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 I

14 Weeks of Curves Training

Testing Intervals

2 Wk 1,200 kcal/d 8 Wk 1,600 kcal/d 4 Wk 2,600 kcal/d Intermittent 2d @ 1,200 kcal/d

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

• At 0, 2, 10, 10.4, & 14 Wks:
  • Dietary Records (4-d)
  • Psychometric Tests
  • Body Composition/Bone Density (DEXA)
  • Total Body Water (BIA)
  • Hip & waist measurement
  • Resting HR & BP
  • Fasting Blood Samples (12h)
  • Resting Energy Expenditure (REE)

• At 0, 10, & 14 wks:
  • Maximal Stress Test
  • 1RM Bench Press
  • 80% of 1RM on Bench Press
  • 1RM Leg Press
  • 80% of 1RM on Leg Press
  • Side effects were monitored by an RN on a weekly basis

14 Weeks of Curves Training
### Curves I

<table>
<thead>
<tr>
<th>Variable</th>
<th>Impact of Curves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>↓ (10 – 14 lbs)</td>
</tr>
<tr>
<td>Body Fat</td>
<td>↓ (1-3%)</td>
</tr>
<tr>
<td>REE</td>
<td>↑ (100 – 400 kcal/d)</td>
</tr>
<tr>
<td>Waist &amp; Hip Circumferences</td>
<td>↓ (2-3&quot;)</td>
</tr>
<tr>
<td>Most Effective Diets</td>
<td>HCD for Women with Low REE</td>
</tr>
<tr>
<td></td>
<td>High Protein</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Impact of Curves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximal Aerobic Capacity</td>
<td>↑ (7%)</td>
</tr>
<tr>
<td>Muscular Strength / Endurance</td>
<td>↑ (10 – 15%)</td>
</tr>
<tr>
<td>Resting HR &amp; BP</td>
<td>↓ (3 – 5 beats/min)</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>↓ (10 – 20 mg/dl)</td>
</tr>
<tr>
<td>Leptin</td>
<td>↓ (20 – 24%)</td>
</tr>
<tr>
<td>Body Image, Self-Esteem</td>
<td>↑</td>
</tr>
<tr>
<td>Quality of Life</td>
<td>↑</td>
</tr>
</tbody>
</table>
Research Update

Curves II

Testing Intervals

<table>
<thead>
<tr>
<th>1 Wk</th>
<th>9 Wk</th>
<th>4 Wk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,200 kcal/d</td>
<td>1,600 kcal/d</td>
<td>2,600 kcal/d</td>
</tr>
</tbody>
</table>

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

- At 0, 1, 10, 10.4, & 14 Wks:
  - Dietary Records (4-d)
  - Psychometric Tests
  - Body Composition/Bone Density (DEXA)
  - Total Body Water (BIA)
  - Hip & waist measurement
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- At 0, 10, & 14 wks:
  - Maximal Stress Test
  - 1RM Bench Press
  - 80% of 1RM on Bench Press
  - 1RM Leg Press
  - 80% of 1RM on Leg Press

Side effects were monitored by an RN on a weekly basis.
Curves II

**Preliminary Results**

**Body Mass**

- HCD+E
- LC-VHP+E
- LC-HP+E
- HCHO+E
- EX
- Control

**Fat Mass**

- HCD+E
- LC-VHP+E
- LC-HP+E
- HCHO+E
- EX
- Control

**Preliminary Results**

- Number of participants: n = 140
- Number of participants: n = 133
Curves II

Resting Energy Expenditure

**Preliminary Results**

Curves II

<table>
<thead>
<tr>
<th>Variable</th>
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<tbody>
<tr>
<td>Maximal Aerobic Capacity</td>
<td>↑ (7%)</td>
</tr>
<tr>
<td>Maximal Strength (BP &amp; LP)</td>
<td>↑ (10%)</td>
</tr>
<tr>
<td>Hip &amp; Waist Circumference</td>
<td>↓ (1.5 - 2&quot;)</td>
</tr>
<tr>
<td>Resting DBP</td>
<td>↓ (4%)</td>
</tr>
<tr>
<td>Total Cholesterol</td>
<td>↓ (4% during diet)</td>
</tr>
<tr>
<td>LDL Cholesterol</td>
<td>↓ (3% during diet)</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>↓ (12%)</td>
</tr>
<tr>
<td>Leptin</td>
<td>↓ (18% during diet; 17% overall)</td>
</tr>
<tr>
<td>Fasting Insulin</td>
<td>↓ (19% during diet; 15% overall)</td>
</tr>
<tr>
<td>Insulin Sensitivity</td>
<td>19% Improvement</td>
</tr>
</tbody>
</table>
Curves Works!

