

**Tuesday November 3, 3:30-5:00 PM**

**T-OR-2092**

**Orexin A in Ventrolateral Preoptic Area Increases all Components of Total Energy Expenditure and Orexin Dual Receptor Antagonism Lowers Total and Resting Energy Expenditure**

Jamie Coborn *Shantz Arizona*, Danielle DePorter, Charles Billington *Minneapolis Minnesota*, Jennifer Teske *Tucson Arizona*, Catherine Kotz *Minneapolis Minnesota*

**Background:** Orexin receptor stimulation reduces weight gain by increasing total energy expenditure (TEE) and EE due to physical activity (EEPA). Identifying whether components of TEE are affected by orexin receptor stimulation or antagonism with dual orexin receptor antagonists (DORAs) for insomnia treatment has clinical relevance for obesity treatment. We tested whether 1) DORA in the ventrolateral preoptic area (VLPO) blocked orexin-A (OXA)-induced arousal, PA, and components of total EE [EE during sleep (EESleep), rest (EErest), wake (EEwake) and EEPA]; and 2) DORA alone reduced TEE and its components. We hypothesized 1) DORA would reverse OXA-induced increases in arousal, PA, components of TEE and reductions in sleep and EESleep and 2) DORA alone would reduce TEE.

**Methods:** To test this, 3-mo. old male Sprague-Dawley rats (N=7) were surgically implanted with cannulae targeting VLPO and radiotelemetric EEG/EMG transmitters to determine sleep/wake states. DORA (0 or 62.5nmol) was injected 20 min. prior to OXA (0 or 62.5 pmol) in VLPO in a repeated measures design. EEG/EMG, PA and EE was measured continuously each second post-injection. Based on time stamped data, EEPA (EE while moving based on infrared sensors), EEwake (EE when awake), EErest (EE when awake but not moving), and EESleep (EE during NREM or REM sleep) were determined.

**Results:** DORA blocked OXA-induced increases in arousal, PA, TEE, EEPA, EEwake, EErest and EESleep 1h post-injection ( $P < 0.05$ ). OXA significantly reduced sleep but significantly increased EESleep 1h post-injection ( $P < 0.05$ ). DORA alone significantly reduced TEE and EErest 2h post-injection ( $P < 0.05$ ).

**Conclusions:** These data suggest 1) OXA reduces weight gain by stimulating TEE through increases in not only EEPA and EErest but also EESleep and 2) reduced TEE and EErest are residual effects of DORA that may promote weight gain.

**T-OR-2093**

**A Thrifty Human Phenotype is Associated with a Lower Core Body Temperature and Greater Adiposity**

Martin Reinhardt *Phoenix Arizona*, Marie Thearle *Phoenix AZ*, Susanne Votruba *Phoenix AZ*, Jonathan Krakoff *Phoenix AZ*

**Background:** In small studies, a larger 24-hour energy expenditure (EE) decrease with fasting (FST) correlates with a smaller EE increase with overfeeding (OF) and predicts less weight loss, i.e. a thrifty phenotype. We examined the association of body composition and core body temperature (CBT) with the EE decrease with FST.

**Methods:** 77 subjects (26W/25NA/13B/13H; 58 male; 35.9±10.2 yrs; %body fat: 30.4±11.8; fat mass (FM): 26.6±14.0kg) were admitted to a clinical research unit to measure EE within a whole room calorimeter during FST, energy balance (EB), and OF with twice energy requirements. Thrifty and spendthrift phenotypes were defined as below and above the median EE response to FST, respectively. Core body temperature (CBT) was measured using an ingested monitor

during these interventions (combined mean CBT: 36.94±0.22, range: 36.43, 37.48°C). Body composition and truncal fat volume (6228±3971cm<sup>3</sup>) were measured with DXA.

**Results:** Compared to EB, EE increased 9.7±5.2% ( $p < 0.0001$ ) during OF and decreased -8.0±4.3% ( $p < 0.0001$ ) with FST. A greater decrease in EE with FST correlated with a smaller increase with OF ( $r = 0.27$ ,  $p = 0.02$ ). Whole body fat mass (FM) (30.1 v 23.1kg;  $p = 0.01$ ), and truncal fat (7139 v 5316cm<sup>3</sup>;  $p = 0.03$ ) were greater in thrifty individuals, adjusted for sex. After accounting for age, sex, race, ambient temperature and fat free mass, FM ( $\beta = -0.16\%$ ;  $p = 0.003$ ) and truncal fat ( $\beta = -0.0004\%$ ;  $p = 0.03$ ) were associated with the EE response to FST. Due to differences in menstrual cycle phase in women, we only analyzed CBT in males. Thrifty men had lower CBT (36.80 v 36.96°C;  $p = 0.004$ ) compared to spendthrift men. Lower CBT was associated with a greater EE decrease in response to FST ( $\beta = 1.43\%$  per 0.1°C,  $p = 0.0003$ ), even after adjusting for covariates.

**Conclusions:** We confirmed the correlation between EE changes with FST and OF in a larger, more diverse group. Thrifty individuals were more likely to have greater overall and truncal adiposity plus lower CBT consistent with a more efficient metabolism.

**T-OR-2094**

**Adaptive Thermogenesis Lowers VO<sub>2</sub>max without Compromising Running Performance in High- and Low-Capacity Rats**

Sromona Mukherjee *Kent Ohio*, Steven Britton *Ann Arbor Michigan*, Lauren Koch *Ann Arbor Michigan*, Colleen Novak *Kent OH*

**Background:** To lose weight when on a diet, energy expenditure needs to exceed energy intake. During calorie restriction (CR), adaptive thermogenesis occurs, where there is a decrease in energy expenditure beyond what is predicted by decreased body mass. Adaptive thermogenesis varies between individuals and can hinder continued successful weight loss on a diet.

**Methods:** We find that adaptations in activity-related energy expenditure differ in a contrasting rat model of leanness and obesity bred for intrinsic aerobic capacity, high- and low-capacity runners (HCR and LCR). Here, we determined how CR alters aerobic capacity and running performance. Maximal oxygen consumption (VO<sub>2</sub> max) was measured in HCR and LCR before and after 21 days of 50% CR using a treadmill test.

