



# WOMEN WHO PARTICIPATE IN A STRUCTURED WEIGHT LOSS PROGRAM WITH RESISTANCE-EXERCISE EXPERIENCE MORE FAVORABLE CHANGES IN BODY COMPOSITION WHEN COMPARED TO OTHER POPULAR WEIGHT LOSS PROGRAMS

B Lockard, C Baetge, K Levers, E Galvan, A Jagim, S Simbo, M Byrd, YP Jung, J Oliver, M Koozehchian, R Dalton, D Khanna, B Sanchez, J Kresta, K Horrell, T Leopold, M Cho, S Springer, A Rivera, C Cerda, C Rasmussen, R Kreider. Exercise & Sport Nutrition Lab, Texas A&M University, College Station, TX

## Abstract

127 sedentary women (46±12 yr, 45.5±5% body fat, 35.1±5 kg/m<sup>2</sup>) were randomized to participate in a control group (C) or the Curves Complete® program with online support (CC), Weight Watchers® Points Plus (WW), Jenny Craig® (JC), or Nutrisystem® Advance Select™ (NS) weight loss programs for 12-wks. Body mass, DEXA body composition, and resting energy expenditure (REE) measurements were obtained at 0, 4, 8, & 12 wks and analyzed by MANOVA. Data are presented as changes from baseline after 12-wks. Participants in the diet groups lost similar amounts of body mass (C 0.1±3.1; CC -6.1±3.2; WW -4.3±3.5; JC -5.3±3.8; NS -5.1±4.5 kg, p=0.001). However, participants in the CC group experienced significantly greater loss in fat mass (C -0.0±2.0; CC -5.2±2.8; WW -2.2±2.6; JC -3.5±3.3; NS -2.3±2.5 kg, p=0.001), less loss in FFM (C 0.1±2.3; CC -0.7±2.5; WW -1.8±2.3; JC -1.8±2.1; NS -2.4±2.2 kg, p=0.002), and greater reductions in percent body fat (C -0.1±1.7; CC -3.3±2.3; WW -0.6±2.5; JC -1.4±2.4; NS -0.2±1.7%, p=0.001). REE tended to differ among groups (C 39±190; CC 0±154; WW -108±159; JC -27±206; NS -43±206 kcal/d, p=0.07). Results indicate that participation in the CC program promotes more favorable changes in body composition than other popular weight loss programs.

## Rationale

Obesity affects more than 1/3 of US adults, including 2 million more women than men. Excess weight can lead to many health concerns, to include CVD and T2DM. Curves®, Jenny Craig®, Nutrisystem®, and Weight Watchers® are four widely recognized commercial companies that provide weight management services based on scientifically validated principles. PURPOSE: To compare the efficacy of these programs on markers of body composition and metabolism in previously sedentary overweight women.

## Experimental Design

- Subjects were informed of the experimental procedures and signed informed consent statements in adherence with human subject guidelines.
- 127 sedentary women (46±12 yr, 45.5±5% body fat, 35.1±5 kg/m<sup>2</sup>) participated in the study.
- Subjects were assigned to a control group (C; n=20), a Curves Complete® with online support group (CC; n=23), a Weight Watchers® group (WW; n=29), a Jenny Craig® group (JC; n=27), or a Nutrisystem® group (NS; n=28).
- The CC group followed a high protein diet of 45:30 (% pro:cho), consuming 1,200 kcal/day for 1-wk and 1,500 kcal/d for 11 wks. Additionally the CC participants completed a 30-min resistance based circuit interspersed with calisthenic

- exercises or Zumba 4-d per week. This group had access to online individualized weekly meal plans, daily motivational and educational videos, and weekly personal coaching sessions.
- WW participants followed the Weight Watchers® Points Plus program, following food plans based on a points system and attending weekly meetings for weigh-ins and presentations regarding exercise recommendations, tracking methods, and weight reduction strategies. Exercise was encouraged but not mandatory.
- Subjects in JC and NS received meals delivered to their home for 12 weeks and participated in a weekly phone consultation to discuss weight changes, exercise encouragement, and online tracking methods. Exercise was encouraged but not mandatory.
- The C group was encouraged to maintain normal activity and nutrition patterns.

## Methods & Procedures

- Body composition was determined at 0, 4, 8, & 12 wks utilizing the Hologic Discovery W QDR series Dual Energy X-ray Absorptiometry (DEXA) system (Watham, MA).
- Resting Energy Expenditure (REE) was assessed at 0, 4, 8, & 12 wks using the Parvo Medics TrueMax 2400 Metabolic Measurement System (Sandy, UT).

## Statistical Analysis

Data were analyzed by MANOVA with repeated measures using IBM SPSS for Windows version 20.0 software (Chicago, IL) and are presented as means ± SD % change from baseline for each group after 4, 8, & 12 weeks.

## Results

- All diet groups lost similar amounts of body mass (p=0.001)
  - CC: 2.9±1.9, -4.7±2.3, -6.1±3.2
  - WW: -2.5±1.8, -3.7±2.6, -4.3±3
  - JC: -2.9±1.4, -4.2±2.6, -5.3±3.8
  - NS: -3.1±2.7, -4.4±3.3, -5.1±4.5
- CC experienced significant differences in the following:
  - Greater loss in fat mass (kg) (p=0.001)
    - C: -0.03±2.2, 0.2±2.3, -0.03±2.0
    - CC: -2.0±2.0, -3.6±2.3, -5.2±2.8
    - WW: 0.8±1.5, -1.8±1.9, -2.2±2.6
    - JC: -1.8±1.5, -3.2±2.4, -3.5±3.3
    - NS: -1.6±2.0, -2.0±2.2, -2.3±2.5
  - Less loss in FFM (kg) (p=0.002)
    - C: -0.1±1.4, -0.1±1.7, 0.1±2.3
    - CC: -0.7±1.8, -1.1±2.2, -0.7±2.5
    - WW: -1.5±1.8, -1.6±1.6, -1.8±2.3
    - JC: -1.3±2.0, -1.0±2.3, -1.8±2.1
    - NS: -1.4±2.0, -2.1±1.8, -2.4±2.2

Greater reduction in %BF (p=0.001)

- C: 0.1±1.7, 0.3±1.7, -0.1±1.7
- CC: -1.0±2.0, -2.0±2.4, -3.3±2.3
- WW: 0.1±1.7, -0.4±1.8, -0.6±2.5
- JC: -0.6±1.9, -1.7±2.4, -1.4±2.4
- NS: -0.3±1.9, -0.2±1.8, -0.2±1.7
- There was a tendency for REE to differ among groups (kcal/d) (p=0.07)
  - C: -20±149, 17±180, 39±190
  - CC: -47±144, -23±176, 0±154
  - WW: -113±160, -130±167, -108±159
  - JC: -71±144, -64±196, -27±206
  - NS: -68±154, -58±151, -43±206

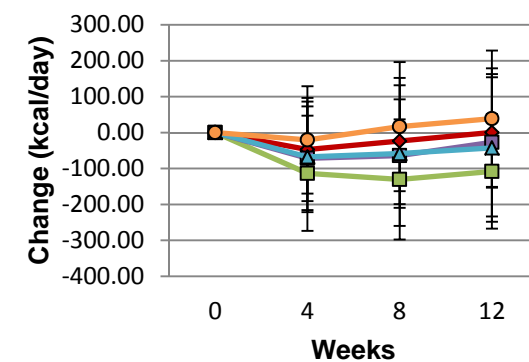
## Conclusions and Application

Results indicate that the CC program with online support provides more favorable changes in body composition than the other weight loss programs. Sedentary individuals who participate in a structured diet and exercise program can improve their body mass, body composition, and resting energy expenditure.

## Acknowledgements & Funding

Supported by Curves International Inc., Waco, TX  
<http://esnl.tamu.edu>

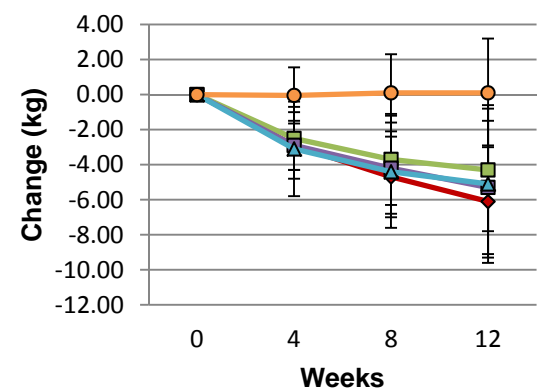
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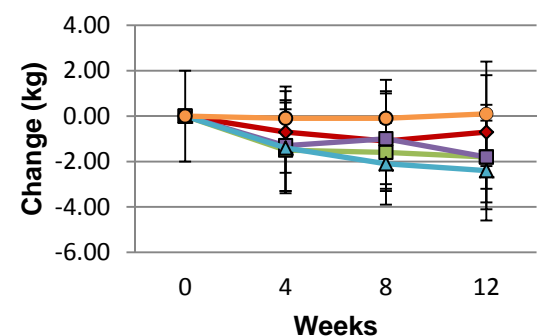
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CC WW JC NS Control

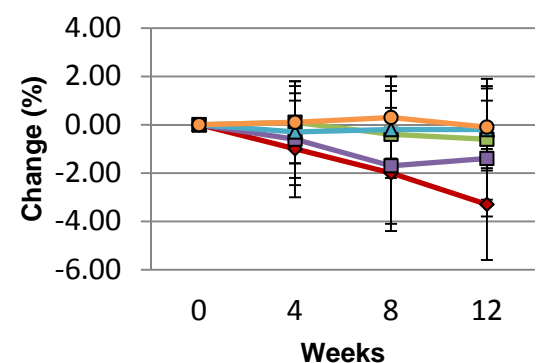
## Body Mass



## Fat Free Mass



## Body Fat





# WOMEN WHO PARTICIPATE IN A STRUCTURED WEIGHT LOSS PROGRAM WITH RESISTANCE-EXERCISE EXPERIENCE MORE FAVORABLE CHANGES IN BLOOD LIPIDS WHEN COMPARED TO OTHER POPULAR WEIGHT LOSS PROGRAMS

