

compared to the DLG ($F = 3.23, p < .05$). **CONCLUSIONS:** These data suggest that self-regulation in early childhood is a significant *modifiable* construct influencing risk for cardiometabolic disease in adolescence and should be investigated as a potential target for future behavioral interventions. Funded by NICHD R01HD078346

929 Board #190 May 30 2:00 PM - 3:30 PM
Changes In Liver And Skeletal Muscle Sensitivity In Response To Acute And Chronic Calorie Restriction On A Low Carbohydrate Diet

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 (No relevant relationships reported)

PURPOSE: We determined the effects of acute and chronic calorie restriction with a low-carbohydrate diet on hepatic and skeletal muscle insulin sensitivity. **METHODS:** Twelve obese subjects (body-mass index, $36.1 \pm 1.0 \text{ kg/m}^2$) followed a low-carbohydrate (<60g/d) energy-deficit diet (1,200kcal/day). Magnetic resonance spectroscopy, muscle biopsies, and a euglycemic-hyperinsulinemic clamp were used to determine insulin action, cellular insulin signaling and intrahepatic triglyceride content before, after 48 h, and after ~12 wks (7% weight loss) of diet therapy. **RESULTS:** Intrahepatic triglyceride content significantly decreased at both 48-h ($28.6 \pm 3.8\%$) and 7% weight loss ($-38.0 \pm 4.5\%$; $p < 0.05$) compared to baseline. Basal glucose production rate significantly decreased at 48 h ($21.8 \pm 3.2\%$, $p < 0.001$) and after 7% weight loss ($20.8 \pm 3.4\%$, $p < 0.001$). Insulin-mediated glucose uptake did not significantly increase at 48 h ($4.4 \pm 12.7\%$, $p > 0.05$) but did significantly increase at 7% weight loss ($35.2 \pm 8.4\%$, $p < 0.05$). Insulin-stimulated phosphorylation of Jun N-terminal kinase decreased by ($-15.4 \pm 18.1\%$, $p > 0.05$) and ($-41.3 \pm 19.5\%$, $p < 0.05$) and phosphorylation of Akt increased by $19.2 \pm 26.9\%$ ($p > 0.05$) and $36.1 \pm 12.4\%$ ($p < 0.05$), after 48-h and 7% weight loss respectively. **CONCLUSIONS:** A low carbohydrate calorie diet acutely reduced intrahepatic triglyceride content and improved hepatic insulin sensitivity whereas moderate weight loss is necessary to improve insulin sensitivity in the skeletal muscle.

930 Board #191 May 30 2:00 PM - 3:30 PM
Exercise Training Attenuates Non-Alcoholic Fatty Liver Disease in rats with Diabetes via Endoplasmic Reticulum Stress

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 (No relevant relationships reported)

Non-alcoholic fatty liver disease (NAFLD) is highly prevalent in type 2 diabetes (T2D). Recent evidence supports that endoplasmic reticulum (ER) stress plays a critical role in the development of NAFLD. Although exercise training has been commonly prescribed for the treatment of NAFLD, the effects of different types of exercise on ER stress in NAFLD under type 2 diabetic condition are largely unknown. **PURPOSE:** The purpose of this study was to determine the effects of aerobic and resistance exercises on hepatic ER stress response and NAFLD in rats with T2D. **METHODS:** Male Sprague-Dawley rats were randomly assigned to four groups (n=10/group): Control (CON), T2D, T2D with aerobic exercise (T2D+AE; treadmill walking at 30 m/min, 0° incline, 60 mins/day, 5 day/week, for 8 weeks) and T2D with resistance exercise (T2D+RE; climbing a 80° incline vertical ladder with weights progressively increased from 50% to 100% of maximal carrying capacity on the tail, 3 times/day, 5 days/ week, for 8 weeks). Liver tissue samples were collected for histopathological analysis of the density of lipid droplets, and immunoblot analysis of expression levels of ER stress proteins, including glucose-regulated protein (GRP78), C/EBP homologous protein (CHOP), caspase 12, and c-Jun N-terminal kinase (JNK). One-way ANOVAs and Tukey's -test were used for data analysis. **RESULTS:** The density of lipid droplets in the liver was significantly higher in the T2D group than in the CON group ($p < 0.01$), but was significantly lower in the T2D+AE and T2D+RE groups when compared to the T2D group (both $p < 0.01$). In addition, the T2D group had significantly higher levels of protein expression of GRP78, CHOP, caspase 12 and JNK when compared to the CON group (all $p < 0.01$). Both exercise groups had significantly lower levels of protein expression of GRP 78, CHOP, Caspase 12 and JNK when compared to the T2D group ($p < 0.05$ to $p < 0.01$). **CONCLUSION:** Our findings suggest that both aerobic and resistance exercises are protective against NAFLD in rats with T2D by potentially regulating proteins involved in ER stress response.

