Overview

• ESNL Tour
• Research Findings
  – Curves I & II Combined
  – Curves Extension
  – Curves Calcium
  – Curves Osteoarthritis
  – Curves Intensity
  – Metabolism Study
• Ongoing/Planned Studies
Exercise & Sport Nutrition Lab

Baylor University

What are the overall effects of Curves I & II?
Curves I & II

14 Weeks of Curves Training

Testing Intervals

1-2 Wk
1,200 kcal/d

8-9 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

n=283

- At 0, 2, 10, 10.4, & 14 W:
  - 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

Curves I & II

More evidence that HP diets promote greater weight loss!

p = 0.001

Body Mass

n = 283
Curves I & II

Fat Mass

n = 283
p = 0.001

70 – 85% of weight loss is fat!
VHP diet promotes most fat loss!

Curves I & II

Resting Energy Expenditure

n = 283
p = 0.001

134 kcal/d
941 kcal/wk
1.16 lbs/mo
14 lbs/year!
### Curves I & II

<table>
<thead>
<tr>
<th>Variable</th>
<th>Impact of Curves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat</td>
<td>↓ (1.5 – 2%)</td>
</tr>
<tr>
<td>Waist &amp; Hip</td>
<td>↓ (2-3&quot;)</td>
</tr>
<tr>
<td>Resting HR</td>
<td>↓ (3.4%)</td>
</tr>
<tr>
<td>Resting SBP</td>
<td>↓ (3.2%)</td>
</tr>
<tr>
<td>Resting DBP</td>
<td>↓ (4%)</td>
</tr>
<tr>
<td>1 RM Bench Press</td>
<td>↑ (9%)</td>
</tr>
<tr>
<td>1 RM Leg Press</td>
<td>↑ (11%)</td>
</tr>
<tr>
<td>BP Endurance</td>
<td>↑ (22%)</td>
</tr>
<tr>
<td>LP Endurance</td>
<td>↑ (23%)</td>
</tr>
</tbody>
</table>

Statistically significant time effects (p<0.05).

### Curves I & II

<table>
<thead>
<tr>
<th>Variable</th>
<th>Impact of Curves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximal Oxygen Uptake</td>
<td>↑ (8%)</td>
</tr>
<tr>
<td>Total Cholesterol</td>
<td>↓ (5% @ 10W)</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>↓ (7%)</td>
</tr>
<tr>
<td>Glucose</td>
<td>↓ (3%)</td>
</tr>
<tr>
<td>Leptin*</td>
<td>↓ (18%)</td>
</tr>
<tr>
<td>Fasting Insulin*</td>
<td>↓ (19%)</td>
</tr>
<tr>
<td>Insulin Sensitivity*</td>
<td>↑ (19%)</td>
</tr>
</tbody>
</table>

Statistically significant time effects (p<0.05).

* Curves II
### Curves I & II

<table>
<thead>
<tr>
<th>Variable</th>
<th>Impact of Curves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appetite</td>
<td>▼ (9%)</td>
</tr>
<tr>
<td>Hunger</td>
<td>▼ (8%)</td>
</tr>
<tr>
<td>Feeling of Fullness</td>
<td>▲ (5%)</td>
</tr>
<tr>
<td>Energy</td>
<td>▲ (40%)</td>
</tr>
<tr>
<td>Quality of Diet</td>
<td>▲ (73%)</td>
</tr>
<tr>
<td>Physical Functioning*</td>
<td>▲ (10%)</td>
</tr>
<tr>
<td>Physical Limitations*</td>
<td>▼ (28%)</td>
</tr>
<tr>
<td>General Health*</td>
<td>▲ (6%)</td>
</tr>
</tbody>
</table>

Statistically significant time effects (p<0.05).
* Curves II

### Curves I & II

<table>
<thead>
<tr>
<th>Variable</th>
<th>Impact of Curves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitality*</td>
<td>▲ (15%)</td>
</tr>
<tr>
<td>Limitations Due to Emotional Factors*</td>
<td>▼ (20%)</td>
</tr>
<tr>
<td>Mental Health*</td>
<td>▲ (7%)</td>
</tr>
<tr>
<td>Appearance Evaluation*</td>
<td>▲ (28%)</td>
</tr>
<tr>
<td>Body Area Satisfaction*</td>
<td>▲ (19%)</td>
</tr>
<tr>
<td>Overweight Preoccupation*</td>
<td>▲ (10%)</td>
</tr>
<tr>
<td>Self-Classified Weight*</td>
<td>▲ (9%)</td>
</tr>
</tbody>
</table>

Statistically significant time effects (p<0.05).
* Curves I
Curves is Taking Care of Business!

Promoting Weight-Loss & Improving Health & Fitness

Why do diets fail?

Most people regain weight lost within 6 – 12 months!
Curves Long-Term Study - Weight Loss

$n = 164$

Maintained Weight Loss!

Curves Long-Term Study - Weight Loss

$n = 107$

Maintained Weight Loss!
Curves Long-Term Study - Weight Loss

Body Mass

<table>
<thead>
<tr>
<th>Change (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>-10</td>
</tr>
<tr>
<td>-20</td>
</tr>
<tr>
<td>-30</td>
</tr>
</tbody>
</table>

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

n = 84

Maintained Weight Loss!

