## Curves Research Update

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## Overview

- Curves I Review
- Research Update
- Curves II
- Long-term Study
- New Research Findings
- Exercise Intensity Study
- Metabolism Study
- Calcium Study
- Curves in Middle Schools
- Planned Studies



## We got the data!



## Curves Works!

## Curves

## Curves I



- At 0, 10, \& 14 wks:
- Maximal Stress Test
- 1RM Bench Press
- Dietary Records (4-d)
- Psychometric Tests
- Body Composition/Bone Density
- $80 \%$ of 1 RM on Bench Press

- Total Body Water (BIA)
- Hip \& waist measurement
- $20 \%$ Leg Press
- $80 \%$ of 1 RM on Leg Press
- Resting HR \& BP
- Fasting Blood Samples (12h)
- Resting Energy Expenditure (REE)


## Curves I

| Variable | Impact of Curves |
| :--- | :---: |
| Weight | $\downarrow$ (10 - 14 lbs) |
| Body Fat | $\downarrow(\mathbf{1 - 3 \%})$ |
| REE | $\uparrow(100-\mathbf{4 0 0} \mathbf{~ k c a l / d )}$ |
| Waist \& Hip <br> Circumferences | $\downarrow(\mathbf{2 - 3}$ ") |
| Most Effective Diets | HCD for Women with Low REE |
|  | High Protein |

## Curves

## Curves I

| Variable | Impact of Curves |
| :---: | :---: |
| Maximal Aerobic Capacity | $\uparrow$ (7\%) |
| Muscular Strength / Endurance | $\uparrow(10-15 \%)$ |
| Resting HR \& BP | $\downarrow$ ( $3-5$ beats/min) |
| Cholesterol | $\downarrow$ ( $10-20 \mathrm{mg} / \mathrm{dl}$ ) |
| Leptin | $\downarrow$ (20-24\%) |
| Body Image, Self-Esteem | $\uparrow$ |
| Quality of Life | $\uparrow$ |

## Research Update



## Cuñes.

## Curves II



| 1 Wk | 9 Wk |
| :--- | :---: |
| 1,200 | $1,600 \mathrm{kcal} / \mathrm{d}$ |
| $\mathrm{kcal} / \mathrm{d}$ |  |

Control, EX Only, HCHO, MHP, VHP, HCD Diets

```
4 Wk
2,600 kcal/d
Diet 2d @ 1,200
\(\mathrm{kcal} / \mathrm{d}\) only with 3 lb
weight gain
```

- At 0, 1, 10, 10.4, \& 14 W:
- Dietary Records (4-d)
- Psychometric Tests
- Body Composition/Bone Density
- At 0, 10, \& 14 wks:
- Maximal Stress Test
(DEXA)
- 1RM Bench Press
- Total Body Water (BIA)
- $80 \%$ of 1 RM on Bench Press
- Hip \& waist measurement
- Resting HR \& BP
- Fasting Blood Samples (12h)

1RM Leg Press

- $80 \%$ of 1 RM on Leg Press
- Side effects were monitored by an RN on a weekly basis
- Resting Energy Expenditure (REE)



## Curves II

Fat Mass



Curves.
** Preliminary Results **


## Curves II

Resting Energy Expenditure


## Curves II

| Variable | Impact of Curves |
| :--- | :---: |
| Maximal Aerobic Capacity | $\uparrow$ (7\%) |
| Maximal Strength (BP \& LP) | $\uparrow$ (10\%) |
| Hip \& Waist Circumference | $\downarrow$ (1.5 - 2") |
| Resting DBP | $\downarrow$ (4\%) |
| Total Cholesterol | $\downarrow$ (4\% during diet) |
| LDL Cholesterol | $\downarrow$ (3\% during diet) |
| Triglycerides | $\downarrow$ (12\%) |
| Leptin | $\downarrow$ (18\% during diet; 17\% overall) |
| Fasting Insulin | $\downarrow$ (19\% during diet; 15\% overall) |
| Insulin Sensitivity | $\mathbf{1 9 \%}$ Improvement |

## Curies

## Curves Works!



One Week Phase I Diet \&
Free Living Maintenance Phase

## Cuñes

Curves Long-Term Study
Weight Loss


$\mathrm{n}=110$
Curves
Continued Weight Loss ** Preliminary Results **

# Curves Long-Term Study 




Curives
Maintained 80\% of Weight Loss ** Preliminary Results **

Curves Long-Term Study
Weight Loss

$\mathrm{n}=44$
Curves.
Maintained 60\% of Weight Loss
** Preliminary Results **

# Curves Long-Term Study 

Weight Loss



Curves
Maintained 61\% of Weight Loss ** Preliminary Results **

## Curves Works!



> Long-Term Weight Loss
> \& Weight Management

Curves

## What's New?



## Are you ready of this?

## Cuñes.

## Exercise Intensity

- Purpose
- Determine exercise intensities of women using Curves equipment
- Exercise intensity and
energy expenditure of 30-min workout
- Evaluate reliability of workouts



## Curves

## Biomechanical Analysis

- 10 experienced subjects tested on each machine
- Subjects performed
- $3 \times 1$ repetition max (RM) tests
- $3 \times 30$ s sets at 20,25 , and 30 reps
- Repeated tests on M, W, F
- 2-D video biomechanical analysis and force production
 from pressure sensors placed on machines recorded


## Cur̃es

## Biomechanical Analysis



Curves.