**Results:** 50% CR did not significantly compromise running performance (top speed, total intervals completed) in either HCR or LCR. In contrast, oxygen consumption decreased even when body weight and lean mass was taken into account. The significant reduction of VO<sub>2</sub> max suggests an increase in energy efficiency. Thus CR made HCR and LCR running more efficient without dampening their running. Food restriction did not change the maximal respiratory exchange ratio (RER). HCRs' capacity and performance were significantly higher than LCR, consistent with their phenotypes

**Conclusions:** During food restriction, adaptive thermogenesis occurs in VO<sub>2</sub>max, increasing running efficiency and conserving energy, making rats less susceptible to weight loss while protecting running performance. Supported by NIH grant:R15 403009 ,RO1 443163, R24OD010950

**T-OR-2095**

**The Thermogenic Responses to Overfeeding and Cold Are Differentially Regulated**

Courtney Peterson *Baton Rouge Louisiana*, Virgile Lecoultré *Fribourg N/A*, Elizabeth Frost *Baton Rouge LA*, Leanne

Redman *Baton Rouge Louisiana*, eric ravussin *Baton Rouge LA*

**Background:** Brown adipose tissue (BAT) is a highly metabolic tissue that generates heat through mitochondrial uncoupling. BAT activity negatively correlates with BMI, and it has been suggested that obesity may partially be due to low BAT mass and/or activity. BAT activity has been proposed to mediate both cold-induced thermogenesis (CIT) and diet-induced thermogenesis (DIT). We therefore set out to determine whether there is a relationship between CIT and DIT in humans and whether daily cold exposure for 4 weeks could increase both DIT and CIT by recruiting and activating BAT. **Methods:** Nine lean, healthy men ( $23 \pm 3$  years old,  $23.0 \pm 1.8$  kg/m<sup>2</sup>) completed 20 minutes of cold exposure (4°C) five days per week for 4 weeks. Before and after the cold intervention, CIT (the increase in RMR at 16°C relative to 22°C) was measured by a ventilated hood indirect calorimeter, whereas DIT was measured for 24 hours in a respiratory chamber in response to 50% overfeeding.

**Results:** After four weeks of cold acclimation, participants lost  $0.5 \pm 0.5$  kg ( $71.0 \pm 6.6$  vs.  $71.5 \pm 6.5$  kg;  $p=0.03$ ). Consistent with increased BAT activity, CIT more than doubled from  $5.2 \pm 14.2\%$  at baseline to  $12.0 \pm 11.1\%$  ( $p=0.05$ ), in parallel with increased SNS activity (HRV). However, twenty-four-hour energy expenditure ( $2166 \pm 206$  to  $2118 \pm 188$  kcal/day;  $p=0.15$ ) and diet-induced thermogenesis ( $7.4 \pm 2.7\%$  to  $7.7 \pm 1.6\%$ ;  $p=0.78$ ) were not altered by the cold intervention. Moreover, there was no association between CIT and DIT at baseline or post-intervention, or in their changes during the intervention ( $p \geq 0.47$ ).

**Conclusions:** Cold acclimation therefore increases CIT but not DIT, which suggests that CIT and DIT likely involve separate regulatory mechanisms. BAT activation does not appear to play a major role in DIT and modulating energy expenditure in response to excess energy intake.

#### T-OR-2096

##### Is a Calorie a Calorie? Mathematical Model Predicts Differing Body Fat Loss with Carbohydrate vs. Fat Restriction in Obese Adults

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**Background:** Dietary carbohydrate restriction has been purported to result in metabolic adaptations that promote body fat loss to a greater extent than an equal calorie restriction of dietary fat.

**Methods:** We investigated body fat loss resulting from selective restriction of dietary carbohydrate versus fat in 19 adults with obesity. The diets were equal in calories and were instituted in a randomized crossover fashion. Subjects were confined to a metabolic ward for a pair of 2 week periods separated by a 2-4 week washout. The rate of body fat loss was calculated by fat balance as measured by indirect calorimetry during five days spent in a metabolic chamber each visit. A mathematical model of metabolism was used to simulate the

intervention, quantitatively integrate the data, and predict the long-term effects of adhering to isocaloric diets varying in carbohydrate and fat.

**Results:** Both the model and the data showed that dietary carbohydrate restriction led to a sustained increase in net fat oxidation, but restriction of dietary fat had little effect. However, the fat balance data and model simulations demonstrated that body fat loss was significantly greater with dietary fat restriction. Model simulations indicated that prolonged adherence to diets differing in composition, but not calories, can theoretically result in differences body fat loss. However, metabolic adaptations act to limit body fat differences over a wide range of isocaloric substitutions of dietary carbohydrate and fat.

**Conclusions:** Calorie for calorie, dietary fat restriction led to more body fat loss than restriction of dietary carbohydrate in adults with obesity. However, model simulations suggest that long-term exposure to isocaloric diets with widely ranging carbohydrate and fat content would lead to only small differences in body fat and energy expenditure. Therefore, the relative efficacy of low carbohydrate versus low fat diets for body fat loss likely results primarily from differences in overall calorie intake.

#### T-OR-2097

##### GLP-1 Receptor Activation Suppresses Calorie Intake without Altering Food Preferences in Mice

Jingjing Niu *Durham NC*, Jenny Tong *Durham NC*, Ivan Araujo *New Haven CT*

**Background:** Roux-en-Y gastric bypass surgery invariably results in marked increase in postprandial glucagon-like peptide-1 (GLP-1) secretion. Concomitantly to the augmented incretin response, Roux-en-Y gastric bypass also leads to reduction in both calorie intake and preference for high-calorie foods. While it is commonly assumed that the enhanced GLP-1 signaling mediates the surgery-induced effects on feeding, it remains unclear whether GLP-1 influences food choices in addition to reducing calorie intake. The aim of the present study was to determine whether rises in GLP-1 levels are sufficient to concomitantly suppress calorie intake and shift preferences towards low-calorie foods.

**Methods:** Experiment 1: In adult mice, systemic injections of a GLP-1 receptor (GLP-1r) agonist (Byetta) were paired with either low- or high-calorie sugar or fat solutions in a conditioning protocol. Preferences for low- vs. high-calorie solutions were subsequently assessed using the brief-access two-bottle preference test. Experiment 2: Preference tests as described in experiment 1 were performed after i.p. injections of Byetta.

**Results:** We found that while systemic GLP-1r agonism produced robust suppression of both lipid and sugar intake, it failed to shift intake preference from high- to low-calorie solutions. Pairing GLP-1r agonism with either low- or high-calorie lipids or sugars did not alter the animals' preference for high-calorie solutions. Furthermore, treatment with Byetta did not alter the high-calorie nutrient preference without food pairing.

**Conclusions:** Our data indicates that, despite the potent satiation effect of GLP-1, the shift in preference towards low-calorie foods following bariatric surgery is GLP-1 independent. The bariatric surgery effect on food choice may be mediated by other gut hormones or by alterations in gut-brain neural signaling.

#### T-OR-2098

**Obesity is Associated with Differential Food-Cue Induced Recruitment of Brain Regions and Networks After Fructose vs. Glucose Ingestion**

Kathleen Page *Los Angeles California*, Andrew Melrose *Laguna Niguel California*, Shan Luo, Ana Romero *Los Angeles CA*, Kayan Sarpelleh *Los Angeles CA*, John Monterosso *Los Angeles CA*

**Background:** The central administration of fructose increases feeding whereas glucose suppresses feeding in animals. Human studies show that fructose compared with glucose ingestion results in greater brain responses to food cues in regions involved in attention and reward. The aim of this study was to determine the effects of fructose vs. glucose ingestion on food-cue induced recruitment of brain networks relevant to eating behavior in obese vs. lean individuals.