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## Abstract

123 sedentary women were randomized into a control group (C), Curves Complete® (CC), Weight Watchers® (WW), Jenny Craig® (JC), or Nutrisystem® (NS) weight loss program for 12-wks. Fasting blood samples were obtained at 0, 4, 8, & 12 wks. Data are percent changes from baseline. Significant group x time interactions were observed in TG (C -2.2±29, -7.7±26, 0.1±24; CC -27.1±21, -24.2±24, -23.2±20; WW -8.5±32, 1.6±36, -2.7±31; JC 3.3±40, 8.0±34, 15.1±43; NS 6.9±39, 11.2±33, 11.1±29 %,  $p=0.002$ ) and HDL-c (C 0.6±11, -3.5±10; CC -0.8±11, 0.3±11, 5.0±15; WW -5.1±12, -4.0±13, 0.2±14; JC -10.9±12, -6.4±14, -5.0±16; NS -6.2±14, -6.5±12, -4.0±13 %,  $p=0.01$ ). Total CHL tended to differ among groups (C 0.6±12, -0.3±12; -2.2±11; CC -11.8±11, -9.1±9, -7.5±11; WW -5.8±12, -2.8±12, 0.6±12; JC -7.2±13, -3.3±13, -2.3±11; NS -4.9±13, -4.5±12, -3.8±16 %,  $p=0.07$ ). No differences were observed among groups in LDL-c (C -1.9±18, 1.7±23; -4.0±17; CC -11.1±15, -9.2±13, -7.8±19; WW -1.4±20, 1.6±23, 10.4±51; JC -6.5±17, -1.7±17, -2.7±12; NS -4.6±18, -5.5±14, -6.1±21 %,  $p=0.21$ ) or blood glucose (C 1.7±8, 2.6±6; -1.3±8; CC -2.2±10, -1.9±8, -2.4±12; WW -1.5±12, -1.1±9, -1.7±8; JC -3.3±9, -2.4±11, -1.6±10; NS -0.8±16, -3.2±14, -2.9±16 %,  $p=0.91$ ). Results reveal a high protein/low fat weight loss program with resistance-training promotes more favorable changes in blood lipids compared to some other popular weight loss programs.

Supported by Curves International (Waco, TX)

## Rationale

Currently, 78.4 million American adults are obese (BMI of 30.0 kg/m<sup>2</sup> and higher), partly due to physical inactivity and poor nutritional choices. If the current trend in the rate of obesity continues, healthcare care costs attributable to obesity could reach approximately \$960 billion by 2030. Dyslipidemia and impaired glucose tolerance are commonly associated with obesity; together these physiological conditions further increase the risk of diseases such as cardiovascular disease, type 2 diabetes, and certain types of cancer. Curves®, Jenny Craig®, Nutrisystem®, and Weight Watchers® are four widely recognized commercial companies that provide weight management services based on scientifically validated principles. The purpose of this experiment is to compare the efficacy of these programs on blood lipid markers after a 12-week intervention.

## Statistical Analysis

Data were analyzed by MANOVA with repeated measures using IBM SPSS for Windows version 20.0 software (Chicago, IL) and are presented as means ± SD % change from baseline for each group after 4, 8, & 12 weeks.

## Experimental Design

- Subjects were informed as to the experimental procedures and signed informed consent statements in adherence with human subject guidelines.
- 123 sedentary women (46.0±12 yr, 45.8±5% body fat, 35.0±6 kg/m<sup>2</sup>) participated in this study.
- Subjects were randomly assigned to a control group (C; n=20), a Curves Complete® with online support group (CC; n=20), a Weight Watchers® group (WW; n=29), a Jenny Craig® group (JC; n=26), or a Nutrisystem® group (NS; n=28).
- The CC group followed a high protein diet of 45:30 (% pro:cho), consuming 1,200 kcal/day for 1-wk and 1,500 kcal/d for 11 wks. Additionally the CC participants completed a 30-min resistance based circuit interspersed with calisthenic exercises or Zumba 4 days per week. This group had access to online individualized weekly meal plans, daily motivational and educational videos, and weekly personal coaching sessions.
- WW participants followed the Weight Watchers® Points Plus program, following food plans based on a points system and attending weekly meetings for weigh-ins and presentations regarding exercise recommendations, tracking methods, and weight reduction strategies. Exercise was encouraged but not mandatory.
- Subjects in JC and NS received meals delivered to their home for 12 weeks and participated in a weekly phone consultation to discuss weight changes, exercise encouragement, and online tracking methods. Exercise was encouraged but not mandatory.
- The C group was encouraged to maintain normal activity and nutrition patterns.

## Methods & Procedures

- Fasting blood samples were obtained at 0, 4, 8, & 12 wks and sent to Quest Diagnostics (Houston, TX) for analysis of serum triglycerides (TG), high density lipoprotein (HDL-c), low density lipoprotein (LDL-c), total cholesterol (Total CHL), and glucose.
- 4-day food records and activity logs were obtained at 0, 4, 8 & 12 weeks and analyzed.

## Results

- Significant group x time interactions were observed in triglycerides ( $p=0.002$ ) and high density lipoprotein ( $p=0.01$ ).
- Total cholesterol tended to differ among groups ( $p=0.07$ ), but was not significantly different.
- No differences were observed among groups in low density lipoprotein ( $p=0.21$ ) or blood glucose ( $p=0.91$ ).

- Results reveal a high protein/low fat weight loss program with resistance-training promotes more favorable changes in blood lipids compared to some other popular weight loss programs.

## Conclusion & Application

Results indicate that the Curves Complete® with online support group (CC) provides more favorable changes in blood lipid when compared to other popular weight loss programs. Sedentary individuals who participate in a structured diet and exercise program can improve their blood lipid profile and thus possibly reduce their risk for diseases such as cardiovascular disease and type 2 diabetes.

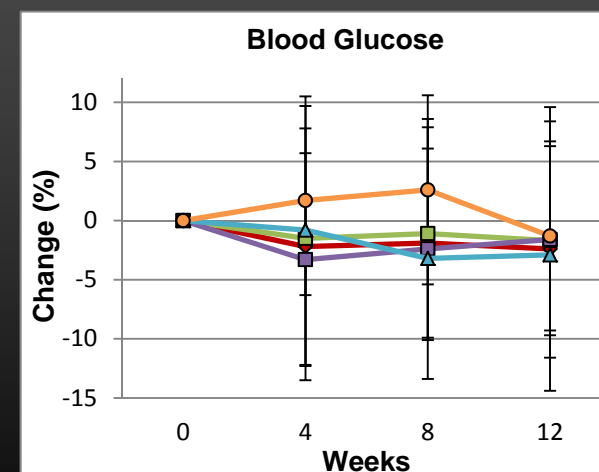
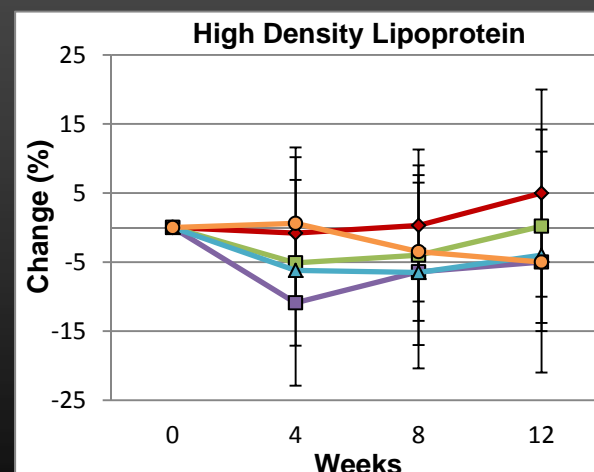
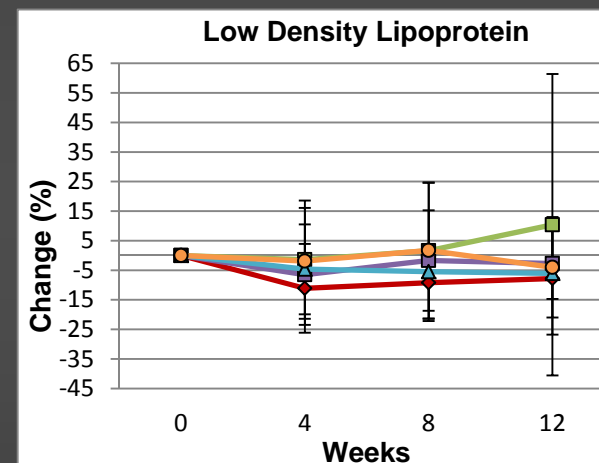
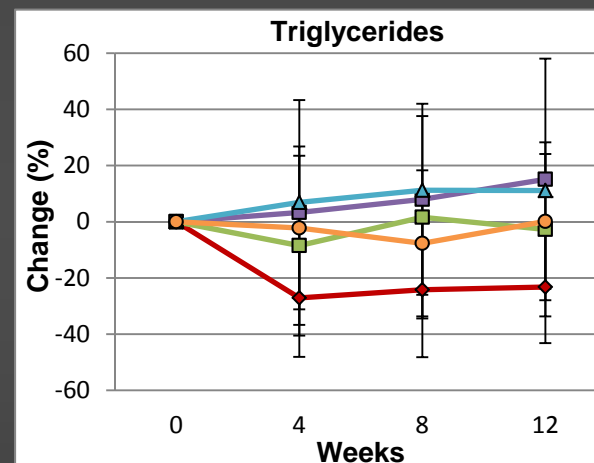
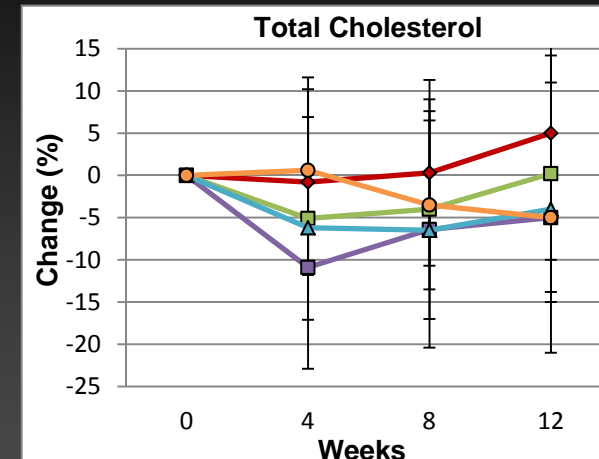
## Acknowledgement and Funding