Curves Long-Term Study - Weight Loss

Body Mass

<table>
<thead>
<tr>
<th>Change (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>-10</td>
</tr>
<tr>
<td>-20</td>
</tr>
<tr>
<td>-30</td>
</tr>
</tbody>
</table>

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

n = 66

Maintained majority of weight loss after 1 year!
Curves is Taking Care of Business!

Promoting Long-Term Weight Maintenance!

What’s New?
Calcium & Weight Loss

- Calcium is good for your bones and waistline!
- Currently conducting a study to determine whether calcium supplementation in post-menopausal women participating in the Curves program would promote greater fat loss
- Strongly recommend calcium supplementation for Curves

Curves Calcium

- 149 post-menopausal women:
  - 53.5±6 yrs
  - 46.3±5 % BF
  - 34.2±6 kg•m2 BMI
- Randomized into 3 groups
  - Exercise + No Diet
  - Exercise + High CHO Diet
  - Exercise + High Protein Diet
- Diet Program
  - 1 W @ 1,200 kcals/d
  - 9 W @ 1,600 kcals/d
  - 4 W @ 2,600 (High CHO);
    Diet for 2-d @ 1,200 kcal/d if gain 3 lbs
Curves Calcium

• Randomized and double blind assignment:
  – Placebo
  – Calcium Citrate (800 mg/d of calcium as citrate)
  – Curves Calcium (800 mg/d of calcium as citrate and malate and 400 IU/d of Vitamin D)
  – HUM Supplement (1,000 mg/d of calcium as citrate, 600 mg/d of green tea extract, and 200 mg/d of 7-Keto DHEA)

Curves Calcium - Body Mass

Body Mass n = 149
Curves Calcium - Body Mass

Body Mass

n = 149

Weeks

Change (kg)

Curves Calcium - Fat Mass

Fat Mass

n = 149

Time

Change (g)

Curves Calcium - Body Mass

n = 149

Weeks

Change (kg)

Curves Calcium - Fat Mass

n = 149

Time

Change (g)
Curves Calcium - Fat Mass

• 36% - 44% greater fat loss when dieting!
• 26% - 69% greater fat loss than CC!
Curves Calcium - Bone Mass

- The Curves program is effective to promote and maintain weight loss in post-menopausal women
- Supplementation with Curves Bioavailable Calcium promoted greater weight loss when combining exercise with dieting
Curves is Taking Care of Business!

*Post-Menopausal Women!*

Curves Osteoarthritis

- 30 women with knee OA:
  - 55.1±7 yrs
  - 195.9±28 lbs
  - 64.2±13 in
  - 46.0±3 % BF

- Randomized into 2 groups
  - Exercise + High CHO Diet
  - Exercise + High Protein Diet

- Double blind randomization:
  - Placebo
  - Curves J&CT Support
Curves Osteoarthritis

14 Weeks of Curves Training

Testing Intervals

- 1 Wk: 1,200 kcal/d
- 9 Wk: 1,600 kcal/d
- 4 Wk: 2,600 kcal/d

Intermittent 2d @ 1,200 kcal/d

HCHO or VHP Diets

n=30

• At 0, 10, & 14 W:
  • Dietary Records (4-d)
  • Psychometric Tests
  • Body Composition/Bone Density
  • Total Body Water (BIA)
  • Hip & waist measurement
  • Resting HR & BP
  • Fasting Blood Samples (12h)
  • Resting Energy Expenditure (REE)
  • Knee flexibility
  • Ratings of Knee Pain

• 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
  • Isokinetic Knee Tests
  • Balance & Sit to Stand Tests
  • Side effects were monitored by an RN on a weekly basis

• Overall Results (Both Groups)
  - ↓ Body weight (-4.7±7 lbs)
  - ↓ Fat mass (-4.9±5 lbs)
  - No change in FFM
  - ↑ 1RM BP (14%)
  - ↑ BP Endurance (16%)
  - ↑ Knee Range of Motion
  - ↑ Sit to Stand Rising Index (10%)
  - ↑ Step Up/Over Lift Up Index (8%-11%)
  - ↓ Step Up/Over Movement Time (-15%)
  - ↑ Forward Lunge Distance (8%)
  - ↓ Forward Lunge Contact Time (-19%)
  - ↓ Forward Lunge Impulse (-17%)
Curves Osteoarthritis

• Overall Results (Both Groups)
  – ↑ Isokinetic Knee Extension Torque @ 60, 180 & 300 deg/sec
  – ↑ Isokinetic Knee Flexion Torque @ 60, 180 & 300 deg/sec
  – ↑ Relative Maximal Oxygen Uptake (6%)
  – ↓ VAS Knee Pain (-52%)
  – ↓ WOMAC Pain (-53%)
  – ↓ WOMAC Stiffness (-38%)
  – ↓ WOMAC Limitations in Physical Function (-46%)

Curves Osteoarthritis

• Overall Results (Both Groups)
  – ↓ Appetite (-12%)
  – ↑ Energy (28%)
  – ↑ Quality of Diet (21%)
  – ↑ QOL - Physical Functioning (59%)
  – ↑ QOL - Vitality (120%)
  – ↑ QOL - Social Functioning (65%)

• Curves J&CT Support supplementation tended to reduce perceptions of knee pain (p=0.10)
• Additional research is needed with a larger number of subjects over a longer period of time
Curves Osteoarthritis

- Curves fitness & weight loss program promotes weight loss, improves fitness, and increases functional capacity in women with OA
- Curves JCT Support supplementation may have some therapeutic benefit on reducing pain

Curves is Taking Care of Business!