One Week Phase I Diet & Free Living Maintenance Phase

Curves Long-Term Study
Weight Loss

n = 110
Continued Weight Loss
** Preliminary Results **
**Curves Long-Term Study**

**Weight Loss**

- **n = 66**
- **Maintained 80% of Weight Loss**
- **Preliminary Results**

<table>
<thead>
<tr>
<th>Time</th>
<th>Change (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10W</td>
<td>-14</td>
</tr>
<tr>
<td>14W</td>
<td>-12</td>
</tr>
<tr>
<td>3M</td>
<td>-12</td>
</tr>
<tr>
<td>6M</td>
<td>-10</td>
</tr>
<tr>
<td>9M</td>
<td>-8</td>
</tr>
<tr>
<td></td>
<td>-6</td>
</tr>
<tr>
<td></td>
<td>-4</td>
</tr>
<tr>
<td></td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

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**Curves Long-Term Study**

**Weight Loss**

- **n = 44**
- **Maintained 60% of Weight Loss**
- **Preliminary Results**

<table>
<thead>
<tr>
<th>Time</th>
<th>Change (lbs)</th>
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<tbody>
<tr>
<td>0</td>
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</tr>
<tr>
<td>10W</td>
<td>-12</td>
</tr>
<tr>
<td>14W</td>
<td>-10</td>
</tr>
<tr>
<td>3M</td>
<td>-8</td>
</tr>
<tr>
<td>6M</td>
<td>-6</td>
</tr>
<tr>
<td>9M</td>
<td>-4</td>
</tr>
<tr>
<td></td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

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**Curves**
Curves Long-Term Study

Weight Loss

** Preliminary Results **

Body Mass

Change (lbs)

0 10W 14W 3M 6M 9M 12M

n = 29

Maintained 61% of Weight Loss

Curves Works!

Long-Term Weight Loss & Weight Management

Curves
What’s New?

Are you ready for this?

Curves

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 x 1 repetition max (RM) tests
  - 3 x 30s 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
Biomechanical Analysis

Mean 30s Force Output (% of 1 RM)

<table>
<thead>
<tr>
<th>Machine</th>
<th>20/30s</th>
<th>25/30s</th>
<th>30/30s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leg Press</td>
<td>52</td>
<td>51</td>
<td>50</td>
</tr>
<tr>
<td>Hip Abd/Add.</td>
<td>73</td>
<td>76</td>
<td>79</td>
</tr>
<tr>
<td>Dip / Shrug</td>
<td>60</td>
<td>64</td>
<td>74</td>
</tr>
</tbody>
</table>
### Biomechanical Analysis

#### Total Work (J)

<table>
<thead>
<tr>
<th>Machine</th>
<th>20/30s</th>
<th>25/30s</th>
<th>30/30s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leg Press</td>
<td>5250</td>
<td>7301</td>
<td>9340</td>
</tr>
<tr>
<td>Hip Abd/Add.</td>
<td>3855</td>
<td>5074</td>
<td>7298</td>
</tr>
<tr>
<td>Dip / Shrug</td>
<td>2664</td>
<td>3229</td>
<td>3495</td>
</tr>
</tbody>
</table>

#### 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 ± 4 yrs post-menopausal
  ▪ 183 ± 28 lbs;
  ▪ 64 ± 3 in
  ▪ 1,758 ± 251 ml/min VO$_2$max (6.2 METS)
  ▪ 1,287 ± 202 ml/min VANT (73% ± 3%)
• Subjects performed the Curves 30-min workout on two occasions
• Exercise VO$_2$ and CO$_2$ measurements obtained using a CosMed K4b portable metabolic measurement system
• Metabolic cost, energy expenditure, and CHO/Fat oxidation determined