Supported by Curves International Inc., Waco, TX

<http://esnl.tamu.edu>

## Legend

CC WW JC NS Control







# EFFECTS OF PARTICIPATION IN POPULAR WEIGHT LOSS AND FITNESS PROGRAMS ON MARKERS OF HEALTH AND FITNESS IN WOMEN



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## Abstract

125 sedentary women ( $46 \pm 12$  yr,  $45.5 \pm 5\%$  body fat,  $35.0 \pm 5$  kg/m<sup>2</sup>) were randomized to participate in a control group (C) or Curves Complete® (CC), Weight Watchers® (WW), Jenny Craig® (JC), or Nutrisystem® (NS) weight loss programs for 12- wks. Participants in the diet groups were encouraged to exercise (WW, JC, NS) while those in the CC group participated in a structured exercise program. Data were analyzed by MANOVA or ANOVA and are presented as changes from baseline after 12-wks. Participants in the diet groups had greater changes in waist (C  $2.1 \pm 6.9$ ; CC  $-4.7 \pm 3.2$ ; WW  $-4.1 \pm 5.7$ ; JC  $-3.7 \pm 3.6$ ; NS  $-3.3 \pm 6.4$  %,  $p=0.001$ ) and hip circumference (C  $0.7 \pm 2.5$ ; CC  $-4.0 \pm 2.6$ ; WW  $-2.5 \pm 2.4$ ; JC  $-4.2 \pm 3.5$ ; NS  $-3.6 \pm 3.5$  %,  $p=0.001$ ). Resting HR ( $-2.5 \pm 9$  %,  $p=0.005$ ) and SBP ( $-4.0 \pm 12$  %,  $p=0.005$ ) decreased overtime with no change in DBP. SBP decreased more in some diet and exercise groups compared to group C ( $p<0.05$ ). Changes in Peak Aerobic capacity (PAC) (C  $-2.2 \pm 10$ ; CC  $14.4 \pm 10$ ; WW  $7.9 \pm 19$ ; JC  $8.1 \pm 11$ ; NS  $3.8 \pm 7$  %,  $p=0.001$ ) and 1 RM bench press (C  $-1.2 \pm 14$ ; CC  $6.0 \pm 12$ ; WW  $4.9 \pm 15$ ; JC  $5.4 \pm 14$ ; NS  $-3.7 \pm 15$  %,  $p=0.06$ ). Results indicate diet and exercise programs promote improvements in fitness and the CC program promotes greater changes in aerobic capacity.

Supported by Curves International (Waco, TX)

## Rationale

Research scientists in the Exercise & Sport Nutrition Laboratory at Texas A&M University conducted a study on the efficiency and safety of the Curves fitness and weight loss program on markers of health and fitness in women. The curves fitness program involves performing a 30-minute Curves circuit style resistance training program interspersed with calisthenic exercise or Zumba dance exercises. Participants in the diet groups Weight Watchers® (WW), Jenny Craig® (JC), or Nutrisystem® (NS) were encouraged to exercise while subjects in the control group were encouraged to maintain their normal diets and activities for 12 wks. Results indicate diet and exercise programs promote improvements in fitness and the CC program promotes greater changes in aerobic capacity.

## Experimental Design

### Subjects

- 125 sedentary women ( $46 \pm 12$  yrs;  $45.5 \pm 5\%$  body fat;  $35 \pm 5$  kg/m<sup>2</sup>) participated in this study.
- Subjects were informed as to the experimental procedures and signed informed consent statements in adherence with the human subject guidelines of Texas A&M University.

## Diet Protocol

- 20 subjects in a control group (C) (normal diet and activities)
- 21 subjects in a Curves Complete® (CC) group
- 24 subjects in a Weight Watchers® (WW) group
- 27 subjects in a Jenny Craig® (JC) group and
- 28 subjects in a Nutrisystem® (NS) weight loss programs for 12 wks.
- Subjects were required to maintain their diet groups for the duration of the study.

## Training Protocol

- Subjects in the Curves group participated in a supervised 30-min resistance training (Curves with Zumba) fitness program 4 days/week for the entire duration of the study.
- Participants in the diet groups (WW, JC, NS) were encouraged to exercise while subjects in the control group maintained their normal diet and activities for the duration of the study program.

## Methods & Procedures

- Waist and Hip circumferences, Resting HR, DBP and SBP, PAC and 1RM bench press measurements were obtained from 0, 4, 8 and 12 weeks
- Subjects reported any side effects associated with participating in the study to a research assistant on a weekly basis.

## Statistical Analysis

- Data were obtained at 0, 4, 8, & 12 wks and analyzed by MANOVA or ANOVA using SPSS for Windows version 21 software (Chicago, IL) and are presented as means  $\pm$  SD changes from baseline after 12 weeks of the study.

## Results

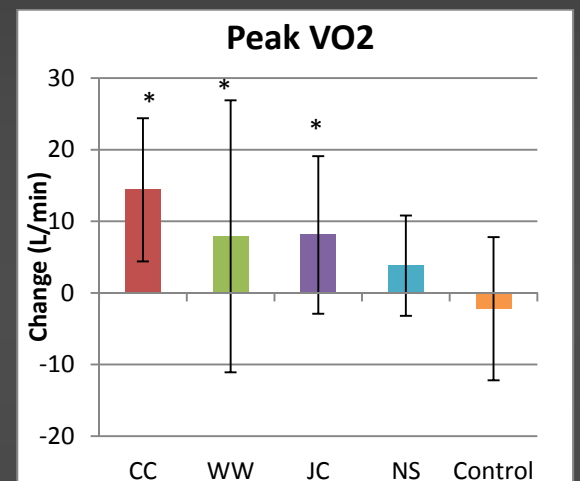
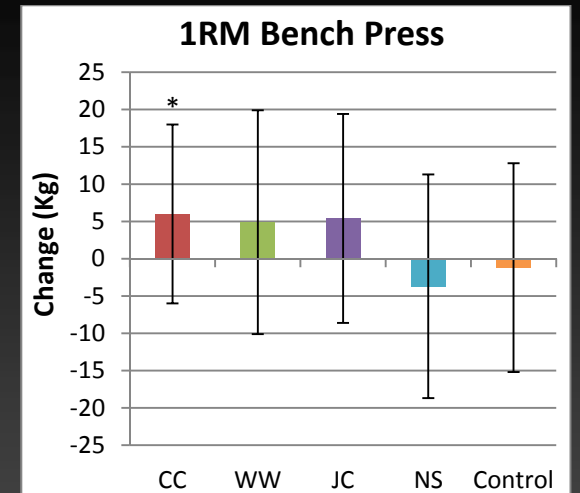
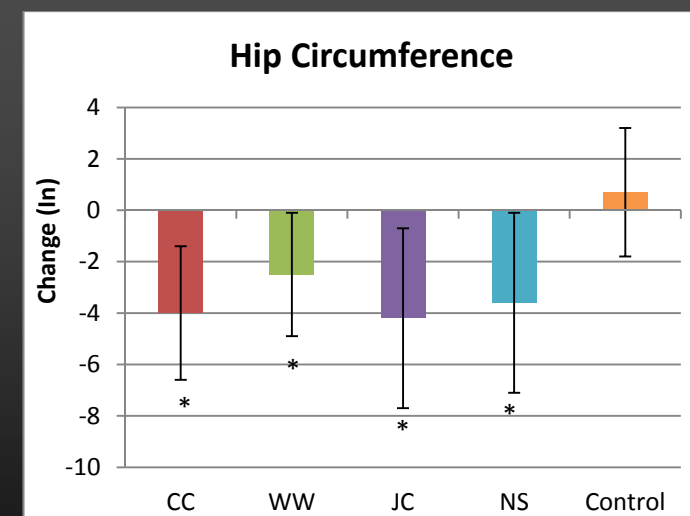
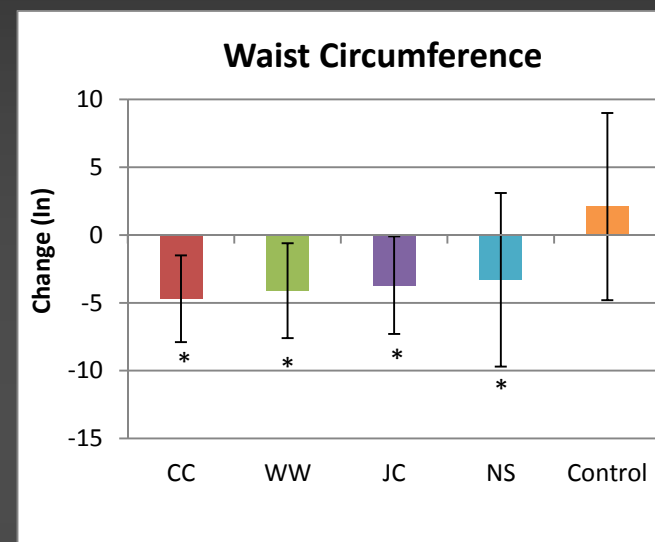
- The weight loss program promoted greater changes in waist (C  $2.1 \pm 6.9$ ; CC  $-4.7 \pm 3.2$ ; WW  $-4.1 \pm 5.7$ ; JC  $-3.7 \pm 3.6$ ; NS  $-3.3 \pm 6.4$  %,  $p=0.001$ ) and hip circumference (C  $0.7 \pm 2.5$ ; CC  $-4.0 \pm 2.6$ ; WW  $-2.5 \pm 2.4$ ; JC  $-4.2 \pm 3.5$ ; NS  $-3.6 \pm 3.5$  %,  $p=0.001$ ).
- Resting HR ( $-2.5 \pm 9$  %,  $p=0.005$ ) and SBP ( $-4.0 \pm 12$  %,  $p=0.005$ ) decreased overtime with no change in DBP. SBP decreased more in some diet and exercise groups compared to group C ( $p<0.05$ ).
- There was some evidence that experiencing the effects of weight loss prior to initiation of a weight loss program tended to influence changes in PAC (C  $-2.2 \pm 10$ ; CC  $14.4 \pm 10$ ; WW  $7.9 \pm 19$ ; JC  $8.1 \pm 11$ ; NS  $3.8 \pm 7$  %,  $p=0.001$ ) and 1 RM bench press (C  $-1.2 \pm 14$ ; CC  $6.0 \pm 12$ ; WW  $4.9 \pm 15$ ; JC  $5.4 \pm 14$ ; NS  $-3.7 \pm 15$  %,  $p=0.06$ ).