Women with Osteoarthritis!
Energy Expenditure Analysis

- 33 sedentary subjects
  - 53 ± 7 yrs
  - 193 ± 32 lbs;
  - 64.5 ± 3 in
  - 1.8 ± 0.28 L/min VO2max (5.9 METS)
  - 151 ± 15 max HR

- Subjects performed the Curves 30-min workout 2 times

- Exercise VO2 and CO2 measurements obtained using a CosMed K4b portable metabolic measurement system

- Metabolic cost, energy expenditure, and CHO/Fat oxidation determined

Energy Expenditure

![Graph showing oxygen uptake over time for Workout 1 and Workout 2. Maximal oxygen uptake is 1,758 ml/min.]

1.12 L/min or 63% VO2 max
5.5 kcal/min or 165 kcals/30 min
RER of 0.98
Heart Rate Analysis

- 78 subjects
  - 53.6 ± 7 yrs
  - 192 ± 30 lbs;
  - 43.5 ± 5 % BF
  - 66 ± 9 Supine RHR
  - 151 ± 17 max HR
- Subjects performed the Curves 30-min workout on two occasions
- HR determined from Polar HR monitors
- Max HR obtained during maximal treadmill GXT
- HR observed during workout compared to percentage of max HR

Heart Rate Analysis

- Mean HR - 119±15 bpm
- 79% max HR ([Ex HR / Max HR] x 100)
- 63% of Heart Rate Reserve ([Ex HR – RHR] / [Max HR – RHR] x 100)
- Biomechanical studies indicate that exercise intensity ranges from 61% - 73% of 1RM with good reliability (r=0.71 to r=0.87)
- Curves exercise intensity meets ACSM & NSCA guidelines
Curves is Taking Care of Business!

Curves is the Right Type and Amount of Exercise!

Metabolism Study

- 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
- 122 sedentary subjects completed study:
  - 42±11 yrs
  - 64.6±3 in
  - 216±40 lbs
  - 45.6±4.8 %
  - 36.5±6.2 kg•m2 BMI
Metabolism Study

**Body Mass**

- Change (kg)
- Days 0, 1, 2, 3, 4, 7
- 1000 kcals/d

**Total Body Water**

- Change (L)
- Days 0, 1, 2, 3, 4, 7
- 1000 kcals/d

*Curves*
Metabolism Study

**Fat Free Mass**

- Change (g) vs. Days
- Control: 1600, 2100, 2600, 3100
- 1000 kcals/d Increased EI
- p = 0.001, n = 122

**Fat Mass**

- Change (g) vs. Days
- Control: 1600, 2100, 2600, 3100
- 1000 kcals/d Increased EI
- p = 0.001, n = 122
Metabolism Study

Resting Energy Expenditure

<table>
<thead>
<tr>
<th>Days</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change (kcal)</td>
<td>1000 kcals/d</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

-400 | -300 | -200 | -100 | 0 | 100 | 200 | 300 | 400 |

Control

p = 0.001  n = 122

1000 kcals/d Increased EI

Delta Value (pg/ml)

D0 D7 D14

Metabolism Study

Ketones

<table>
<thead>
<tr>
<th>Days Dieting</th>
<th>D0</th>
<th>D7</th>
<th>D14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delta Value (ug/ml)</td>
<td>0.00</td>
<td>0.05</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Leptin

<table>
<thead>
<tr>
<th>Days Dieting</th>
<th>D0</th>
<th>D7</th>
<th>D14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delta Value (pg/ml)</td>
<td>-60.00</td>
<td>-40.00</td>
<td>-20.00</td>
</tr>
</tbody>
</table>
Metabolism Study Observations

- Dieting decreased body weight, body water, fat mass, fat free mass, REE, and appetite hormones (leptin, ghrelin, etc.)
- Increasing energy intake up to 2,600 kcals/d did not promote weight regain
- It may take 7 or more days for REE to fully rebound without exercise

Curves is Taking Care of Business!

*Promoting Weight Loss without Sabotaging Metabolism!*
Ongoing & Planned Studies

• Curves in High Risk Populations (hypertension, diabetes, elderly)
• Effects of Using New “Smart” Equipment on Fitness Gains from Curves
• Effects of Curves and different diets on gene expression
• Exercise Intensity & Energy Expenditure of Highly Trained Women Using Curves
• Web-based Study

Curves is Taking Care of Business!

The most extensively studied and scientifically validated exercise & weight loss program in the industry...period!
Reaching the world through exercise, nutrition, and preventive health research!

www3.baylor.edu/HHPR