**Methods:** 12 lean (6M/6F; age 21.5±2 years; BMI 22.7±1.7 kg/m<sup>2</sup>) and 12 obese (4M/8F; age 22.5±2 years; BMI 35.4±4.7 kg/m<sup>2</sup>) individuals completed 2 fMRI sessions in a double blinded, random order crossover study. Participants ingested 75 g of glucose or fructose before completion of a food-cue task during scanning. A region of interest (ROI) analysis was performed to determine group differences in neural response to food cues between fructose and glucose conditions. Next, we performed a connectivity analysis using temporal concatenation independent components analysis (ICA). Individualized spatial-maps were subjected to a mixed-effects analysis to investigate interactions between group and sugar type.

**Results:** In the ROI analysis, we observed an interaction between group and sugar type in the orbital frontal cortex driven primarily by decreased responsiveness to food-cues following glucose in lean individuals that was non-existent in obese individuals. Connectivity analysis indicated an interaction in the ventral medial prefrontal cortex as part of a component relevant to the canonical network involved in gustation, emotion and reward, with lean individuals evincing higher recruitment after fructose vs. glucose ingestion. The response was reversed in obese individuals, whereby recruitment was higher after glucose vs. fructose.

**Conclusions:** This work builds on human and animal research implicating differential brain responses to glucose and fructose, and implies that food-cue induced recruitment of reward networks may be altered in obesity.

**T-OR-2099**

**Neural Reward Response to Palatable Food Receipt Predicts Weight Variability in a Lean Adolescent Sample**

Samantha Winter *Philadelphia PA*, Karol Osipowicz *Philadelphia Pennsylvania*, Sonja Yokum *Eugene OR*, Eric Stice *Eugene Oregon*, Michael Lowe *Philadelphia PA*

**Background:** Extant literature has demonstrated that reward activation in the brain to palatable food intake is predictive of future weight gain. Recent studies have also found short-term weight variability predicts future weight gain. No studies to date, however, have examined neural correlates of food receipt in relation to future weight variability.

**Methods:** Using fMRI, we assessed whether normal-weight adolescent (N = 65) neural responses to milkshake anticipation and/or receipt predicted weight variability over a four-year follow-up period. Weight variability was calculated using a root mean squared error method (RMSE) in order to assess fluctuations in weight independent of weight trajectory.

**Results:** Controlling for baseline BMI, greater activation in reward regions (bilateral striatum) and taste regions (gustatory

cortex) to milkshake receipt (but not to milkshake anticipation) predicted greater body-weight variability over a four-year follow up. There was also a positive association between WV and weight gain over 4 years.

**Conclusions:** Regions traditionally associated with future weight gain were found to be associated with increased weight variability in response to palatable food taste in the current sample. This suggests that increased reward sensitivity in response to palatable food is associated with global deficits in weight maintenance that may manifest in weight variability or weight gain. The findings are consistent with the possibility that increased weight variability may reflect a deterioration of automatic weight regulation mechanisms, perhaps attributable to the influence of the obesogenic food environment.

**T-OR-2100**

**Taste Processing in Pediatric Overweight**

Cara Bohon *Stanford California*, Talya Feldman *Palo Alto CA*

**Background:** Understanding the neural response to food and food cues during early stages of weight gain in childhood may help us determine the drive processes involved in eating behavior and risk for obesity. This is important for developing successful interventions in this age group. A heightened response in brain reward regions to food cues, but diminished response to actual taste receipt is present in obese adults, but not fully understood in children at early stages of weight gain.

**Methods:** Healthy weight and overweight children ages 4-8 (N=18; 10 with BMI between 15th and 85th %ile and 8 with BMI >85th %ile) underwent fMRI scans while anticipating and receiving tastes of chocolate milkshake. Parents completed a Children's Eating Behaviour Questionnaire. Recruitment is ongoing, and the sample will increase to 20 (10 per group) prior to the presentation.

**Results:** Preliminary results reveal a trend for greater response to milkshake taste receipt in overweight children in the right insula, operculum, precentral gyrus, and angular gyrus, and bilateral precuneus and posterior cingulate. No group differences were found for brain response to food cue.

Exploratory analyses will assess relations between self-report measures of food responsiveness and enjoyment of food and brain response to taste.

**Conclusions:** Although obese adults show a hyporesponse in reward regions to tastes of milkshake, this may reflect a diminished response over time as a consequence of overeating. The lack of a differential response in reward regions and the presence of heightened response in other regions in overweight children may reflect an important developmental shift over the course of obesity impacting treatment outcome. Specifically, regions involved in taste sensation and salience, as well as motor cortex, were activated more in the overweight group. Thus, function in these regions could indicate risk for obesity development and provide an earlier treatment or prevention target.

**T-OR-2101**

**VTA Amylin Receptor Activation Modulates Macronutrient Selection**

Elizabeth Miettlicki-baase *Philadelphia Pennsylvania*, Lauren McGrath *Philadelphia PA*, Tram Pham *Houston TX*, Chan Tran *Nguyen Gettysburg Pennsylvania*, Joanna Krawczyk *Philadelphia Pa*, Matthew Hayes *Philadelphia Pennsylvania*

**Background:** The pancreatic hormone amylin acts in the ventral tegmental area (VTA) to regulate feeding in a physiologically relevant manner. Previous studies from our laboratory demonstrate that VTA amylin receptor (AmR)

activation reduces intake of palatable foods, such as a high-fat diet. However, the ability of VTA AmR signaling to control intake of particular palatable macronutrients, such as fat or carbohydrate, is largely unresolved.

**Methods:** In separate one-bottle tests, rats were trained to consume isocaloric sucrose solution (25%) or Intralipid fat emulsion (10%). Intake of each solution was measured after intra-VTA injection of the AmR agonist salmon calcitonin (sCT). In a separate experiment, rats were given simultaneous access to sucrose and Intralipid at concentrations that are equally consumed by volume (10% sucrose, 10% intralipid) and the intakes of both solutions were monitored after VTA sCT. To specifically address the possibility that VTA AmR activation may generally suppress fluid intake, we evaluated whether intra-VTA sCT reduces ad libitum water intake in chow-fed rats, either in the presence or absence of food.

**Results:** When fat and sugar solutions are presented independently, VTA sCT more durably suppressed intake of fat compared to sucrose. A more specific effect on fat was observed when rats had simultaneous access to concentrations of fat and sucrose that they consumed equally under vehicle conditions; here, intra-VTA sCT preferentially reduced fat intake with no effect on sucrose intake. Separate water intake studies show that although VTA sCT suppresses water intake when food is available, likely due to reduced prandial drinking concomitant with sCT-induced hypophagia, it has no effect on water intake in the absence of food.

**Conclusions:** VTA AmR activation has more potent effects on fat intake compared to sucrose intake. These effects appear to be independent of general effects on fluid intake. DK103804 (EGM-B), DK096139 (MRH).