## Conclusions

Additional research is needed to examine the influence of experiencing the influence of weight loss on work capacity prior to the initiation of a weight loss program on weight loss and different diet programs

## Funding

Supported by Curves International Inc., Waco, TX  
<http://esnl.tamu.edu>





# EFFECTS OF PARTICIPATION IN POPULAR WEIGHT LOSS AND FITNESS PROGRAMS ON INSULIN AND LEPTIN IN WOMEN

R Dalton, B Lockard, C Baetge, K Levers, E Galvan, A Jagim, S Simbo, M Byrd, Y Jung, JM Oliver, M Koozehchian, D Khanna, B Sanchez, JY Kresta, K Horrell, T Leopold, M Cho, S Springer, A Rivera, C Cerda, C Rasmussen, R Kreider. Exercise & Sport Nutrition Lab, Texas A&M University, College Station, TX 77843

## Abstract

100 sedentary women ( $46 \pm 11$  yr,  $45.8 \pm 5\%$  body fat,  $35.2 \pm 5$  kg/m<sup>2</sup>) were randomized to participate in a no diet or exercise control group (C) or the Curves Complete<sup>®</sup> 90-day Challenge (CC), Weight Watchers<sup>®</sup> Points Plus (WW), Jenny Craig<sup>®</sup> (JC), or Nutrisystem<sup>®</sup> Advance Select<sup>™</sup> (NS) weight loss programs for 12-wks. Participants in the diet groups were encouraged to exercise (WW, JC, NS) while those in the CC group participated in a structured circuit-style resistance training (3 d/wk) and walking (3/d wk) program. Fasting blood samples were obtained at 0, 4, 8, & 12 wks. Changes from baseline after 12-wks intervention for fasting insulin, the glucose to insulin ratio, homeostatic model assessment (HOMA), and leptin were analyzed by one-way ANOVA. Participants in the CC group tended to experience greater changes in fasting insulin (C  $0.8 \pm 6.9$ ; CC  $-7.5 \pm 14$ ; WW  $-2.9 \pm 8.1$ ; JC  $-3.8 \pm 6.3$ ; NS  $-1.2 \pm 8.3$  uIU/ml,  $p=0.10$ ), the glucose to insulin ratio (C  $-1.3 \pm 4.1$ ; CC  $7.0 \pm 14$ ; WW  $3.3 \pm 5.4$ ; JC  $4.8 \pm 7.4$ ; NS  $-6.0 \pm 21$ ,  $p=0.01$ ), HOMA (C  $0.1 \pm 1.6$ ; CC  $-2.3 \pm 4.4$ ; WW  $-0.8 \pm 1.7$ ; JC  $-1.0 \pm 1.9$ ; NS  $-0.4 \pm 2.2$ ,  $p=0.07$ ) and leptin (C  $4.3 \pm 16$ ; CC  $-17.9 \pm 21$ ; WW  $-13.0 \pm 16$ ; JC  $-12.2 \pm 25$ ; NS  $-3.5 \pm 26$  ng/ml,  $p=0.03$ ) compared to some other diet and exercise interventions. Results indicate that participation in different diet and exercise programs may have variable effects on markers of insulin resistance and leptin. Supported by Curves International (Waco, TX).

## Rationale

Obesity and physical inactivity are two of the leading causes of preventable death in the United States. Many options are available to help reduce these conditions and improve the health of individuals. Curves International, Inc., Weight Watchers International, Inc., Jenny Craig, Inc., and Nutrisystem are four widely available commercial enterprises that provide weight management programs, based on scientific principles, to consumers. PURPOSE: To determine the effects of following either the no diet or exercise control group (C) or the Curves Complete<sup>®</sup> 90-day Challenge (CC), Weight Watchers<sup>®</sup> Points Plus (WW), Jenny Craig<sup>®</sup> (JC), or Nutrisystem<sup>®</sup> Advance Select<sup>™</sup> (NS) weight loss programs for 12-weeks on insulin and leptin measurements.

## Experimental Design

- Subjects were informed of the experimental procedures and signed informed consent statements in adherence with the human subject guidelines.
- 100 sedentary women ( $46 \pm 11$  yrs;  $45.8 \pm 5\%$  body fat;  $35.2 \pm 5$  kg/m<sup>2</sup>) participated in this study.
- Subjects were randomly assigned to the no diet or exercise control group (C,  $n=18$ ) or the Curves Complete<sup>®</sup> 90-day Challenge (CC,  $n=14$ ), Weight Watchers<sup>®</sup> Points Plus (WW,  $n=22$ ), Jenny Craig<sup>®</sup> (JC,  $n=23$ ), or Nutrisystem<sup>®</sup> Advance Select<sup>™</sup> (NS,  $n=23$ ) weight loss programs.
- The CC diet involved consuming a high protein diet of a 45:30 protein to carbohydrate ratio which consisted of 1,200 kcal/d for 1-wk and 1,500 kcal/d for 11 wks. Subjects in the CC group participated in a supervised 30-min resistance circuit training program that was interspersed with callisthenic exercises and Zumba performed 4-d per week.
- Subjects in the WW group followed the Weight Watchers Points Plus Program, which consisted of food plans based on a points system and weekly meetings where exercise recommendations, tracking methods, and weight reductions strategies were presented and weekly weights were attained. Exercise was encouraged but not mandatory.
- Subjects in the JC or NS programs received meals for 12 weeks and were able to speak with a consultant each week regarding their weight changes and exercise protocol, as well as use online tracking methods. Exercise was encouraged but not mandatory.

## Methods & Procedures

Fasting blood samples were obtained at 0, 4, 8, & 12 weeks where serum was collected from the samples and kept at  $-80^{\circ}\text{F}$ . Analysis of insulin and leptin content was conducted via ELISA (ALPCO Diagnostics, Salem, NH).

## Statistical Analysis

Data were analyzed by one-way ANOVA using SPSS for Windows version 20 software (Chicago, IL) and are presented as means  $\pm$  SD percent changes from baseline.

## Results

Participants in the CC group tended to experience greater changes in:

- Fasting insulin (C  $0.8 \pm 6.9$ ; CC  $-7.5 \pm 14$ ; WW  $-2.9 \pm 8.1$ ; JC  $-3.8 \pm 6.3$ ; NS  $-1.2 \pm 8.3$  uIU/ml,  $p=0.10$ ).
- The glucose to insulin ratio (C  $-1.3 \pm 4.1$ ; CC  $7.0 \pm 14$ ; WW  $3.3 \pm 5.4$ ; JC  $4.8 \pm 7.4$ ; NS  $-6.0 \pm 21$ ,  $p=0.01$ ).
- HOMA (C  $0.1 \pm 1.6$ ; CC  $-2.3 \pm 4.4$ ; WW  $-0.8 \pm 1.7$ ; JC  $-1.0 \pm 1.9$ ; NS  $-0.4 \pm 2.2$ ,  $p=0.07$ ).
- Leptin (C  $4.3 \pm 16$ ; CC  $-17.9 \pm 21$ ; WW  $-13.0 \pm 16$ ; JC  $-12.2 \pm 25$ ; NS  $-3.5 \pm 26$  ng/ml,  $p=0.03$ ).
- Significant differences were found between:
  - Groups 2, 3, and 4 versus group 5 for the glucose to insulin ratio.
  - Groups 2, 3, and 4 versus group 6 for leptin levels.
  - Groups with differing symbols indicate significant differences

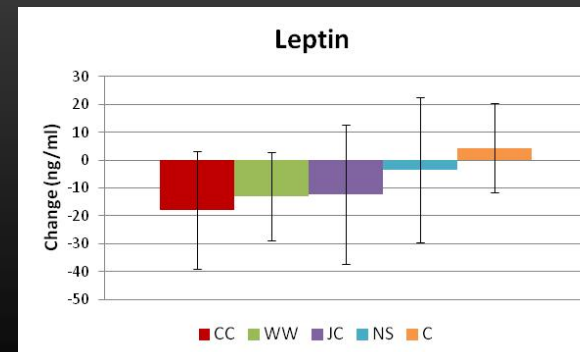
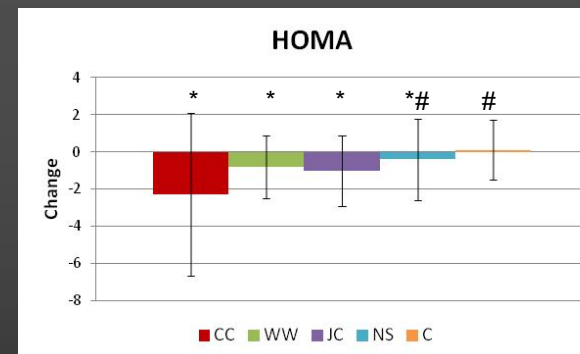
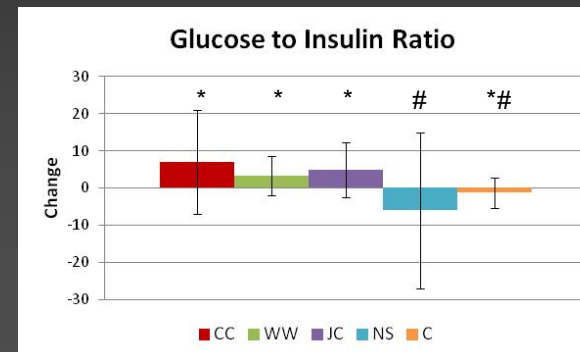
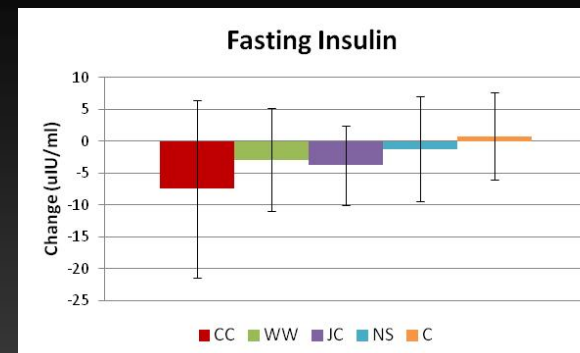
## Conclusions

Results indicate that participation in different diet and exercise programs may have variable effects on markers of insulin resistance and leptin.

## Acknowledgements and Funding

We would like to thank Dr. J.P. Bramhall for his medical expertise throughout this study. Supported by Curves International Inc., Waco, TX.