Energy Expenditure

Post-Menopausal Women

Oxygen Uptake

Max = 1,758 ml/min

1.146 L/min or 65% VO$_2$ max
5.7 kcal/min or 171 kcals/30 min
Oxidized 81% 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?
  - VO₂ max ranges from 1.7 – 2.5 L/min for untrained women (6-10 METS)
  - At 65% VO₂ max and RER of 0.94, would expend 1.1 – 1.6 L/min or 164 – 238 kcals per 30 min workout
  - Highly trained female athletes with a VO₂ max of 2.5 – 3.5 L/min could expend 238 – 522 kcals per workout at 65% VO₂ max
  - Average VO₂ max in Curves II study (n=279, 37±8 yrs, 64±3 in, 206±39 lbs, 45±4% fat) was 2.0±0.3 L/min (range 1 – 2.9 L/min)
  - At 65% and RER of 0.94, these women would expend an average of 194 kcals/30 min workout (range 150 – 281 kcals)

- Curves program meets ACSM and AHA standards for improving aerobic fitness

Heart Rate Analysis

Preliminary Results

- 33 subjects
  - 49 ± 9 yrs
  - 201 ± 30 lbs;
  - 45 ± 5 % BF
  - 69 ± 8 RHR
  - 159 ± 18 max HR
  - 136 ± 10 VANT HR (73 ± 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 ± 15 b/min
Represents 80% Max HR ([Ex HR / Max HR] x 100)
Represents 64% of Heart Rate Reserve
([Ex HR – RHR] / [Max HR – RHR] x 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 kcal/d high CHO or PRO diet for 7 days and then:
  ▪ 1,600 kcal/d mixed diet for 7 days
  ▪ 2,100 kcal/d mixed diet for 7 days
  ▪ 2,600 kcal/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 ± 4 yrs post-menopausal
  ▪ 183 ± 28 lbs;
  ▪ 64 ± 3 in
Metabolism Study
Preliminary Results

**Body Water**

- **n = 30**
- Days: T1, T2, T3, T4, T7, T8, T9, T10, T11, T14
- Percentage (%): 34, 36, 38, 40

1,000 kcals/d / 2,600 kcals/d
(~ 2,100 Recorded)

**Fat Mass**

- **n = 30**
- Days: 0, 1, 2, 3, 4, 7, 8, 9, 10, 11, 14
- Grams: 42500, 43500, 44500, 45500

1,000 kcals/d / 2,600 kcals/d
(~ 2,100 Recorded)
Metabolism Study
Preliminary Results

**Fat Free Mass**

- **n = 30**
- **Days**
- **Grams**

1,000 kcals/d / 2,600 kcals/d
(~ 2,100 Recorded)

**Body Fat**

- **n = 30**
- **Days**
- **%**

1,000 kcals/d / 2,600 kcals/d
(~ 2,100 Recorded)
**Metabolism Study**

**Preliminary Results**

**Resting Energy Expenditure**

\[
\text{ Days} \\
\begin{array}{cccccccccc}
0 & 1 & 2 & 3 & 4 & 7 & 8 & 9 & 10 & 11 & 14 \\
\hline
15 & 15.5 & 16 & 16.5 & 17
\end{array}
\]

\[n = 30\]

\[1,000 \text{ kcals/d} / 2,600 \text{ kcals/d}\]

\[\text{(~2,100 Recorded)}\]

**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 kcals/d
- It may take 7 or more days at 2,600 kcals/d (~2,100 kcals/d recorded on NR) for REE to rebound without exercise
- Long-term low calorie dieting can sabotage metabolism!
Curves Calcium

Preliminary Results

- 210 post-menopausal women participated:
  - 54 ± 6 yrs
  - 64 ± 3 in
  - 195 ± 33 lbs
  - 46 ± 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 Calcium

Body Mass

n = 101

** Preliminary Results **
Curves Calcium

** Preliminary Results **

*Fat Mass*

- Placebo
- Calcium
- Calcium Citrate
- HUM

*Body Fat*

- Placebo
- Calcium
- Calcium Citrate
- HUM

** Preliminary Results **

*Fat Mass*

n = 97

*Body Fat*

n = 97
Curves Calcium

Bone Mass

** 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

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
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

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
Reaching the world through exercise, nutrition, and preventive health research!

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