cm). Compared with TAG groups, DAG