<http://esnl.tamu.edu>







# ADDING ACCESS TO ONLINE MEAL PLANS AND MONITORING TO A STRUCTURED WEIGHT LOSS PROGRAM WITH RESISTANCE-EXERCISE PROMOTES MORE POSITIVE CHANGES IN TRIGLYCERIDES

K Levers, B Lockard, C Baetge, E Galvan, A Jagim, S Simbo, M Byrd, YP Jung, JM Oliver, M Koozehchian, R Dalton, D Khanna, B Sanchez, JY Kresta, K Horrell, T Leopold, M Cho, S Springer, A Rivera, C Rasmussen, R Kreider, Exercise & Sport Nutrition Lab, Texas A&M University, College Station, TX 77843

## Abstract

48 sedentary women (44.8±10 yr, 44.8±4% body fat, 33.9±6 kg/m<sup>2</sup>) were randomized to participate in the Curves Complete® weight loss and exercise program for 12-wks with (CC-OS) and without (CC-NS) online support that provided access to meal plans and progress monitoring. Fasting blood samples were obtained at 0, 4, 8, & 12 wks and analyzed by MANOVA. Data are presented as changes from baseline after 4, 8, and 12 wks for the CC-OS and CC-NS groups, respectively. Overall MANOVA analysis revealed a significant time (p=0.001) difference with no significant group x time effects (p=0.57). Univariate analysis revealed significant time effects for TG, CHL, HDL, and LDL and that participants in the CC-OS group experienced greater changes in TG (CC-OS -27.1±21, -24.2±24, -23.2±20; CC-NS 0.9±29, -6.1±22, -6.7±26 %, p=0.001) with no differences observed among groups in total CHL (CC-OS -11.8±11, -9.1±9, -7.5±11; CC-NS -6.0±10, -4.0±11, -3.6±10 %, p=0.17), HDLc (CC-OS -0.8±11, 0.3±11, 5.0±15; CCNS -3.4±9, -0.1±13, 2.5±15 %, p=0.78), LDLc (CC-OS -11.1±15, -9.2±13, -7.8±19; CC-NS -7.4±15, -6.6±16, -4.7±11 %, p=0.83) or blood glucose (CC-OS -2.2±10, -1.9±8, -2.4±12; CC-NS 1.2±14, 1.6±12, -0.6±15 %, p=0.75). Results indicate that adding online access to meal plans and monitoring can promote more favorable changes in TG during a structured weight loss program with resistance-based exercise.

Supported by Curves International, Waco TX.

## Rationale

Physical inactivity and poor nutritional health have led to a worldwide epidemic of obesity. The pattern of American obesity continues to rise as 78.4 million adults are now classified as obese (BMI ≥ 30 kg/m<sup>2</sup>), which is nearly double the number of obese adults in 2003 (40 million). Dyslipidemia and high blood glucose levels in conjunction with physical inactivity have proven to be major contributors in the development of type 2 diabetes, heart disease, and some cancers. This alarming rise of obesity and prevalence of metabolic syndrome calls for identification of weight loss programs that utilize proven weight loss strategies to promote changes in body composition and improve markers of fitness and health. Curves International, Inc. is one of the most widely recognized commercial companies that provide weight management and dietary services that are based on scientifically validated principles. **PURPOSE:** To determine the effects of the Curves Complete® weight loss and exercise program with (CC-OS) and without (CC-NS) online support that provided access to meal plans and progress monitoring for 12-wks on markers of cardiovascular health in previously sedentary, overweight women.

## Experimental Design

### Subjects

- 48 sedentary women (44.8±10 yr, 44.8±4% body fat, 33.9±6 kg/m<sup>2</sup>) were randomized to participate in the Curves Complete® weight loss and exercise program for 12-wks with (CC-OS) and without (CC-NS) online support that provided access to meal plans and progress monitoring.
- Subjects were informed as to the experimental procedures and signed a consent statement in adherence with the human subject guidelines of Texas A&M University.

### Training Protocol

- Subjects participated in a supervised 30-min hydraulic resistance circuit training program interspersed with either callisthenic exercises or Zumba 3-d/wk that either included online support with access to dietary and progress monitoring or not for the 12-wk duration of the study.

### Dieting Protocol

- During the first week, subjects consumed 1,200 kcals/d followed by ingesting 1,500 kcals/d for 11-wks.
- Diets were focused on a high protein intake consisting of a 45:30 protein to carbohydrate ratio.

## Methods & Procedures

- Subjects were recruited to participate in this study through flyers, newspaper ads, and radio advertisements.
- Body mass, DEXA body composition, anthropometric measurements, resting blood pressures, and fasting blood samples were obtained at 0, 4, 8 and 12 weeks.
- All measurements through the study were obtained by lab personnel.
- Lipid blood panel and blood glucose data were obtained using standardized serum measurement techniques to analyze each fasting blood sample.

## Statistical Analysis

- Data were analyzed by MANOVA with repeated measures using IBM SPSS for Windows version 21.0 software (Chicago, IL) and are presented as percent changes from baseline after 4, 8, and 12-wks.

## Results

- Significant mean changes were observed in blood lipid profile markers (TG, CHL, HDL, and LDL) at 4, 8, and 12-wks compared to baseline values irrespective of group.
- Significant differences were observed among groups with respect to changes in TG (CC-OS -27.1±21, -24.2±24, -23.2±20; CC-NS 0.9±29, -6.1±22, -6.7±26 %, p=0.001).
- No significant differences were observed among groups in total CHL (CC-OS -11.8±11, -9.1±9, -7.5±11; CC-NS -6.0±10, -4.0±11, -3.6±10 %, p=0.17), HDLc (CC-OS -0.8±11, 0.3±11, 5.0±15; CCNS -3.4±9, -0.1±13, 2.5±15 %, p=0.78), LDLc (CC-OS -11.1±15, -9.2±13, -7.8±19; CC-NS -7.4±15, -6.6±16, -4.7±11 %, p=0.83) or blood glucose (CC-OS -2.2±10, -1.9±8, -2.4±12; CC-NS 1.2±14, 1.6±12, -0.6±15 %, p=0.75).

## Conclusions

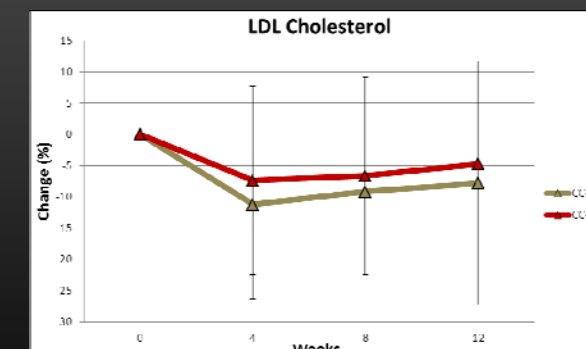
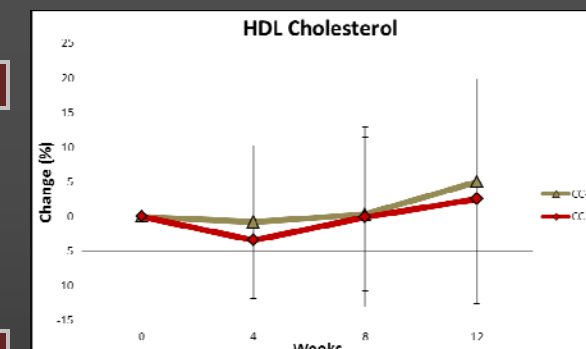
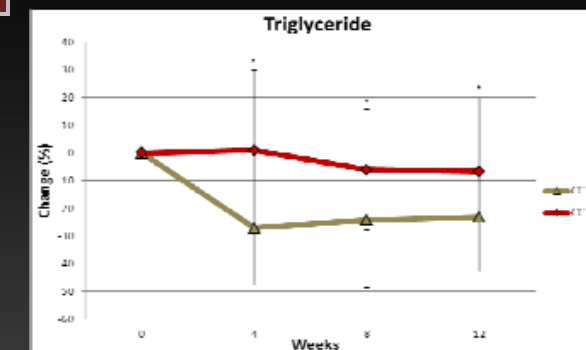
- 12-wks of participation in the aforementioned Curves Complete® diet and exercise programs found that subjects generally improved blood lipid and glucose biomarkers of cardiovascular health over the course of the program and adding online dietary and progress monitoring significantly improved triglyceride levels compared to those not offered online support.

## Practical Application

- Sedentary individuals who participate in a structured weight loss and resistance-based exercise program that includes online access to meal plans and monitoring can promote more favorable changes in blood triglyceride levels over those without online support.

## Acknowledgements and Funding

Supported by Curves International Inc., Waco, TX  
<http://esnl.tamu.edu>



\* Significant mean changes observed between groups.



# ADDING ACCESS TO ONLINE MEAL PLANS AND MONITORING IMPROVES SUCCESS TO A STRUCTURED WEIGHT LOSS PROGRAM WITH RESISTANCE EXERCISE IN WOMEN

C Baetge, B Lockard, K Levers, E Galvan, A Jagim, S Simbo, M Byrd, Y Jung, JM Oliver, M Koozehchian, R Dalton, D Khanna, B Sanchez, JY Kresta, K Horrell, T Leopold, M Cho, S Springer, A Rivera, C Cerda, C Rasmussen, R Kreider. Exercise & Sport Nutrition Lab, Texas A&M University, College Station, TX 77843

## Abstract

51 sedentary women (44.5±10 yr, 44.9±4% body fat, 34.0±6 kg/m<sup>2</sup>) were randomized to participate in the Curves Complete<sup>®</sup> weight loss and exercise program for 12-wks with (CC-OS) and without (CC-NS) online support that provided access to meal plans and progress monitoring. Body mass, DEXA body composition, and resting energy expenditure (REE) measurements were obtained at 0, 4, 8, & 12 wks and analyzed by MANOVA. Data are presented as changes from baseline after 4, 8, and 12 wks for the CC-OS and CC-NS groups, respectively. Overall MANOVA revealed that both groups experienced improvements in body composition with minimal effects on REE. An overall significant interaction was observed among groups (p=0.02). Participants in the CC-OS group tended to experience more favorable changes in body mass (CC-OS -2.6±1.3, -4.8±2.3, -6.2±3.3; CC-NS -2.2±1.9, -3.5±3.1, -4.3±4.3 kg, p=0.08) and fat mass (CC-OS -1.8±1.8, -3.5±2.3, -5.2±2.9; CC-NS -2.0±2.4, -3.4±2.8, -3.8±4.0 kg, p=0.11), while FFM was preserved to a greater degree in the CC-NS group (CC-OS -0.8±1.6, -1.2±2.1, -0.8±2.5; CC-NS 0.0±1.5, 0.2±1.6, -0.2±2.0 kg, p=0.05). No significant differences were seen among groups in percent body fat (CC-OS -0.9±1.8, -1.9±2.4, -3.3±2.3; CC-NS -1.5±2.3, -2.5±2.5, -2.7±3.4 %, p=0.21) or REE (CC-OS -47±144, -23±176, 0.4±154; CC-NS -83±174, -65±184, -102±170 kcal/d, p=0.16). Results indicate that adding online access to meal plans and monitoring can promote more favorable changes in body composition while maintaining REE.

