Relations of Strength Training to Body Image Among a Sample of Female University Students

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ABSTRACT
College women enrolled in a strength training class were evaluated before and after the class using a combination of physical fitness measures, including weight, percentage of body fat, body circumference, and strength measures. Forty-nine subjects participated in strength training, twice a week for a total of 12 weeks. At the end of the class, participants were asked to respond to 9 open-ended questions dealing with perceptions of body image. Physical results of the study showed a mean weight gain of 1 lb, an average increase in body fat of 0.9%, and a 5–11 lb improvement in maximal lifting ability. In addition, most subjects reported that they felt healthier and more fit and had an improved body image and a better attitude about their physical selves after strength training. In this study, exercise using strength training improved strength and body image in women.

Key Words: body esteem, exercise


Introduction

Body image is the mental picture of the physical self, with feelings about this image being based on cultural ideals (11). This image can have little resemblance to how a woman actually looks, weighs, or is measured objectively in fat or muscle. A positive body image would seem to be related to a woman’s overall sense of self-esteem, normal eating, and exercise habits (1). Most important, many researchers propose that body image, particularly a distorted body image, is related to eating disorders in women (2, 3). Dissatisfaction with weight and a negative body image are strong motivators for engaging in restrictive dieting (5). Researchers investigated whether physical self-perceptions could be changed by either aerobics or weight training using quantitative psychological instruments (4). They found that both fitness and physical self-perceptions were enhanced by participation in exercise.

The purpose of this research on body image and exercise was directed at further investigating whether subjects’ perceptions of body image, when measured using a qualitative study design, indicated any change in either specific or global body satisfaction as a result of a 12-week program of strength training. The qualitative study design used the natural setting where data were gathered using subjects’ own words describing their feelings toward their bodies after a course in strength training.

A positive or negative effect on body image would have an implication on the use of exercise, particularly strength training, as a method to improve body image. For future research this study recorded how strength training affected weight, percentage of fat, and strength during a semester-long course. These factors may or may not relate to a change in body image, but we believed that it was important to record these for future studies.

Methods

Experimental Approach to the Problem

This study was designed to answer the question of what effect strength training has on body image in women by asking questions and recording women’s responses to a qualitative questionnaire at the end of a strength training course. The null hypothesis in similar research studies is that exercise has no effect on a woman’s body image.

Subjects

College women were enrolled in a strength training class for women at a 4-year, midwestern, comprehensive institute. Their mean (±SD) age, weight, and percentage of body fat were 20 ± 2.4 years, 139 ± 31.99 lb, and 23.83 ± 5.46% fat, respectively. All 49 subjects were Caucasian. An institutional review board for human ethics approved the protocol and participants before participation in exercise and pretest measures.
Subjects signed an informed consent. All testing and exercise sessions adhered to American College of Sports Medicine guidelines.

**Strength Training**
Subjects participated in strength training classes twice a week for 50 minutes (workout time is approximately 40 minutes for 12 weeks). Two weeks at the beginning of the 16-week semester and 2 weeks at the end were spent on testing, organizing, and providing general instruction. During each class, subjects were taught to stretch both before and after each strength training session. The first 4 weeks of active class time were spent learning and practicing weight exercises specific to muscle groups, such as bench press, biceps curl, and triceps extension, for 3 sets of 10–12 repetitions. Corresponding stretches were demonstrated and practiced at the end of each session. After this, subjects spent 2 weeks exploring various types of weight-training programs (pyramid [repetitions of 10, 8, 6], endurance [repetitions of 15 for 2 sets], or toning [3 sets of 10–12 repetitions]). Each subject was then asked to select one of the programs that was most aligned with her individual goals for the semester. Program selections were recorded on note cards. Subjects were required to have the instructor review their programs. Subjects spent the subsequent 6 weeks following their individual programs of strength training. A total of 12 weeks was spent in active weightlifting.

**Measures**
Subjects’ pre- and posttraining measures of weight were taken using a balance beam scale. Percentage of body fat was measured before and after training using the John Bull skinfold caliper to take measurements of the thigh, suprailiac, and triceps. A percentage of fat value was derived from equations developed by Jackson et al. (7).

Strength was assessed using the amount of weight students could lift comfortably 10 times without undue strain for each muscle group. Strength was assessed for biceps, triceps, leg press, hamstrings, and quadriceps. Circumferences were measured in inches using standard sites of shoulder, chest, arm, hips, thighs, calf, and waist with a standard tape measure. Physical evaluation was done at the end of the course, with the same person evaluating skinfold measures, strength, total weight, and circumferences.