## Biomechanical Analysis



Time, Seconds

## Curves



Biomechanical Analysis

Mean 30s Force Output (\% of 1 RM)

| Machine | $20 / 30$ s | $25 / 30 \mathrm{~s}$ | $30 / 30$ s |
| :--- | :---: | :---: | :---: |
| Leg Press | 52 | 51 | 50 |
| Hip Abd/ <br> Add. | 73 | 76 | 79 |
| Dip / Shrug | 60 | 64 | 74 |

Curves.

## Biomechanical Analysis

## Total Work (J)

| Machine | $20 / 30 \mathrm{~s}$ | $25 / 30 \mathrm{~s}$ | $30 / 30 \mathrm{~s}$ |
| :--- | :---: | :---: | :---: |
| Leg Press | 5250 | 7301 | 9340 |
| Hip Abd/ <br> Add. | 3855 | 5074 | 7298 |
| Dip / Shrug | 2664 | 3229 | 3495 |

## Curves.

## Biomechanical Analysis

- Observations
- Exercise intensities are within recommended NSCA and ACSM guidelines for resistance training
- Range of motion and force production is reduced with higher cadences
- Higher cadences allow for more energy expenditure but lose range of motion and strength benefits
- More energy is expended on machines working larger muscle groups
- Must stay in control during movement
- 15 - 20 reps / 30 s appears to be optimal



## Energy Expenditure Analysis Preliminary Results

- 12 sedentary subjects
- $52 \pm 4$ yrs post-menopausal
- $183 \pm 28 \mathrm{lbs} ;$
- $64 \pm 3$ in
- $1,758 \pm 251 \mathrm{ml} / \mathrm{min} \mathrm{VO}_{2} \max$ (6.2 METS)
- $\quad 1,287 \pm 202 \mathrm{ml} / \mathrm{min}$ VANT ( $73 \% \pm 3 \%$ )
- Subjects performed the Curves 30min workout on two occasions
- Exercise $\mathrm{VO}_{2}$ and $\mathrm{CO}_{2}$ measurements obtained using a CosMed K4b portable metabolic measurement system
- Metabolic cost, energy expenditure, and $\mathrm{CHO} / \mathrm{Fat}$ oxidation determined



## Curves

## Energy Expenditure

Post-Menopausal Women

$1.146 \mathrm{~L} / \mathrm{min}$ or $65 \% \mathrm{VO}_{2}$ max
Curves.
$5.7 \mathrm{kcal} / \mathrm{min}$ or $171 \mathrm{kcals} / 30 \mathrm{~min}$ Oxidized $81 \% \mathrm{CHO}$ and $19 \%$ Fat with RER of 0.94

## Energy Expenditure Analysis Preliminary Results

- How many calories can you burn during 30 min Curves workout?
- $\mathrm{VO}_{2}$ max ranges from 1.7-2.5 L/min for untrained women (6-10 METS)
- At $65 \% \mathrm{VO}_{2}$ max and RER of 0.94 , would expend $1.1-1.6 \mathrm{~L} / \mathrm{min}$ or $164-238 \mathrm{kcals}$ per 30 min workout
- Highly trained female athletes with a $\mathrm{VO}_{2}$ max of $2.5-3.5 \mathrm{~L} /$ min could expend 238 522 kcals per workout at $65 \%$ VO2max
- Average $\mathrm{VO}_{2}$ max in Curves II study ( $\mathrm{n}=279,37 \pm 8$ yrs, $64 \pm 3 \mathrm{in}, 206 \pm 39 \mathrm{lbs}$, $45 \pm 4 \%$ fat) was $2.0 \pm 0.3 \mathrm{~L} / \mathrm{min}$ (range 1 $2.9 \mathrm{~L} / \mathrm{min}$ )
- At $65 \%$ and RER of 0.94 , these women would expend an average of $194 \mathrm{kcals} / 30$ min workout (range 150-281 kcals)
- Curves program meets ACSM and AHA standards for improving aerobic fitness



## Curives

## Heart Rate Analysis Preliminary Results

- 33 subjects
- $49 \pm 9 \mathrm{yrs}$
- $201 \pm 30 \mathrm{lbs} ;$
- $45 \pm 5 \% \mathrm{BF}$
- $69 \pm 8 \mathrm{RHR}$
- $159 \pm 18$ max HR
- $136 \pm 10$ VANT HR ( $73 \pm 5 \%$ )
- Subjects performed the Curves 30-min workout on two occasions
- HR determined from Polar HR monitors
- Max and VANT HR obtained during maximal treadmill GXT
- HR observed during workout compared to percentage of max HR and VANT HR