#### T-OR-2102

##### **Effect of a Weight-Stable Diet Containing Increased High-Fructose Corn Syrup on Liver Fat Content and Insulin Sensitivity**

Shelby Sullivan *St. Louis Missouri*, Faidon Magkos *Saint Louis MISSOURI*, Nada Abumrad *Saint Louis MO*, Samuel Klein *St. Louis MO*, Bruce Patterson *Saint Louis MO*

**Background:** Although ingestion of high-fructose corn syrup (HFCS) has been implicated as an important contributor to the development of nonalcoholic fatty liver disease and insulin resistance, it is unclear if this occurs when there is no increase in body weight. The purpose of this study is to determine the effects of consuming a weight-stable diet containing 25% of calories from HFCS on: 1) intrahepatic triglyceride (IHTG) content, 2) hepatic insulin sensitivity and 3) skeletal muscle insulin sensitivity

**Methods:** 7 obese subjects (4 women, 3 men; BMI  $35.5 \pm 2.8$  kg/m<sup>2</sup>) with usual dietary intake of <9% total calories as HFCS participated. Subjects consumed a run-in low-HFCS diet (5% calories as HFCS) for two weeks before baseline testing, then 4 weeks of a high-HFCS diet (25% of calories as HFCS). All meals and drinks were provided. Magnetic resonance spectroscopy was used to assess IHTG content and a hyperinsulinemic-euglycemic clamp procedure with stable isotope tracer infusion was used to determine insulin sensitivity in liver [hepatic insulin sensitivity index: reciprocal of the product of the basal endogenous glucose production rate (in  $\mu\text{mol} \cdot \text{kg FFM}^{-1} \cdot \text{min}^{-1}$ ) and fasting plasma insulin concentration (in  $\mu\text{U/mL}$ )] and skeletal muscle (percent increase in insulin-stimulated glucose disposal rate).

**Results:** Body weight and % body fat did not change after 4 weeks of treatment with the high-HFCS diet ( $99.2 \pm 11.6$  kg vs  $98.5 \pm 11.6$  kg and  $45.3 \pm 6.7\%$  vs  $45.3 \pm 7.1\%$ , before and after

diet treatment, respectively). The high HFCS diet also did not change IHTG content ( $4.6 \pm 4.2\%$  before and  $3.9 \pm 3.5\%$  after), hepatic insulin sensitivity index ( $0.64 \pm 0.28$  vs  $0.74 \pm 0.38$  [ $100 \div (\mu\text{mol} \cdot \text{kg FFM}^{-1} \cdot \text{min}^{-1} \times \mu\text{U/mL})$  before and after]; or insulin-stimulated glucose disposal rate ( $228 \pm 103\%$  vs  $219 \pm 102\%$  before and after).

**Conclusions:** These results suggest that consuming a high-HFCS diet does not have adverse effects on IHTG content or insulin action in liver or skeletal muscle when body weight is stable.

#### T-OR-2103

##### **Neural Responses to Food Words in Obese and Lean Individuals Under Stressed and Non-Stressed Conditions**

Susan Carnell *Baltimore Maryland*, Leora Benson *Baltimore Maryland*, Zhishun Wang *New York NY*, Bradley Peterson *Los Angeles CA*, Allan Geliebter *NY NY*

**Background:** Obese individuals may show heightened responses to environmental food cues, and stress has been associated with greater intake and weight. We aimed to study neural responses to minimal food cues (written words) under normal conditions and following a stressor in obese vs. lean individuals.

**Methods:** We recruited 12 lean and 17 obese participants. On two separate days, participants underwent an fMRI scan during which they viewed words representing high energy-density [ED] foods, low-ED foods, and non-foods and rated how much they wanted to eat each food item. On one day, the scan was preceded by a Socially-Evaluated Cold Pressor Test [SECPT] (stress); on the other (counter-balanced) by a warm water task (control). A multi-item ad libitum meal followed each scan.

**Results:** Wanting scores were highest for the high-ED foods under both conditions ( $p < 0.001$ ), and obese, but not lean, individuals consumed more calories during the stress (vs. control) condition ( $p = 0.018$ ). Imaging analyses for the non-stress condition revealed that obese (vs. lean) individuals showed increased responses to food (vs. non-food) cues and high-ED (vs. low-ED) food words in multiple cortical and sub-cortical brain regions including the caudate, dlPFC, cingulate, sensorimotor cortex, SMA and brainstem. In comparisons of the stress vs. control condition, both obese and lean individuals showed increased food vs. non-food and high-ED vs. low-ED responses in distinct but overlapping neural circuits.

**Conclusions:** Our results suggest that obese vs. lean adults show heightened neural responses to minimal food vs. non-food and high-ED vs. low-ED food word cues under normal, non-stressed conditions. Both obese and lean adults showed some evidence for increased neural food cue responses following a stress manipulation, but only obese individuals consumed more at a subsequent ad libitum meal. Heightened neurobehavioral responses to food cues in both stressed and non-stressed conditions could contribute to excessive intake and weight gain.

#### T-OR-2104

##### **Quantifying Pediatric Fitness Levels that Counteract the Obesity Effect of the FTO Gene**

Adil Malek *Montgomery Alabama*, Jose Fernandez *Birmingham AL*

**Background:** Obesity negatively impacts patient's lives. The complex etiology of obesity is influenced by genetics. The FTO gene contributes to obesity-related traits in various populations, with physical activity (PA) counteracting its effect to some extent. This study identified the level of PA and  $\text{VO}_{2-170}$  ( $\text{VO}_2$ ) required to reduce the effect of the FTO gene

on body fat.

**Methods:** Age, gender, ethnicity, Tanner stage, socio-economic status and body mass index percentile (BMI%) were obtained in a cross-sectional sample of 295 children. Percent body fat (PBF) was obtained from DEXA. FTO and ancestry informative markers were genotyped to identify genetic variation and estimate genetic admixture, respectively. PA and VO<sub>2</sub> measurements were determined by 10-day accelerometer trials and standard graded exercise testing. Multiple linear regression analysis and ANCOVA were used to confirm the association of the FTO gene with adiposity and to predict the value of PA or VO<sub>2</sub> required to decrease PBF below 25 or BMI% below 85th for each FTO genotype.

**Results:** Our participants had a mean age of 9.55 years and were 46.7% female. The FTO risk allele was significantly associated with increased BMI% ( $p=0.0100$ ) and PBF ( $p=0.0146$ ). Risk allele-carrying children with PA counts at 440000 and VO<sub>2</sub> levels at 29.5 had PBF less than 25, and those with PA counts at 145000 and VO<sub>2</sub> at 18.0 had BMI% less than 85th, compared to children without the risk allele.

**Conclusions:** Our results suggest that appropriate levels PA or VO<sub>2</sub> can counteract the predisposing effect of the FTO risk genotype in children, providing insights into the role of PA and fitness as potential mediators of adiposity and FTO and challenging the misconception that genetic predisposition may imply genetic determinism. Further work evaluating the interaction of long-term PA and fitness interventions with genes is needed to continue identifying clinical obesity-preventive tools.

#### T-OR-2105

##### For Whom is Weekly Accountability Necessary? Neuropsychological Predictors of Weight Change in the Second Phase of Behavioral Weight Loss

Emily Wyckoff *Philadelphia PA*, Stephanie Manasse *Philadelphia PA*, Evan Forman *Philadelphia PA*, Meghan Butryn *Philadelphia PA*

**Background:** Group behavioral weight loss (BWL) is the current gold standard weight loss treatment; however, weight regain is normative and long-term outcomes are poor. The accountability of weekly group meetings is considered a major motivator for weight loss. As such, losing the accountability of weekly meetings in the second phase of treatment is a likely driver of weight regain. Executive functioning (EF) processes may moderate the impact of reduced accountability on adherence to dietary and physical activity recommendations and thus weight change during a period of reduced accountability.