During the course, we developed a qualitative questionnaire. This questionnaire asked subjects to reflect on changes in their overall health and body image as well as their attitude toward perceived physical changes as a result of the program. The questionnaire was given to a panel of experts to establish content and face validity and to students outside the class to test for clarity in reading. At the end of the course, subjects were invited to respond to this questionnaire. Instructions were given to students at this time to remind them that completing the questionnaire was not compulsory and would not affect their course grade.

**Statistical Analyses**
Pre- to posttraining changes (post-pre) were calculated for each of the physical measures obtained in the study. The related samples $t$-test was used to evaluate the statistical significance of each of the 15 average changes. To control for the inflation of the type-I error rate, the alpha level of 0.05 was adjusted using the Bonferroni technique (10). Therefore, the alpha level used to assess each average change for the statistical significance was 0.05/15 or 0.00333. Finally, to assess the magnitude of the change, Cohen's $d$ was calculated by dividing each average change by the pooled pre- and posttraining standard deviations. The $d$ values were compared with the conventional effect sizes of 0.2, 0.5, and 0.8 to indicate small, moderate, and large changes, respectively (6).

For the open-ended questionnaires, the participant’s responses were examined for each of the 9 items. Phrases that pertained to the effect of strength training on overall health and fitness, body image, and attitude toward physical changes were identified. These phrases were grouped in conceptually distinct categories, and the number of individuals who mentioned these category phrases were counted.

**Results**
Table 1 shows the pre- to posttraining average changes for each of the physical measures. Average changes in weight and percentage of fat were quite small. On average, subjects gained 1.08 lb and 0.9% body fat. Neither of these gains were statistically significant, and the $d$ values reflect trivial gains. Circumference changes, on average, were small (less than 1/3 of an inch) and were not statistically significant, except for the thigh circumference. On average, the thigh circumference was reduced by nearly an inch, and the $d$ value suggests that it represents a moderate-sized change. Finally, strength gains, on average, were all positive, as expected, and ranged from about 5 to 11 lb. Four of the strength gains were statistically significant, with 3 of the gains being of moderate size and the fourth gain, biceps strength, being substantial.

Of the 41 participants who completed the open-ended questionnaire, 97.5% indicated that they felt healthier and more fit after the strength training (Table 2). The phrases they used alluding to health and fitness were “toned up,” “stronger,” “more fit,” “in-shape,” “more energy,” and “healthier.” In addition, 51.2% of the participants indicated that perceptions of their body image improved after the training class. In describing their feelings toward their body or body image, subjects used phrases such as “look better,” “improved body-image,” “acceptance of self,” “self
Table 1. Group means for change in percentage of body fat, circumference, and strength experienced by subjects.

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Pretraining mean (SD)</th>
<th>Posttraining mean (SD)</th>
<th>Change</th>
<th>Cohen's d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body fat (%)</td>
<td>41</td>
<td>23.83 (5.46)</td>
<td>24.75 (5.61)</td>
<td>+0.90</td>
<td>0.16</td>
</tr>
<tr>
<td>Weight (16)</td>
<td>35</td>
<td>139.02 (31.99)</td>
<td>140.11 (31.99)</td>
<td>+1.08</td>
<td>0.03</td>
</tr>
<tr>
<td>Circumferences</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulder (in.)</td>
<td>42</td>
<td>40.42 (2.87)</td>
<td>40.16 (2.45)</td>
<td>−0.26</td>
<td>0.10</td>
</tr>
<tr>
<td>Chest (in.)</td>
<td>41</td>
<td>35.59 (3.13)</td>
<td>35.66 (3.04)</td>
<td>+0.07</td>
<td>0.02</td>
</tr>
<tr>
<td>Arm (in.)</td>
<td>42</td>
<td>10.91 (1.31)</td>
<td>11.14 (1.45)</td>
<td>+0.22</td>
<td>0.16</td>
</tr>
<tr>
<td>Hips (in.)</td>
<td>42</td>
<td>35.45 (4.78)</td>
<td>35.73 (4.32)</td>
<td>+0.27</td>
<td>0.06</td>
</tr>
<tr>
<td>Thighs (in.)</td>
<td>41</td>
<td>21.54 (2.22)</td>
<td>20.67 (1.98)</td>
<td>−0.87*</td>
<td>0.42</td>
</tr>
<tr>
<td>Calf (in.)</td>
<td>42</td>
<td>14.02 (1.87)</td>
<td>13.95 (1.21)</td>
<td>−0.07</td>
<td>0.06</td>
</tr>
<tr>
<td>Waist (in.)</td>
<td>41</td>
<td>28.75 (4.17)</td>
<td>28.87 (3.88)</td>
<td>+0.12</td>
<td>0.03</td>
</tr>
<tr>
<td>Strength</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biceps</td>
<td>42</td>
<td>35.71 (11.55)</td>
<td>46.66 (9.60)</td>
<td>+10.95*</td>
<td>1.03</td>
</tr>
<tr>
<td>Triceps</td>
<td>40</td>
<td>39.06 (7.61)</td>
<td>43.87 (7.78)</td>
<td>+4.81*</td>
<td>0.62</td>
</tr>
<tr>
<td>Leg press</td>
<td>42</td>
<td>76.54 (15.55)</td>
<td>84.16 (13.43)</td>
<td>+7.61*</td>
<td>0.53</td>
</tr>
<tr>
<td>Hamstrings</td>
<td>39</td>
<td>62.30 (14.41)</td>
<td>67.56 (14.04)</td>
<td>+5.25</td>
<td>0.37</td>
</tr>
<tr>
<td>Quadriceps</td>
<td>39</td>
<td>69.48 (15.20)</td>
<td>74.35 (12.52)</td>
<td>+4.87</td>
<td>0.35</td>
</tr>
<tr>
<td>Chest</td>
<td>40</td>
<td>73.30 (12.84)</td>
<td>81.87 (13.76)</td>
<td>+8.57*</td>
<td>0.64</td>
</tr>
</tbody>
</table>