Supported by Curves International (Waco, TX)

## Rationale

Energy-deficient diets and physical inactivity have led to a worldwide epidemic of obesity. The alarming rise in the prevalence of obesity underscores the need to identify weight loss programs that utilize proven weight loss strategies to affectively lead to changes in body composition and improve markers of fitness and health. Curves International, Inc. is a widely recognized commercial company that provides weight management services that are based on scientifically validated principles. Within the Curves program, there are two approaches to follow the diet: online support and no online support. **PURPOSE:** To determine if following either the Curves Complete<sup>®</sup> weight loss and exercise program for 12-wks (CC-OS) with provided access to meal plans and progress monitoring or without (CC-NS) online support provides a greater change in body composition and resting energy expenditure in previously sedentary overweight women.

## Experimental Design

- Subjects were informed of the experimental procedures and signed informed consent statements in adherence with human subject guidelines.
- 51 sedentary women (44.5±10 yr, 44.9±4% body fat, 34.0±6 kg/m<sup>2</sup>) were randomized to participate in the Curves Complete<sup>®</sup> weight loss and exercise program for 12-wks.
- Subjects in the CC-OS (n=22) were able to track their diet and exercise through an online database, were provided online meal plans, as well as weekly progress monitoring.
- Those in the CC-NS (n=29) had no online support but had hands on diet material.
- Both groups consumed a high protein diet of a 45:30:25 protein to carbohydrate to fat ratio, which consisted of 1,200 kcal/d for 1-wk and 1,500 kcal/d for 11 wks.
- All subjects participated in a supervised 30-min resistance circuit training program interspersed with calisthenic exercises and Zumba, performed 4-d per week.

## Methods & Procedures

- Body composition was determined at 0, 4, 8, & 12 wks utilizing the Hologic Discovery W QDR series Dual Energy X-ray Absorptiometry (DEXA) system (Watham, MA).
- Resting Energy Expenditure (REE) was assessed at 0, 4, 8, & 12 wks using the Parvo Medics TrueMax 2400 Metabolic Measurement System (Sandy, UT).

## Statistical Analysis

Data were analyzed by MANOVA with repeated measures using IBM SPSS for Windows version 20.0 software (Chicago, IL) and are presented as means ± SD % change from baseline for each group after 4, 8, & 12 weeks.

## Results

- Overall MANOVA revealed that both groups experienced improvements in body composition with minimal effects on REE.
- An overall significant interaction was observed among groups (p=0.02).
- Participants in the CC-OS group tended to experience more favorable changes in body mass (CC-OS -2.6±1.3, -4.7±2.3, -6.2±3.3; CC-NS -2.2±1.9, -3.5±3.1, -4.3±4.3 kg, p=0.08) and fat mass (CC-OS -1.8±1.8, -3.5±2.3, -5.2±2.9; CC-NS -2.0±2.4, -3.4±2.8, -3.8±4.0 kg, p=0.11)
- FFM was preserved to a greater degree in the CC-NS group (CC-OS -0.8±1.6, -1.2±2.1, -0.8±2.5; CC-NS 0.0±1.5, 0.2±1.6, -0.2±2.0 kg, p=0.05)

- No significant differences were seen among groups in percent body fat (CC-OS -0.9±1.8, -1.9±2.4, -3.3±2.3; CC-NS -1.5±2.3, -2.5±2.5, -2.7±3.4 %, p=0.21) or REE (CC-OS -47±144, -23±176, 0.4±154; CC-NS -83±174, -65±184, -101±170 kcal/d, p=0.16).

## Conclusions

Results indicate that adding online access to meal plans and monitoring can promote more favorable changes in body composition while maintaining REE.

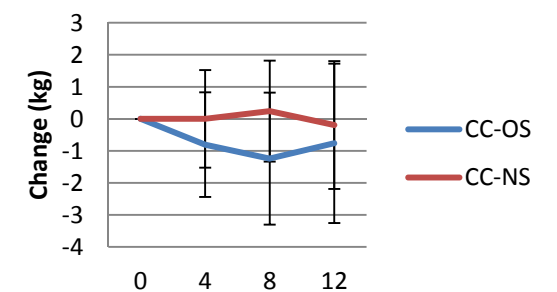
## Practical Application

Sedentary individuals who participate in a structured diet and exercise program can have greater improvements in their body mass and body composition, as well as maintain resting energy expenditure, when online support and monitoring are present.

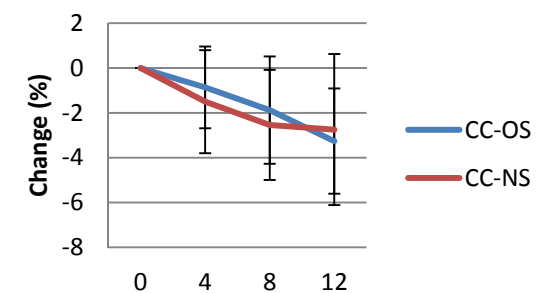
## Acknowledgements & Funding

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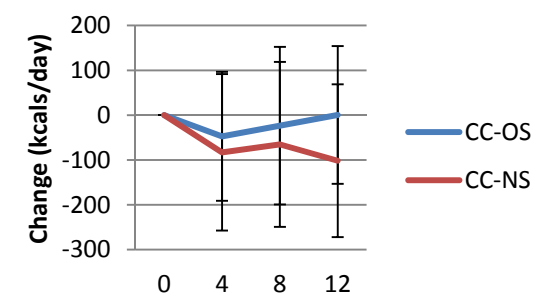
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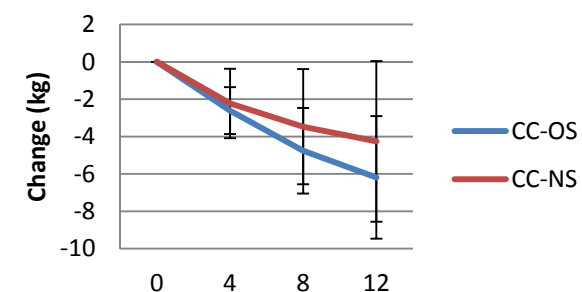
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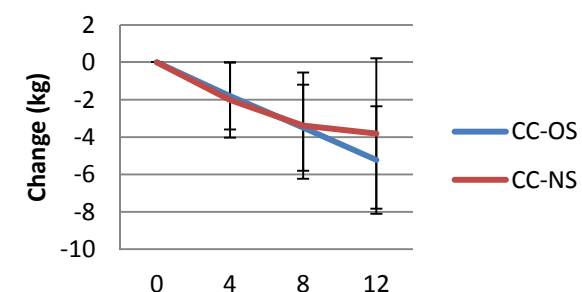
## REE



## Body Mass



## Fat Mass







# ADHERENCE TO A HIGH PROTEIN AND LOW FAT ENERGY-RESTRICTED DIET WHILE PARTICIPATING IN A CIRCUIT RESISTANCE-EXERCISE PROGRAM PROMOTES FAT LOSS WITH NO LOSS IN FAT FREE MASS IN POST-MENOPAUSAL WOMEN



YP Jung, B Lockard, C Baetge, K Levers, E Galvan, A Jagim, S Simbo, M Byrd, JM Oliver, M. Koozehchian, R Dalton, D Khanna, B. Sanchez, JY Kresta, K Horrell, T Leopold, M Cho, S Springer, A Rivera, C Cerda, C Rasmussen, R Kreider, Exercise & Sport Nutrition Lab, Texas A&M University, College Station, TX 77843

## Abstract

41 sedentary women (55.3±10 yr, 45.0±4% body fat, 33.7±5 kg/m<sup>2</sup>) were randomized to participate in a control group (C) or the Curves Complete® (CC) weight loss and circuit resistance-exercise program for 12-wks. Participants in the CC program followed an energy-restricted diet (30% C, 45% P, and 25% F) while participating in a circuit resistance-training (3 d/wk) and walking (30 min, 3/d wk) program. Body mass, DEXA body composition, and resting energy expenditure (REE) measurements were obtained at 0, 4, 8, & 12 wks and analyzed by MANOVA. Data are presented as changes from baseline after 4, 8, and 12 wks for the C and CC groups, respectively. Participants in the CC program lost significant amounts of body mass (C -0.05±1.6, -0.1±2.2, 0.1±3.1; CC -2.1±1.7, -3.1±2.6, -3.9±3.2, kg, p=0.001), fat mass (C -0.0±2.2, 0.2±2.3, -0.0±2.0; CC -2.2±1.4, -2.8±2.0, -4.1±2.4 kg, p=0.001) and body fat (C 0.1±1.7, 0.3±1.7, -0.1±1.7; CC -1.8±2.1, -2.2±2.3, -3.5±2.5 %, p=0.001) than controls with no time (p=0.54) or group x time effects on FFM (C -0.1±1.4, -0.1±1.7, 0.1±2.3; CC 0.2±1.8, 0.1±1.9, 0.5±1.6 kg, p=0.89). REE tended to differ among groups (C -20±149, 17±180, 39±190; CC -30±140, -65±169, -85±130, kcal/d, p=0.03). Results indicate that post-menopausal women who participate in an energy deficit higher protein and low fat diet with resistance-exercise can promote fat loss without loss of FFM.

