Evidence suggests that women are about one-half as strong in the upper body and two-thirds as strong in the lower body as men. In response to training, women have been shown to achieve smaller absolute but the same or even greater relative increases in strength than men. It appears that relative improvements in total body mass or lean body mass. It has been hypothesized that men and women may achieve different strength gains in response to various resistance training modalities. Here, we wanted to determine the relative strength improvements of women in both groups were similar to that of men and improvements in strength relative to lean body mass was also similar to men (21.46 kg and 28.98 kg, respectively). ART and WT women demonstrated greater improvement in bench press strength than men, if values are expressed relative to total body mass or lean body mass. It has been hypothesized that men and women may achieve different strength gains in response to various resistance training modalities.

**RESULTS**

Significant increases in muscular strength were observed in men and women of both groups. Data indicated that significant group difference (P > 0.03). The purpose of the study was to investigate the effects of a manual training based accommodating resistance training (ART) program and a similarly structured weight training (WT) program on muscular strength of men and women.

**METHODS**

Muscular Strength – Pre- and Post-training by 1RM bench press and back squat

N = 84 physically active college students were randomly assigned to either the ART or WT group

14-week training program with 3 training sessions/week

ART and WT groups performed identical training programs

Each training session was 6 to 9 exercises

All exercises were performed with 2-4 sets of 8-12 repetitions

ART and WT training sessions had same order of exercises, number of sets, reps, and rest intervals

**CONCLUSION**

The 14-week ART and WT programs elicited improvements for muscular strength of men and women.

Men’s absolute and relative strength were significantly greater than women pre- and post-training.

Absolute muscular strength improved similarly for men and women (P > 0.001)

**PRACTICAL APPLICATION**

Comparably designed ART and WT programs provide similar improvements in muscular strength for men and women. Despite similar changes of absolute strength, women may benefit from resistance training more than men because of the greater improvement in relative strength.

**ACKNOWLEDGEMENTS**

Supported by The University of Texas at El Paso University Research Initiative.

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**TABLES**

**Pre- and Post-Training Data for Absolute Strength (kg)**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>Pre-training (kg)</th>
<th>Post-training (kg)</th>
<th>Absolute Change (kg)</th>
<th>Magnitude of Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BENCH PRESS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>ART 88.9 ± 24.2</td>
<td>WT 93.2 ± 15.0</td>
<td>4.3 ± 8.8</td>
<td>5.2 ± 8.8</td>
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<tr>
<td>Women</td>
<td>ART 30.9 ± 6.6</td>
<td>WT 31.4 ± 5.3</td>
<td>5.0 ± 4.5</td>
<td>12.9 ± 12.3</td>
</tr>
<tr>
<td><strong>SQUAT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>ART 104.1 ± 29.7</td>
<td>WT 104.5 ± 26.3</td>
<td>21.5 ± 15.7</td>
<td>17.5 ± 12.2</td>
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<tr>
<td>Women</td>
<td>ART 44.3 ± 16.2</td>
<td>WT 48.7 ± 16.4</td>
<td>23.3 ± 11.0</td>
<td>33.0 ± 16.3</td>
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</tbody>
</table>

**Pre- and Post-Training Data for Relative Strength (kg/LBM)**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>Pre-training (kg/LBM)</th>
<th>Post-training (kg/LBM)</th>
<th>Absolute Change (kg/LBM)</th>
<th>Magnitude of Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BENCH PRESS</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Men</td>
<td>ART 1.27 ± 0.28</td>
<td>WT 1.36 ± 0.22</td>
<td>0.05 ± 0.11</td>
<td>5.4 ± 9.6</td>
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<td>Women</td>
<td>ART 0.67 ± 0.11</td>
<td>WT 0.68 ± 0.15</td>
<td>0.06 ± 0.10</td>
<td>10.7 ± 16.1</td>
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<tr>
<td><strong>SQUAT</strong></td>
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</tr>
<tr>
<td>Men</td>
<td>ART 1.50 ± 0.36</td>
<td>WT 1.49 ± 0.30</td>
<td>0.29 ± 0.23</td>
<td>22.8 ± 20.7</td>
</tr>
<tr>
<td>Women</td>
<td>ART 0.84 ± 0.30</td>
<td>WT 0.84 ± 0.30</td>
<td>0.35 ± 0.17</td>
<td>41.9 ± 27.0</td>
</tr>
</tbody>
</table>

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**Figure:**

- **Resistant Bench Press**
- **Resistant Squat**

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**Figure Captions:**

- Resistant Squat: Illustrates the use of a squat with resistance bands.

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**Graphs:**

- Graph A: Comparison of absolute strength improvements between men and women.
- Graph B: Comparison of relative strength improvements between men and women.

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**Figure Legends:**

- Graph A: Significant difference in absolute strength improvements between men and women (P < 0.001).
- Graph B: Significant difference in relative strength improvements between men and women (P < 0.005).

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**Images:**

- Image 1: Photograph of a woman performing a bench press with resistance bands.
- Image 2: Photograph of a woman performing a squat with resistance bands.

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**Table Legends:**

- Table 1: Comparison of pre- and post-training strength improvements for men and women.
- Table 2: Comparison of pre- and post-training absolute and relative strength improvements for men and women.

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**References:**


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**Table Notes:**

- Significant difference between men and women for height, weight, and body fat (P < 0.003).
- Absolute and relative strength of men was significantly greater than women pre- and post-training (P < 0.001).
- Bench press and squat strength improved following training for men and women of the ART and WT groups (P < 0.001 and WT < 0.003, respectively).
- Significant improvement in relative strength was noted for pre- and post-training sessions. Both men and women improved significantly with the ART program (P < 0.001); however, the total increase in muscle mass for women of the ART and WT groups (21.46 kg and 28.98 kg, respectively) was distinctly smaller than the men (27.44 kg and 28.61 kg, respectively). ART and WT women demonstrated greater improvement in bench press strength relative to lean body mass (10.75% and 14.3%, respectively), compared to ART and WT men (6.1% and 7.3%, respectively) and ART and WT women demonstrated greater improvement in absolute squat strength than men (21.5% and 23.5%, respectively) and ART and WT men (16.2% and 17.8%, respectively).