931 Board #192 May 30 2:00 PM - 3:30 PM
Effect of Exercise and/or Spirulina maxima On Body Composition In Overweight/Obese Humans

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 (No relevant relationships reported)

Overweight and obesity are the main risk factors for cardiovascular diseases, which are the leading causes of death worldwide. As a consequence of this, it is indispensable to apply a nutritional intervention involving both a healthy diet adjustment and to promote an active lifestyle, since they are effective in preventing and reducing weight gain and excessive accumulation of body fat.

PURPOSE: To determine the independent and synergistic effect of a systematic physical exercise program and/or *Spirulina maxima* supplementation on body composition in overweight and obese subjects. **METHODS:** Through a randomized, double-blind, placebo-controlled, counterbalanced crossover study design, overweight and obese adults (N= 52, 25.12 ± 4.88 y, 1.71 ± 0.11 m, 88.14 ± 16.99 kg) were evaluated during a 12 wk of 4.5 g a day of supplementation (6 wk *Spirulina maxima* and 6 wk placebo) and/or a systematic physical exercise program (three days a week 20 to 30 min of aerobic exercise with intensities between 50% and 80% of maximum heart rate (HR max) and two days 20 to 30 min between 80% and 90% of HR max using high-intensity interval training (HIIT) intervention); the participants were divided in four groups: exercise and *Spirulina maxima* supplementation (ES), exercise and placebo supplementation (E), *Spirulina maxima* supplementation without exercise (S), and the control one, placebo without exercise (C). Body weight, body mass index (BMI) and body fat percentage (BFP) were assessed. Differences between treatments comparisons in all response variables were made using and ANOVA test. The present study was approved by bioethics committee of Universidad Autónoma de Ciudad Juárez. **RESULTS:** The differences between individuals usually are of wide range, for that reason the results are shown like differences between final and initial evaluations. All the treatments showed statistical differences compared with the control in body weight (kg) (ES= -2.36 ± 0.84 , E= -0.89 ± 0.68 , S= -0.91 ± 0.73 , C= 0.04 ± 1.28), BMI (kg.m^{-2}) (ES= -0.72 ± 0.41 , E= -0.26 ± 0.29 , S= -0.31 ± 0.48 , C= 0.01 ± 0.44), and BFP (%) (ES= -1.15 ± 0.20 , E= -0.49 ± 0.21 S= -1.46 ± 0.45 , C= -0.04 ± 0.13). **CONCLUSION:** *Spirulina maxima* intake joint a HIIT have an individual and a synergistic effect on body composition (decrease of body weight, BMI and BFP) in overweight and obese adults.

932 Board #193 May 30 2:00 PM - 3:30 PM
Restricted Carbohydrate Diet and Exercise Increase BDNF, Cognitive Function, and Metabolic Profiles

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 (No relevant relationships reported)

Metabolic syndrome (MetS) has been recognized as one of the most important clinical challenges and global health issues of today. Growing evidence suggests that mechanisms of energy metabolism may play a key role in mediating aspects of cognitive function. Brain-derived neurotrophic factor (BDNF) is one such factor well known for its critical role in neuronal plasticity, including memory and learning, and more recently metabolic processes, including body weight control, food intake and energy homeostasis. **PURPOSE:** The purpose of this study was to investigate the effect of diet and exercise on cognitive and metabolic function in individuals characterized with MetS. **METHODS:** Eleven subjects with MetS followed a crossover design with two 4-wk interventions, including a restricted carbohydrate paleolithic-based diet (RCPD) with high intensity interval training (RCPD-Ex) and a RCPD with sedentary activity (RCPD-Sed), separated by a 4-wk washout period. A two-way analysis of variance with repeated measures was performed with post-hoc analysis using simple effects analysis with a Bonferroni adjustment. The level of statistical significance was established a priori as $P < 0.05$. Values are reported as means \pm SD. **RESULTS:** Compared to baseline, RCPD-Sed and RCPD-Ex improves cognitive function, including improving serum BDNF by 20% and 38% (15.4 ± 5.2 verse 18.5 ± 4.6 and 21.2 ± 6.4 ng/mL), psychomotor speed and cognitive flexibility (-14%, -14%), and self-perceived cognitive symptoms and functioning (+8%, +16%), respectively. Compared to baseline, RCPD-Sed and RCPD-Ex also improves metabolic markers, reducing waist adiposity (15%, 18%), weight loss (-3%, -5%), body fat % (BF%: -7%, -12%), fasting plasma glucose (GLU: -20%, -27%), triglycerides (TG; -47%, -52%), mean arterial pressure (MAP; -28%, -34%), and increases HDL-C (+22%, +36%), respectively. RCPD-Sed and RCPD-Ex reduces fasting insulin by -34% and -39% (12.8 ± 9.1 , 11.3 ± 9.4 $\mu\text{U/ml}$), HOMA-IR by -37% and -41% (1.7

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