*Supported by Curves International (Waco, TX)*

## Rationale

It is generally recognized that post-menopausal women require more dietary protein due to decrease in protein synthesis of muscle. Post-menopausal women experience increases in body fat mass and redistribution of fat mass, and these changes can increase the risk of diabetes and cardiovascular disease. A diet rich in high-quality protein is gaining scientific support as a successful strategy to promote weight loss and prevent weight gain or regain in adults. Moreover, high protein diets help better control appetites and calorie intake, and maintain fat free mass while burning fat for fuel. Circuit training is short bursts of resistance exercise using moderate weight and frequent repetitions, followed quickly by another burst of exercise targeting a different muscle group. It is proved by many scientific researches that is the most time efficient way to promote fat loss without muscle loss as well as to enhance cardiovascular fitness and muscle endurance.

## Experimental Design

- Subjects were informed as to the experimental procedures and signed informed consent statements in adherence with human subject guidelines.
- 41 sedentary women (55.3±10 yr, 45.0±4% body fat, 33.7±6 kg/m<sup>2</sup>) participated in this study.
- Subjects were assigned to a Control group (n=20), a Curves group (n=21).
- Subjects in the CC group followed an energy-restricted diet (30% C, 45% P, and 25% F).
- Subjects in the CC group participated in a supervised 30-min resistance circuit training program with that was interspersed with callisthenic exercises and Zumba performed 4-d per week.

## Methods & Procedures

- Body Weight was measured by utilizing standard procedures at 0, 4, 8, & 12 weeks.
- Body Composition (BF and FFM) was measured by Dual-Energy X-ray Absorptiometry at 0, 4, 8, & 12 weeks.
- Resting Energy Expenditure (REE) was measured by indirect calorimetry at 0, 4, 8, & 12 weeks.

## Statistical Analysis

Data were analyzed by ANOVA with repeated measures using IBM SPSS for Windows version 20.0 software (Chicago, IL) and are presented as means ± SD % change from baseline for each group.

## Results

- Participants in the CC program lost significant amounts of body mass (C -0.05±1.6, -0.1±2.2, 0.1±3.1; CC -2.1±1.7, -3.1±2.6, -3.9±3.2, kg, p=0.001).
- Participants in the CC program lost significant amounts of fat mass (C -0.0±2.2, 0.2±2.3, -0.0±2.0; CC -2.2±1.4, -2.8±2.0, -4.1±2.4 kg, p=0.001).
- Participants in the CC program lost significant amounts of body fat (C 0.1±1.7, 0.3±1.7, -0.1±1.7; CC -1.8±2.1, -2.2±2.3, -3.5±2.5 %, p=0.001) than controls with no time (p=0.54) or group x time effects on FFM (C -0.1±1.4, -0.1±1.7, 0.1±2.3; CC 0.2±1.8, 0.1±1.9, 0.5±1.6 kg, p=0.89).

- REE tended to differ among groups (C -20±149, 17±180, 39±190; CC -30±140, -65±169, -85±130, kcal/d, p=0.03).

## Conclusions

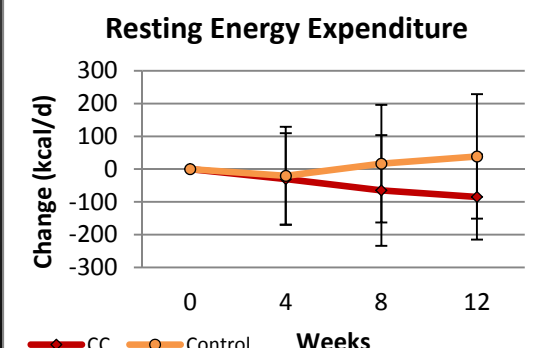
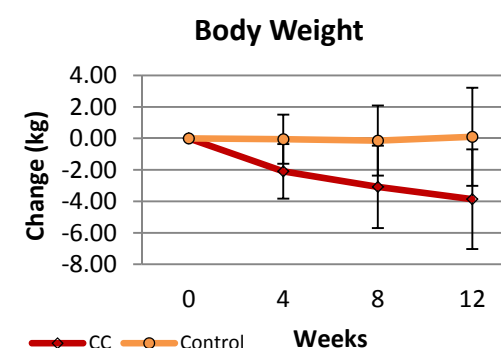
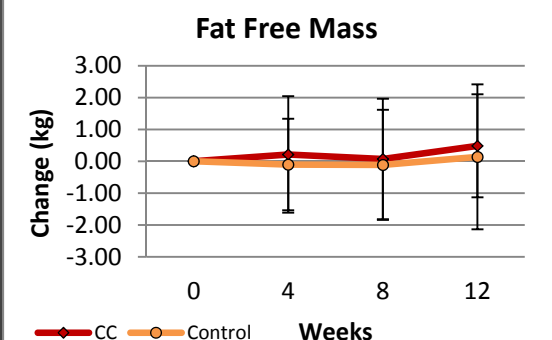
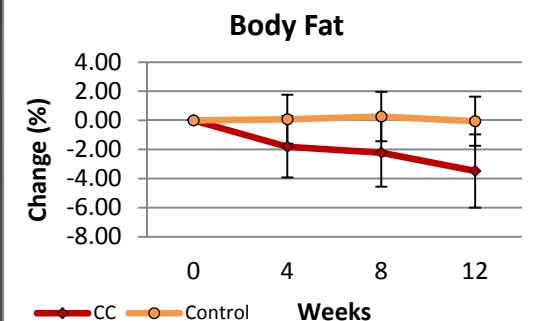
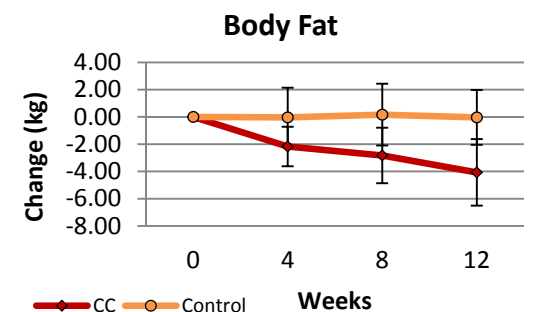
Results indicate that post-menopausal women who participate in an energy deficit higher protein and low fat diet with resistance-exercise can promote fat loss without loss of FFM.

## Practical Application

Sedentary individuals who participate in a structured diet and exercise program can improve their health and fitness markers.

## Acknowledgements & Funding

Supported by Curves International Inc., Waco, TX  
<http://esnl.tamu.edu>





# ADHERENCE TO A HIGH PROTEIN AND LOW FAT ENERGY-RESTRICTED DIET WHILE PARTICIPATING IN A CIRCUIT RESISTANCE-EXERCISE PROGRAM PROMOTES POSITIVE CHANGES IN BLOOD GLUCOSE AND LIPIDS IN POST-MENOPAUSAL WOMEN



A Jagim, M Byrd, B Lockard, C Baetge, K Levers, E Galvan, S Simbo, YP Jung, J Oliver, M Koozehchian, R Dalton, D Khanna, B Sanchez, J Kresta, K Horrell, T Leopold, M Cho, S Springer, A Rivera, C Cerda, C Rasmussen, R Kreider.  
Exercise & Sport Nutrition Laboratory, Texas A&M University, College Station, TX 77843

## Abstract

**PURPOSE:** 41 sedentary women (55.6±10 yr, 45.0±4% body fat, 33.7±5kg/m<sup>2</sup>) were randomized to participate in a control group (C) or the Curves Complete® (CC) weight loss and circuit resistance exercise program for 12-wks. Participants in the CC program followed an energy-restricted diet (30% C, 45% P, and 25% F) while participating in a circuit resistance-training (3 d/wk) and walking (30 min, 3/d wk) program. Fasting blood samples were obtained at 0, 4, 8, & 12 wks and analyzed by MANOVA. Data are presented as changes from baseline after 4, 8, and 12 wks for the C and CC groups, respectively. Overall MANOVA analysis revealed a significant time (p=0.004) and group x time (p=0.002) differences. Univariate analysis revealed significant time effects for TG, CHL, and LDL and that participants in the CC group experienced significantly different changes in blood glucose (C 1.7±8, 2.6±6, -1.3±8; CC 0.6±8, -3.2±6, -0.8±7 %, p=0.04) and CHL (C 0.6±12, -0.3±12, -2.2±11; CC -11.2±11, -9.5±10, -11.2±9%, p=0.005) with no significant differences in TG (p=0.14), HDLc (p=0.37) or LDLc (p=0.11). Results indicate that adherence to a high protein and low fat energy restricted diet while participating in a resistance-based circuit training program promotes favorable changes in blood glucose and some blood lipids in postmenopausal women.  
*Supported by Curves International, Waco, TX*

## Rationale

Sedentary individuals often times have certain elevated risk factors for metabolic disorders such as high blood lipids or elevated blood glucose levels. Previous research in the Exercise and Sport Nutrition Lab has shown positive results on markers of clinical health and weight loss after following the Curves fitness program. The Curves fitness program involves performing a 30-minute hydraulic resistance circuit training program 3 days per week. Results of initial studies have shown that the program promotes weight loss, improves markers of health, and improves fitness levels. Similar research has shown exercise programs to positively affect serum lipid panels as well as blood glucose levels. Mild to moderate weight loss has also been shown to help prevent or reduce the risk of certain metabolic risk factors. The purpose of the study was to examine the effects of a 12 week Curves Complete fitness program on blood glucose and blood lipids.

## Experimental Design

- Subjects were informed as to the experimental procedures and signed informed consent statements in adherence with the human subject guidelines of Texas A&M University.
- 41 sedentary women (55.6±10 yr, 45.0±4% body fat, 33.7±5kg/m<sup>2</sup>) participated in this study.
- Participants in the CC program followed a high protein, low-fat energy-restricted diet (30% C, 45% P, and 25% F).
- The participants in the CC group followed a diet that involved consuming 1,200 kcal/d for 1-wk and 1,500 kcal/d for 11 wks.
- Subjects participated in a supervised 30-min resistance circuit training program that was interspersed with callisthenic exercises and performed 3 days/week for the entire duration of the study.

## Methods & Procedures

Fasting blood samples were obtained at 0, 4, 8 & 12 wks and analyzed for blood glucose and blood lipids.

## Statistical Analysis

Data were analyzed by repeated measures MANOVA analysis using SPSS for Windows version 18 software (Chicago, IL) and are presented as means ± SD changes from baseline.

## Results

- Overall MANOVA analysis revealed a significant time (p=0.004) and group x time (p=0.002) differences.
- Univariate analysis revealed significant time effects for TG, CHL, and LDL levels.
- Participants in the CC group experienced significantly different changes in blood glucose (C 1.7±8, 2.6±6, -1.3±8; CC 0.6±8, -3.2±6, -0.8±7 %, p=0.04).