* p < 0.00333.

Table 2. Most frequent responses to open-ended body image questions.

<table>
<thead>
<tr>
<th>Response category</th>
<th>n</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good health and fitness</td>
<td>40</td>
<td>97.5</td>
</tr>
<tr>
<td>Positive body image and feelings toward body</td>
<td>21</td>
<td>51.2</td>
</tr>
<tr>
<td>Positive attitude toward physical self and physical changes</td>
<td>35</td>
<td>85.3</td>
</tr>
<tr>
<td>Neutral or negative comments</td>
<td>10</td>
<td>24.3</td>
</tr>
</tbody>
</table>

Discussion

In this study, strength training generally did not substantially change participants’ weight, percentage of fat, or circumferences. This result may stem from the short duration of the weightlifting experience or can reflect biological set point. Twelve weeks of active weightlifting may be too short a time to bring about greater changes in the percentage of fat or the circumferences. Weight and percentage of fat may be biologically set for some individuals and are difficult to alter. Strength generally improved as a result of strength training. As expected, the gain made them feel stronger, healthier, and more positive about themselves.

Qualitative research looks for new relationships or deeper understanding of concepts like women’s perception of their body image. In this study the most common response from subjects indicated that they felt more toned up, better about themselves, more confident, healthier, and more positive about their body at the end of the strength training class. The attempt to evaluate the effect of body image on exercise used an open-ended qualitative format, which might have allowed for individual perceptions of body image to be shared. The results of this study validate researchers’ experience of strength training for women.

Practical Applications

There is an emerging desire in women to feel toned, healthy, and better about themselves. Other studies also have reported that exercise leads to greater self-
The results from this study indicate that women express a desire to feel good about themselves rather than to conform to a specific weight or size. Subjects expressed a feeling that a positive body image is more an internal wholeness rather than an attitude toward specific body parts. The items mentioned in this study point to a positive relationship between body image and exercise, as indicated by other studies (4).

Although this study was limited by the small sample and lack of minority individuals, the strength of this study was that diet was deliberately not monitored, recorded, measured, or commented on. No emphasis was placed on dieting to reduce weight or percentage of body fat, which is a source of frustration and leads to feelings of failure for many women. The new paradigm of weight management emphasizes that health and fitness leaders must promote positive feelings about self, normalized eating, and being physically active, as part of the new balanced approach to weight management, greater health, and well being (12).

Perhaps the goal of exercise, specifically strength training, needs to be reexamined in the field. Some research indicates that exercise for health, not weight loss, contributes to a more positive body image (5). This study provides further evidence for this hypothesis. Although the long-term goals of strength gains and weight maintenance still stand as benefits of exercise, equally important to women is the notion of feeling better about their bodies. Self-acceptance should be an important goal for health and fitness leaders. When individuals accept themselves just as they are, behavior change in other areas of health are more likely to occur (8, 9).

If strength training continues to reveal itself as a positive force for women in improving body image, it should be embraced for this purpose alone. A word of caution is that the findings of this study can be generalized only to the college population studied. Further investigation of whether exercise affects the body image of men and women in different age and culture groups needs to be carried out.

Future studies should investigate qualitatively and quantitatively the changes occurring in body image as a result of differing kinds of exercise or activity.

References

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