**Methods:** Overweight and obese participants ( $n=190$ ) received 25 group BWL treatment sessions over a 1-year period. Sessions were held on a weekly basis for the first six months, and transitioned to bi-weekly and then monthly for the second six months. At baseline, participants completed a self-report EF measure, the D-KEFS Tower Test (planning) and Color-Word interference Test (conflict monitoring and self-regulatory control), and a behavioral measure of delayed discounting.

**Results:** Mean percent weight change in the second phase of treatment was  $-0.32$  ( $SD = 4.41$ ). Controlling for weight loss in the first six months of treatment, greater discounting ( $p = .02$ ), poorer regulatory self-control ( $p = .04$ ), and lower self-reported scores of organization and planning ability ( $p = .047$ ) were associated with weight change in the second phase of BWL. Conflict monitoring was predictive at trend level ( $p = .099$ ). Behaviorally-measured planning was not predictive of

weight change.

**Conclusions:** Results suggest that poor self-regulatory control, greater discounting of later rewards, and poor planning may be important predictors of weight regain once clinician and group contact becomes less frequent in BWL. Findings indicate that individuals with poorer EF may benefit from targeted intervention strategies to prevent weight regain once BWL session frequency is reduced.

#### T-OR-2106

##### Fast but not slow weight loss reduces resting energy expenditure independently of body mass loss

Alice Gibson *Camperdown (University of Sydney) New South Wales*, Radhika Seimon *Camperdown NSW*, Charmaine Tam *Sydney NSW*, Tania Markovic, Janet Franklin *Sydney NSW*, Nuala Byrne *Gold Coast Queensland*, Ian Caterson *University of Sydney NSW*, Amanda Sainsbury *Camperdown NSW*

**Background:** Diet induced weight loss often results in 'metabolic adaptation' – a decrease in resting energy expenditure (REE) beyond that expected from changes in body mass and composition. It is not known if metabolic adaptation is related to the rate of weight loss. We compared the effects of fast versus slow weight loss on metabolic adaptation, after loss of a matched amount of body weight and fat free mass (FFM).

**Methods:** This preliminary analysis includes 24 post-menopausal women with obesity (BMI:  $33.8 \pm 2.6$  kg/m<sup>2</sup>, age:  $58.7 \pm 3.5$  years). Participants were randomized to either 4 weeks of FAST weight loss (70% energy restriction,  $n=12$ ) or 16 weeks of SLOW weight loss (30% energy restriction,  $n=12$ ). Body weight, body composition (by air displacement) and REE (by indirect calorimetry) were measured at 0 (baseline), 4 and 16 weeks after commencing energy restriction in the FAST and SLOW groups, respectively. Metabolic adaptation was calculated as the difference between measured REE and that predicted from regression equations of REE against FFM, fat mass and age at baseline.

**Results:** The FAST and SLOW groups lost equivalent weight (FAST:  $6.9 \pm 0.6\%$ , SLOW:  $6.0 \pm 2.5\%$  of baseline body weight;  $p=0.78$ ), and FFM (FAST:  $14.5 \pm 13.8\%$ ; SLOW:  $21.8 \pm 33.3\%$  of weight lost;  $p=0.49$ ). There was significant metabolic adaptation in the FAST group ( $-158 \pm 107$  kcal/day at 4 versus 0 weeks;  $p<0.01$ ), but not in the SLOW group ( $-49 \pm 160$  kcal/day at 16 versus 0 weeks;  $p=0.31$ ). The rate of weight loss (FAST:  $210 \pm 22$  g/day; SLOW:  $54 \pm 21$  g/day;  $p<0.01$ ) was significantly inversely correlated with metabolic adaptation in the SLOW group ( $r=-0.69$ ;  $p=0.01$ ), but not the FAST group ( $r=-0.13$ ;  $p=0.69$ ).

**Conclusions:** Our findings indicate that metabolic adaptation in response to diet-induced weight loss is related to the rate of weight loss.

#### T-OR-2107

##### Technology to Improve Child Health (TECH): Using Wireless Technology to Measure Energy Balance in Children

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**Background:** There is an urgent need for more comprehensive and cost-effective approaches to measuring the energy intake and expenditure of children in free-living conditions.

**Methods:** We piloted a novel wireless assessment tool consisting of an integrated pebble accelerometer and home scale to collect serial physical activity and weight data.

Patients were recruited from a preventative cardiology clinic and asked to wear the accelerometer continuously and weigh themselves daily; data automatically offloaded from home wireless access points to our central database for the duration of the study (3-6 months). A subset of patients received smartphones with a dietary app that digitally captured and transmitted dietary images to a central database, where nutrient content was coded. We directly measured anthropometrics and performed 24-hour dietary recalls at 2 follow-up clinic visits. We also assessed parental impressions of the tool.

**Results:** We recruited 22 participants (mean age 11.1 years, median BMI percentile 95.4); On average, we collected 56 days (range 15-131) of physical activity data and 32 daily weights (range 3-90) per child over the course of the study. 7 participants additionally recorded dietary intake with the smartphone app. Participants recorded an overall mean daily step count of 2567 (SD 1054, range 490 to 4184). Using linear regression to model weight trajectory, we found that 10/23 (43.5%) of participants had a significant increase in daily weight over the study period. The remaining participants had stable weight trajectories. Only 4 participants had significant changes in steps/hour monitored over time – all declines.

**Conclusions:** An integrated wireless tool may represent a comprehensive and efficient method for measuring energy balance in children, with both clinical and research applications. Pediatric weight management is one promising use, allowing clinicians to identify trends in weight gain and physical activity between visits and intervene sooner.

#### T-OR-2108

##### Diet pattern may affect hypertension and left ventricular hypertrophy by altering insulin

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**Background:** Insulin increases sodium retention and has been associated with higher risk for hypertension (HTN). In this cross-sectional study, we tested the hypothesis that diet patterns characterized by high sugar content are associated with insulin, and that higher insulin is associated with prevalent HTN and left ventricular hypertrophy (LVH).

**Methods:** Data were analyzed on 14,729 non-diabetic participants of REGARDS, an observational study of adults aged >45 y residing in 1855 counties across the continental US. Information on habitual diet was collected using the Block 98 Food Frequency Questionnaire. Five diet patterns were considered based on factor analysis: Convenience, Plant-based, Sweets/Fat, Southern, and Alcohol/Salad. Prevalent HTN and electrocardiographic LVH were determined by in-person testing. Logistic regression was used to examine how diet pattern was associated with odds for high fasting insulin [quartiles 3 and 4 vs. quartile 1], after adjusting for covariates. Diet % carbohydrate (CHO), glycemic index, and glycemic load also were examined as predictors of fasting insulin. Subsequently, logistic regression was used to examine the association of insulin quintile with prevalent HTN and LVH, adjusting for covariates.