## Heart Rate Analysis



Mean HR was $126 \pm 15 \mathrm{~b} / \mathrm{min}$
Represents 80\% Max HR ([Ex HR / Max HR] x 100)
Curves.
Represents $64 \%$ of Heart Rate Reserve
([Ex HR - RHR] / [Max HR - RHR] $\times 100$ )

## Curves Works!



## The right type and amount of exercise!

# Metabolism Study 

Preliminary Results

- Subjects recorded 4-d food intake
- Subjects consume a $1,000 \mathrm{kcal} / \mathrm{d}$ high CHO or PRO diet for 7 days and then:
- $1,600 \mathrm{kcal} / \mathrm{d}$ mixed diet for 7 days
- $2,100 \mathrm{kcal} / \mathrm{d}$ mixed diet for 7 days
- $2,600 \mathrm{kcal} / \mathrm{d}$ mixed diet for 7 days
- 3,100 kcal/d mixed diet for 7 days
- Weight, body water, body composition,
 REE, and hormones assessed at 0,1,2,3,4,7,8,9,10,11,12,13,\&14 d
- Preliminary results on 30 sedentary subjects combined (both diets)
- $52 \pm 4$ yrs post-menopausal
- $183 \pm 28$ lbs;
- $64 \pm 3$ in



## Curves.

## Metabolism Study <br> Preliminary Results



Curves
$1,000 \mathrm{kcals} / \mathrm{d}$ / $2,600 \mathrm{kcals} / \mathrm{d}$
( $\sim 2,100$ Recorded)

# Metabolism Study 

Preliminary Results


## Metabolism Study

Preliminary Results


Curves

## Metabolism Study

Preliminary Results


Curves.

$$
\text { 1,000 kcals/d / } \begin{gathered}
2,600 \mathrm{kcals} / \mathrm{d} \\
(\sim 2,100 \text { Recorded })
\end{gathered}
$$

## Metabolism Study

Preliminary Results


Curves.

$$
\begin{gathered}
1,000 \mathrm{kcals} / \mathrm{d} \quad / \quad \begin{array}{c}
2,600 \mathrm{kcals} / \mathrm{d} \\
(\sim 2,100 \text { Recorded })
\end{array}
\end{gathered}
$$

## Metabolism Study

Preliminary Results

$1,000 \mathrm{kcals} / \mathrm{d}$ / $2,600 \mathrm{kcals} / \mathrm{d}$
Curves

## Metabolism Study

Preliminary Results

- Observations
- Dieting decreased body weight, body water, fat mass, and fat free mass
- REE decreases as soon as 1-2 days after of dieting
- Following a 2,600 kcals/d (~2,100 kcals/d recorded on NR) for 7-d after dieting did not promote weight regain

- REE increased during $2,600 \mathrm{kcals} / \mathrm{d}$
- It may take 7 or more days at 2,600 kcals/d ( $\sim 2,100$ kcals/d recorded on NR) for REE to rebound without exercise
- Long-term low calorie dieting can sabotage metabolism!



## Cữes.

## Curves Calcium

Preliminary Results

- 210 post-menopausal women participated:
- $54 \pm 6 \mathrm{yrs}$
- $64 \pm 3$ in
- $195 \pm 33 \mathrm{lbs}$
- $46 \pm 4$ \% BF
- Subjects participated in 14-wk Curves II protocol
- Subjects followed high CHO or VHP diet
- Subjects blindly and randomly assigned to:
- Placebo
- Calcium Citrate
- Curves Calcium
- Proprietary Calcium Blend (HUM)
- Preliminary results on first 101 subjects who completed study
Curves.



## Curves Calcium



Body Mass

** Preliminary Results **


## Curves Calcium



Curves.
** Preliminary Results **

## Curves Calcium

Bone Mass


## Curies

** Preliminary Results **

## Curves Calcium

Preliminary Results

- Observations
- Post-menopausal women participating in the Curves program observe significant weight loss and fitness benefits

- Some positive trends (NS) but too early to tell whether calcium supplementation promotes greater weight loss



## Curves in Middle Schools

- Approximately 350 students participating in 3 area schools
- Pre-testing completed on most students
- 8 week Curves circuit program 2 or 3 times a week
- Developed an 8-week, 5-day a week health \& fitness curriculum


## Curves



## Planned Studies

- Web-based Study
- Curves in High Risk Populations (hypertension, diabetes, elderly)
- Effects of Curves program and Joint Supplement in OA

- Effects of Post-Exercise Protein Supplementation on Training Adaptations to the Curves Fitness Program
- Effects of Curves and different diets on gene expression



## Curives

## Optimizing Curves

- Provide a caring and nurturing environment for members
- Ensure proper exercise intensity and progression
- Encourage clients to follow the diet if they want to lose weight



## Curives.

## Optimizing Curves

- Once goal weight is achieved, they must continue to train and diet if they gain weight (3 lbs)
- Encourage involvement in recreational activities
- Add nutritional strategies to optimize recovery, protein synthesis, and fat loss



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