- Participants in the CC group experienced significantly different changes in cholesterol (C 0.6±12, -0.3±12, -2.2±11; CC -11.2±11, -9.5±10, -11.2±9%, p=0.005).
- No significant differences were observed in TG (C -2.2±29, -7.7±26, 0.1±24; CC -21.0±18, -17.3±21, -11.0±34 %, p=0.14), HDLc (C 0.6±11, -3.5±10, -5.0±10; CC 0.1±10, 3.0±23, -2.4±11 %, p=0.37) or LDLc (C -1.9±18, 1.7±23, -4.0±17; CC -11.9±16, -9.5±14, -12.6±13.2 %, p=0.11).

## Conclusions

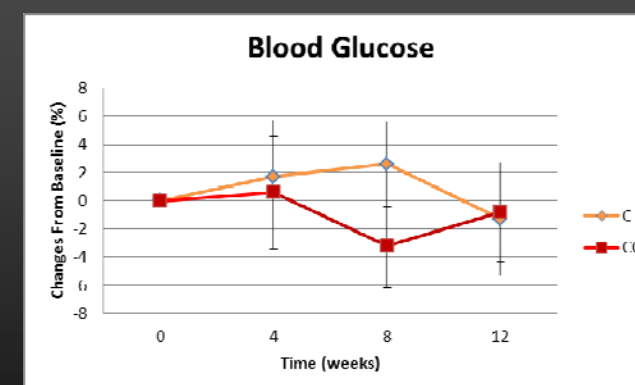
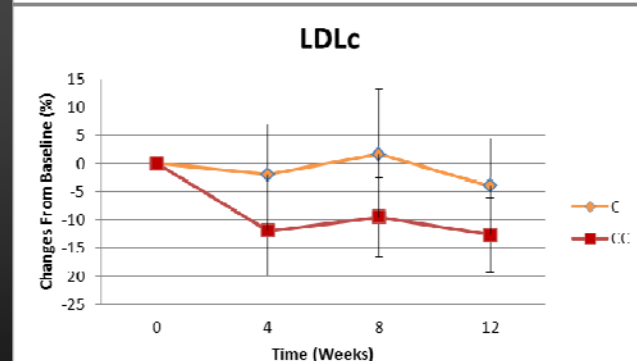
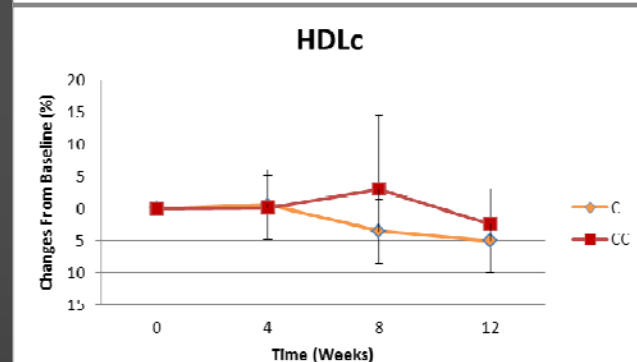
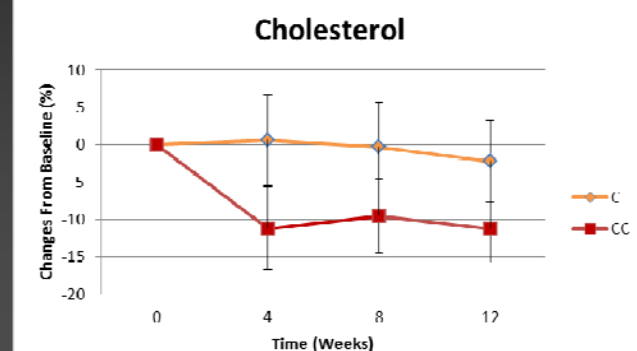
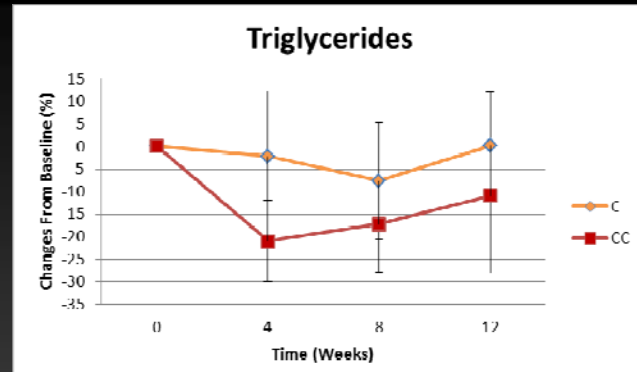
Adherence to a high protein and low fat energy restricted diet while participating in a resistance-based circuit training program promotes favorable changes in blood glucose and some blood lipids in postmenopausal women.

## Acknowledgements

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## Funding

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<http://esnl.tamu.edu>







# Effects of Nutrient Timing Following Resistance Exercise on Changes in Body Composition in Post-Menopausal Women Participating in a Weight Loss Program

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## Abstract

21 sedentary women (59.8±5 yr, 43.7±3% body fat, 31.0±3 kg/m<sup>2</sup>) followed Curves Complete® (CC) energy-restricted diet (30% C, 45% P, and 25% F) while participating in a circuit resistance training (3 d/wk) and walking (30 min, 3 d/wk) program for 12 weeks. Participants ingested a drink containing 15g of protein immediately following (I) or 2-hr after (D) exercise as part of their diet. Data were analyzed by MANOVA, and are presented as changes from baseline after 12 weeks for the I and D groups, respectively. While significant time effects were seen in body mass, fat mass, and body fat; no significant group x time effects were observed. However, participants in the D group generally experienced more favorable changes in body mass (I -3.6±2.2; D -4.2±4.2kg, p=0.59), fat mass (I -3.5±1.5; D -4.8±3.3kg, p=0.32), FFM (I -0.0±1.7; D 1.1±1.1kg, p=0.24), and body fat (I -2.8±1.9; D -4.4±3.1%, p=0.25). No differences were seen among groups in REE (I -82±126; D -90±142kcal/d, p=0.34).

**CONCLUSION:** Additional research should examine whether nutrient timing affects training adaptations in post-menopausal women who participate in an energy deficit, higher protein and low fat diet with resistance-exercise. Reported results appear to suggest the potential for more favorable outcomes via delayed nutrient timing of post exercise nutrition in overweight post-menopausal women pursuing an exercise and energy deficit diet weight loss program.

Supported by Curves International (Waco, TX)

## Rationale

Researchers in the Exercise & Sport Nutrition Laboratory have been conducting a number of studies over the past several years to assess the efficacy of the Curves fitness and weight loss programs. Many studies looking at post exercise timed nutrition have revealed favorable results in various demographics, yet some have reported little or no benefit. Previous ESNL studies have shown more favorable results from the higher protein diet v. a higher CHO diet over a 12 week period of diet and exercise. Nutrient timing continues to be an area of interest in various populations. Hence, the purpose of this study is to examine whether the addition of post exercise immediate (I) or 2 hours post exercise (D) timed nutrition (120kcal; 15g pro, 12g CHO, 1g fat shake) might enhance results achieved during 12 weeks of a prospective exercise and diet weight loss intervention.

## Experimental Design

Participants were informed of the experimental procedures and signed informed consent statements in adherence with the human subject guidelines of Texas A&M University.

21 sedentary overweight post-menopausal women (59.8±5 yrs; 43.7±3% body fat, 31.0±3 kg/m<sup>2</sup>) participated in this study.

- Participants were assigned to the Curves fitness, weight loss program, randomized, matched, and placed into one of two groups:
  - (I, n=9), which received the post exercise nutrition immediately post exercise, or
  - (D, n=12), which received the same nutrition at 2 hours post exercise.
- The Curves program involved a cyclic-energy restricted high protein diet, and participation in the Curves with Zumba circuit-training program. Zumba was interspersed with the Curves circuit resistance workout on 1 of the 3 day/wk exercise regimen, wherein circuit intervals were timed at 60 seconds. The remaining 2d/wk involved 30s intervals, and included calisthenics interspersed with the resistance stations.
- Both (I) and (D) groups consumed a high protein diet [macronutrient composition ratio of 45:30:25 (pro:CHO:fat respectively)] which consisted of 1,200 kcal/d for the first week, and 1,500 kcal/d for the remaining 11 weeks of the study. Post exercise macronutrient and energy content were included in the daily diet only on the days in which each participant exercised in the Curves circuit.

## Methods & Procedures

- Dietary analyses were accomplished through collection of 4-day Food Logs collected at each testing session, and analyzed via Food Processor software (ESHA Research, Salem OR) for macronutrient and caloric content.
- Weekly compliance checks were accomplished via activity log submission, and computerized circuit attendance records.
- Body composition was determined via a Hologic (Bedford, MA) Discovery W Dual Energy X-Ray Absorptiometry (DEXA).
- Resting Energy Expenditure (REE) was analyzed via Parvo Medics (Sandy UT) TrueOne 2400 Metabolic system.

## Statistical Analysis

Data were analyzed by MANOVA, and are presented as changes from baseline after 12 weeks (for the I and D groups, respectively) using SPSS for Windows version 20 software (Chicago, IL), and are presented as means ± SD percent changes from baseline.

## Results

Over 12 weeks, data reported are changes as compared to baseline for the I and D groups respectively.

- significant time effects were seen in body mass, fat mass, and body fat; no significant group x time effects were observed.
- participants in the D group generally experienced more favorable changes in
  - Body Mass (I -3.6±2.2; D -4.2±4.2kg, p=0.59),
  - Fat Mass (I -3.5±1.5; D -4.8±3.3kg, p=0.32),
  - FFM (I -0.0±1.7; D 1.1±1.1kg, p=0.24), and
  - Body Fat (I -2.8±1.9; D -4.4±3.1%, p=0.25).
- No differences were seen among groups in REE: (I -82±126; D -90±142kcal/d, p=0.34).

## Conclusions

Participation in the CC program with the addition of timed post-exercise nutrition may promote more favorable changes in body composition, while a more delayed time of ingestion may be preferable to immediately post-exercise ingestion. Additional research is warranted to study nutrient timing effects on training adaptations in post-menopausal women who participate in an energy deficit, higher protein and low fat diet with resistance-exercise.

## Acknowledgements and Funding

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