**Results:** Adherence to the Sweets/Fat and Southern (characterized by a high loading of sugar-sweetened beverages) diet patterns, and greater %CHO, were associated with greater odds for high insulin (P for trend <0.05 to <0.0001), whereas adherence to the Plant-based and Alcohol/Salad patterns was associated with lower odds for high insulin (P for trend <0.0001). Participants in the highest

quintile of fasting insulin had 3.4 times the odds of having HTN than those in the lowest quintile [OR 3.4, (3.04, 3.81), P for trend <0.001]. The relationship with LVH was similar [OR 2.77, (2.23, 3.45), P for trend <0.001].

**Conclusions:** Diet patterns characterized by high sugar content were associated with high fasting insulin, which in turn, predicted prevalence of HTN and LVH.

#### T-OR-2109

##### Cardiometabolic Risk Factor Incidence in the Metabolically Healthy Obese: The Atherosclerosis Risk in Communities (ARIC) study

Patrick Bradshaw *Chapel Hill North Carolina*, Kamika Reynolds *Chapel Hill North Carolina*, Lynne Wagenknecht *Winston-Salem NC*, Chiadi Ndumele *Baltimore MD*, June Stevens *Chapel Hill North Carolina*

**Background:** Development of cardiometabolic risk factors in metabolically healthy overweight (MHOw) and obese (MHO) individuals is poorly understood and even the definition of the condition remains controversial.

**Methods:** We evaluated the incidence of individual components of metabolic syndrome (MetSyn) in a multi-center, community-based biracial cohort aged 45-64 years at recruitment in 1987-1989 (the Atherosclerosis Risk in Communities (ARIC) study). MetSyn components excluding waist circumference [elevated triglycerides, low high density lipoprotein cholesterol (HDL-C), elevated blood pressure and elevated fasting glucose], body mass index (BMI, kg/m<sup>2</sup>) and sociodemographic data were collected at each of four visits spaced three years apart. Our analysis included 3,746 participants who were not underweight and free of the aforementioned components of MetSyn at the initial visit. Subjects were classified as metabolically healthy normal weight (MHNw), MHOw and MHO at each visit. Interval-censored proportional hazards regression models were used to estimate adjusted hazard ratios (HR) and 95% confidence intervals.

**Results:** We found that the risk of developing each risk factor was higher among MHO than MHNw. The most pronounced association was for elevated fasting glucose [MHO vs. MHNw, HR: 2.69 (2.11, 3.45)]. Obesity was also positively associated with elevated triglycerides [HR: 1.78 (1.41, 2.25)], low HDL-C [HR: 1.83 (1.48, 2.27)] and elevated blood pressure [HR: 1.77 (1.48, 2.11)]. A similar, but less pronounced pattern was noted among the MHOw [MHOw vs. MHNw, elevated glucose, HR: 1.79 (1.49, 2.16); elevated triglycerides, HR: 1.46 (1.24, 1.72); low HDL-C, HR: 1.54 (1.33, 1.80); and elevated blood pressure, HR: 1.23 (1.07, 1.40)].

**Conclusions:** We conclude that even among apparently healthy individuals, obesity and overweight are related to more rapid development of cardiometabolic risk factors, and that elevations in blood glucose may be most likely to develop.

#### T-OR-2110

##### Gluten vs. Gluten Free Diet: A Nutrient Composition Comparison

Amy Taetzsch *Boston Massachusetts*, Carrie Brown *Somerville MA*, Cindy Chen *Boston MA*, Amy Krauss *Boston Massachusetts*, Sai Das *Boston MA*, Susan Roberts *Boston Massachusetts*

**Background:** Gluten free diets may be perceived as being healthier than diets containing gluten. However, there is little data on the nutritional composition of these different dietary patterns.

**Methods:** Two approaches were used to examine the

nutritional composition of diets with and without gluten. First, a meta-analysis was conducted to examine the nutrient composition of a gluten-free diet compared to a control (gluten-containing) diet. Studies were included if they reported nutrient information, were conducted in adults and had a control group. Data from 6 studies were compiled and standardized mean differences in nutrient intake were analyzed using a random effects model. Heterogeneity was examined using the Q statistic. Second, theoretical gluten-containing and gluten-free diets meeting national dietary guidelines were compared. For this a 7-day menu consistent with the MyPlate 2000 calorie menu was developed, and versions using gluten-containing or gluten-free foods were analyzed. Nutrient data were expressed as the sum of nutrients by day, focusing on nutrients known to be limiting or overconsumed in the American diet. Paired t-tests or Wilcoxon Sign rank tests were used to evaluate differences between the gluten-containing and gluten-free plans.

**Results:** Findings from the meta-analysis show the gluten-free diet contained more total energy and less fiber intake versus the control diet, although when heterogeneity was accounted for only lower fiber intake in the gluten free diet remained significant ( $p > 0.01$ ). Findings from the analysis of theoretical menus indicated that the gluten-containing menus were higher in protein, magnesium, potassium, vitamin E, folate, and sodium compared to the gluten-free menus.

**Conclusions:** Based on these results, gluten-free diets do not have any nutritional advantages for individuals without celiac disease or gluten intolerance, and in some respects may be less healthy than gluten-containing diets.

#### T-OR-2111

##### **Dietary Omega-3 Fatty Acid Intake is Associated with Decreased Sleep Latency in Healthy Adults**

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**Background:** Previous research has suggested possible associations between dietary fat intake, obesity and sleep. In a mHypoE-37 neuron cell culture model, saturated fat was found to disrupt regulation of the CLOCK gene (implicated in circadian rhythms) but the addition of docosahexaenoic acid (DHA) attenuated this disruption. There is a paucity of such data in humans. Therefore, the aim of this study was to determine the relationship between total dietary fat, omega-3 fatty acids, and DHA intake with sleep quality among healthy adults.

**Methods:** Data were from an observational study, aimed to phenotype healthy adults, conducted at the NIH Clinical Center (Bethesda, MD). Adults ( $n=226$ ) completed 7 day food records to determine dietary intake of total fat and long chain fatty acids. The Pittsburgh Sleep Quality Index (PSQI) assessed overall sleep quality as well as five subcomponents: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, and daytime dysfunction. Medication, demographics and anthropometric measurements were obtained from medical records. Univariate and multivariate regression analyses explored predictors of total PSQI score and its subcomponents.

**Results:** Medication use, BMI and sex were consistently related to sleep quality. Adjusting for these covariates, percent energy from fat, omega-3 (g/1000 kcal) intake, and DHA (g/1000 kcal) intake were not significant predictors of overall sleep quality. However, when examining PSQI subcomponent

scores in adjusted analyses, omega-3 intake was a statistically significant predictor of sleep latency (Adj.  $R^2=0.050$ ,  $\beta=-0.340$ ,  $p=0.042$ ).

**Conclusions:** While total omega-3 intake was not associated with overall sleep quality, this study suggests the potential role for omega-3 in shortening sleep latency. As short sleep is associated with chronic illness and weight gain, nutritional interventions aimed at increasing sleep duration may lead to improvements in overall health. Thus, further investigation is warranted.

#### T-OR-2112

##### **Understanding the Role of Dietary Intake in the Relationship Between Alcoholic Beverage Consumption and Waist Circumference Among American Adults**

Lauren Butler *Hillsborough North Carolina*, Jennifer Poti *Chapel Hill North Carolina*, Barry Popkin *Chapel Hill North Carolina*

**Background:** Inconsistent relationships between alcoholic beverage consumption and waist circumference (WC) might be related to consumption of added sugar through hypothesized increased sweet preference among drinkers.

**Methods:** This study included US adults  $\geq 20$  years ( $n=15,448$ ) from NHANES 2003-2012. Multivariable linear regression was used to examine associations between the number of alcoholic drinks (0, 1, 2,  $\geq 3$  drinks per day) and added sugar (g/d) and sugary food/beverage intake (kcal/d) and to determine how the association between the number of drinks consumed and WC was modified or confounded by added sugar intake.

**Results:** Among men, drinking  $\geq 3$  drinks/d was negatively associated with dairy desserts. Men who consumed 2 drinks/d had lower added sugar intake ( $72.5 \pm 1.8$  g/d) compared to non-drinking males ( $82.0 \pm 3.6$  g/d). Among women, drinking 1 drink/d was positively associated with dairy desserts; drinking  $\geq 1$  drink/d was positively associated with candy consumption. Further, higher drinks/d was positively associated with added sugar among women. Compared to non-drinkers, drinking  $\geq 3$  drinks/d was positively associated with WC among men (adjusted  $\beta$ ; 95% CI: 2.41; 0.33, 4.49 cm). This relationship differed by tertiles of added sugar consumption (P-interaction  $< 0.10$ ). Men with moderate added sugar intake (39.9 to 82.9 g/d), who drank  $\geq 3$  drinks/d had higher WC ( $102.0 \pm 0.75$  cm) compared to men who drank 2 drinks/d ( $98.9 \pm 0.65$  cm). For those in the highest and lowest tertiles of added sugar intake, higher drinking was not associated with higher WC. Among women, drinking 2 drinks/d was negatively associated with WC (-1.61; -3.15, -0.06 cm); this relationship was neither modified nor confounded by added sugar intake.

**Conclusions:** These results suggest contrasts in relationships between drinking and added sugar and WC across gender subgroups. Further studies are needed to explore the role of high-sugar food and beverage intake in differential associations between alcoholic beverage consumption and WC.

#### T-OR-2113

##### **Inflammation and Components of the Metabolic Syndrome (MetS) in the Insulin Resistance (IR) of African American Adults**

Angela Davis *Bethesda Maryland*, Nicket Dedhia *Bethesda Maryland*, Andrew Demidowich *Bethesda MD*, James Reynolds *Bethesda MD*, Jack Yanovski *Bethesda Maryland*

**Background:** MetS, a constellation of abnormalities that reflects an unhealthy metabolic state, places adults at higher risk of developing cardiovascular disease (CVD) and Type 2 Diabetes (T2DM). Paradoxically, African Americans (AA), as compared to White Americans (WA), have a higher incidence of diabetes and heart disease, despite having lower levels of MetS components (e.g. lower triglycerides and cholesterol concentrations) than similarly obese WA. We studied if inflammation, an independent factor in predicting cardiometabolic risk, could help explain this disparity through its effects on IR.

**Methods:** We assessed the components of the metabolic syndrome (waist circumference, blood pressure, HDL-cholesterol, triglycerides, and fasting glucose), insulin resistance (HOMA-IR), and inflammation (hsCRP) in a convenience sample of overweight/obese adults. The primary statistical analysis was a MANCOVA to examine the impact of race and inflammation on the measured variables, accounting for age, sex, lean mass, and percentage fat mass.

**Results:** 87 AA (age 35.3±1.1y, 87.4% female) and 161 WA (age 41.5±1y, 65.8% female) adults were studied. After accounting for age, sex and body composition, AA had lower LDL-cholesterol (p<.05), waist circumference (p<.001), and triglycerides (p<.001), but greater HOMA-IR (p<.01) and hsCRP (p<0.001) concentrations than did WA. In a regression model, hsCRP significantly (p<.05) and independently contributed to prediction of HOMA-IR. Once hsCRP was in the model, race no longer significantly predicted HOMA-IR (p>.05).

**Conclusions:** In our cohort, AA as compared to WA had a better MetS metabolic profile with lower triglycerides and LDL-cholesterol, but had evidence for greater inflammation that was associated with greater insulin resistance. These findings suggest that inflammation may be a major contributor to the risk of AA for development of T2DM and CVD.

#### T-OR-2114

##### Evaluating the Effect of Posting Calories on McDonald's Menus: A Controlled Natural Experiment

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**Background:** McDonald's decision to voluntarily post calories on menus in late 2012 provided an opportunity to examine the long-term effect of calorie labeling among adults and adolescents.

**Methods:** From 2010-2014, we repeatedly visited approximately 100 fast-food restaurants across 6 major chains: McDonald's, Burger King, Subway, Wendy's, KFC, and Dunkin' Donuts in 4 New England cities. We collected customers' receipts to calculate total calories ordered ("meal calorie content") and asked customers to estimate their meal calorie content. Before McDonald's began labeling ("pre", 2010-2011), we surveyed 606 adults (age 18+) and 524 adolescents (age 11-20) dining at McDonald's and 1271 adults and 654 adolescents at other chains. After labeling ("post", 2013-2014), we surveyed 356 adults and 343 adolescents at McDonald's and 795 adults and 564 adolescents at other chains. We used differences in difference analyses, adjusted for age, sex, BMI, and race, to determine the effect of labeling on customers' meal calorie content and accuracy of calorie estimations.

**Results:** Demographics were similar during the pre- and post-labeling periods (Adults: mean age 37 and 38 years, non-White

race 60% and 61%; Adolescents: mean age 16 years, non-White race 82% and 81%). For adults, meal calorie content pre v. post labeling at McDonald's declined from 721 kcal to 638 and from 892 kcal to 817 at other chains (P<0.01 for both). For adolescents, meal calories at McDonald's declined from 763 kcal to 704 (P=0.05) and from 751 kcal to 744 at other chains (P=0.80). In multivariable models, reductions in meal calories did not differ at McDonald's compared to other chains for either adults (-2 kcal; 95% CI -75, 71) or adolescents (-35 kcal; 95% CI -46, 115). Neither adults nor adolescents at McDonald's improved their calorie estimation pre vs. post. **Conclusions:** Meal calorie content at all restaurants declined. Calorie labeling at McDonald's, however, did not decrease meal calorie content compared to other chains.

#### T-OR-2115

##### Nutritional Quality and Child-Oriented Marketing of Breakfast Cereals in Guatemala

Jackie Soo *Boston Massachusetts*, Paola Letona *Guatemala Guatemala*, Violeta Chacon *Guatemala City Guatemala*, Joaquin Barnoya *St. Louis MO*, Christina Roberto *Boston MA*

**Background:** Food marketing has been implicated as an important driver of obesity. However, few studies have examined food marketing in low- and middle-income countries (LMICs). This study documents the prevalence of advertising on cereal boxes in Guatemala and examines associations between various marketing strategies and nutritional quality.

**Methods:** One box from all available cereals was purchased from a supermarket in Guatemala City, Guatemala. A content analysis was performed to document child-oriented marketing practices, product claims, and health-evoking images. The Nutrient Profile Model (NPM) was used to calculate an overall nutrition score for each cereal (the higher the score, the lower the nutritional quality).

**Results:** 106 cereals were purchased, and half featured child-oriented marketing (54, 50.9%). Cereals had a mean (± standard deviation) of 5.10±2.83 product claims per cereal, and most cereals (102, 96.2%) contained health-evoking images. Child-oriented cereals had, on average, higher NPM scores (13.0±0.55 versus 7.90±0.74, p<0.001) and sugar content (10.1±0.48 versus 6.19±0.50 g/30g, p<0.001) compared to non-child oriented cereals. Cereals with health claims were not significantly healthier than those without claims.

**Conclusions:** In Guatemala, cereals targeting children were generally of poor nutritional quality. Cereals displaying health claims were also not healthier than those without such claims. Our findings support the need for regulations restricting the use of child-oriented marketing and health claims for certain products.

#### T-OR-2116

##### Menu Cognitive Load and Ordering Outcomes: A Randomized Controlled Trial

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**Background:** There is interest in altering restaurant menus to improve eating habits. However, the impact of the cognitive load of menu designs on ordering outcomes is unknown. We hypothesized that a complex menu design would increase total meal energy (kcal), and that the effect may depend on the level of restrained eating.

**Methods:** Participants were randomized to either a “hard” (high cognitive load, H) or “easy” (low cognitive load, E) menu. The first phase (n=30) was conducted without screening for eating behavior traits. The second phase (n=31) was conducted in hungry (fasted since the prior evening), restrained eaters (above median cutoffs). Participants were given five minutes to order, while galvanic skin response (GSR) was measured as an indicator of cognitive load.

**Results:** Participants rated the H menu as more distressing and annoying than the E menu (p=0.0014). GSR change from baseline was significantly higher for H (p=0.04). Participants assigned to E ordered more items than those assigned to H after adjusting for gender and phase (3.4 + 1.13 vs. 2.54 + 1.28, respectively, p= 0.022). Although participants assigned to the easy menu tended to order more energy overall, this was not statistically significant after adjusting for gender and phase (1523 + 625 vs. 1236 + 643, respectively, p=0.18).

**Conclusions:** Contrary to our hypothesis, participants ordered lower kcal meals from the H menu compared to E menu. The effects of prolonged high cognitive load activities on eating behavior may not be equivalent to effects of menu cognitive load on ordering behavior.

#### T-OR-2117

**Effect of Physical Activity Calorie Equivalent Labeling on Selection of High-Calorie Foods in a College Dining Hall**  
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**Background:** Physical activity calorie equivalent (PACE) labeling shows some promise as a technique to reduce portion size but has not yet been examined in college students, a population vulnerable to both weight gain and eating disorders. This study evaluated the effect of posted PACE labels on the selection of pizza and French fries in a dining hall at a large Northeast university.

**Methods:** A focus group was conducted to test different exercise equivalent messages for acceptability and potential impact; messages were finalized based on this feedback. Food selection data (# of pans) for two baseline weeks (no food signage) and two intervention weeks (exercise equivalence posted above pizza and French fries serving areas) was provided by the university’s dining services through their database. The same food items were served during both the baseline and intervention periods.

**Results:** As predicted, there was a significant decrease in the selection of cheese pizza (p=.03) and French fries (p<.01) during the intervention weeks compared to the baseline weeks.

**Conclusions:** PACE labels showed some promise as an inexpensive, minimal intervention that might alter food selection in college students. Future studies should be conducted over a longer period of time and control for unexpected confounding variables (e.g. snow days) when working within a university dining hall setting. Additionally, student patrons exposed to the intervention expressed concern for the stigmatizing nature of the food labels and the implication of perpetuating disordered eating behavior. Moving forward, food labeling efforts should be sensitive to the prevalence of eating disorders on college campuses when designing materials promoting healthy dietary choices.

#### T-OR-2118

**Preliminary Results: Implementation of the regulation on television and film advertising of food and beverages to children in Mexico**

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**Background:** In July 2014, the Guidelines governing advertising of food and non-alcoholic beverages (F&B) to children on television and movie theaters were implemented. Nutritional criteria and restriction of schedules and types of program, where products with low nutritional value cannot be advertised towards children less than 12 years of age, were established therein.

**Methods:** We recorded 567 hours of broadcast television from August to December 2014, of the four national channels with the highest audience. Analysis and coding of recordings was performed using the coding manual from the Rudd Center for Food Policy and Obesity. For the analysis of adverts, the four regulated categories of F&B (i.e. flavored beverages, snacks, confectionery and chocolates) stipulated in the Guidelines, as well as time restriction for advertising products which do not meet the nutritional criteria, were used.

**Results:** From all the identified adverts (n = 21 628), 17.8% were of F&B. Of all F&B ads, 27% (n = 1039) belonged to the four analyzed categories. It was also observed that from the four regulated categories, 26.8% of the ads were being broadcasted during the restricted time, mainly in programs such as soap operas (49.3%), movies (20.1%) and sports programs (11.5%).

**Conclusions:** Preliminary research has reported a high preference within the child population for soap operas, where the broadcasting of products that do not comply with the nutritional criteria, is permitted. Therefore, it is recommended to review the criteria for the type of programs where, the advertising of products that do not meet the nutritional criteria is permitted.

#### T-OR-2119

**The Influence of Sugar-Sweetened Beverage Health Warning Labels on Parents’ Choices and Knowledge**

Christina Roberto *Philadelphia Pennsylvania*

**Background:** Two U.S. states have introduced bills that would require sugar-sweetened beverages (SSBs) to display health warning labels, but little is known about the influence of such labels. The goal of this research was to determine how warning labels may influence consumers and which designs are most impactful.

**Methods:** We recruited a demographically diverse group of 1,707 parents through Survey Sampling International. Parents were randomized to one of 5 health warning label conditions: 1) No health warning label (control); 2) Calorie label; or 3-5) one of three different text versions of the proposed California warning label (e.g., SAFETY WARNING: Drinking beverages with added sugar(s) contributes to obesity, diabetes, and tooth decay). Parents selected beverages for their children in a vending machine choice task, indicated their interest in receiving coupons for different SSBs and non-SSBs, and rated perceptions of health, taste, and willingness to pay for different drinks.

**Results:** Preliminary ANOVA analyses compared no warning label group, calorie label group, and all warning label groups combined. Significantly fewer parents choose an SSB for their child to drink in the warning label condition (42%) versus the no label condition (60%) and calorie label condition (51%); the effect of warning labels was stronger among those with a high

school degree or less. Parents also chose significantly fewer coupons for SSBs. Warning labels significantly decreased perceptions of the healthfulness of SSBs for children (especially among those with less education) and purchase intent of SSBs. Labels significantly increased perceptions that SSB intake will lead to weight gain and diabetes among their children. All p values  $<.01$ . Data for different label versions will also be presented.

**Conclusions:** Health warning labels on SSBs improve parents understanding of the health harms associated with overconsumption of such beverages and may cause parents to purchase fewer SSBs.