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TRAINING VS. BODY IMAGE: DOES TRAINING IMPROVE SUBJECTIVE APPEARANCE RATINGS?

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ABSTRACT. Anderson, M.L., C. Foster, M.R. McGuigan, E. Seebach, and J.P. Porcari. Training vs. body image: Does training improve subjective appearance ratings? *J. Strength Cond. Res. 18(2):255–259. 2004.*—The purpose of this study was to determine if a short-term exercise program (6 weeks) could improve subjective physical appearance ratings. Twenty-five previously sedentary adult men (aged 18–40 years) were randomly assigned to one of 3 training groups: cardiovascular, strength, or control. Subjects participating in an exercise group trained for an average of 34 minutes, 3 times per week. All subjects were pre- and posttested to determine body composition, strength, and cardiovascular fitness. Subjects were also digitally photographed from 4 angles. The photographs were rated by the subjects and by a panel of 6 judges using an analog scale. There was no significant difference in the groups by trials interaction effect for pre- and post-$\dot{V}O_2$max, percent fat, total lean tissue, percent limb fat, percent trunk fat, lean trunk tissue, or lean limb tissue. The subjects rated themselves higher than the panel, with average scores of 4.74 vs. 3.46, 4.26 vs. 3.10, and 4.61 vs. 3.49 for the cardiovascular, strength, and control groups, respectively ($p < 0.05$). The men of the panel rated the subjects significantly higher than did the women, with average scores of 4.61 vs. 2.31, 4.13 vs. 2.06, and 4.53 vs. 2.18 for the cardiovascular, resistance, and control groups, respectively ($p < 0.05$). This study showed that a 6-week training program did not change self-rated or panel-rated appearance scores.

KEY WORDS. fitness programs, attractiveness, shoulder-to-waist ratio, self-perception

INTRODUCTION

Physical attractiveness is a powerful social variable in contemporary society. Physically attractive individuals have been shown to have several advantages over less physically attractive individuals, including more socially desirable personalities, more total happiness, and more successful lives (8). In addition, physically attractive individuals are more likely to find an acceptable life partner, marry sooner, and be better spouses (8). Other studies have shown that physically attractive people are more likely to be recommended for hire during a job interview (9), are more likely to have their written work evaluated favorably (14), and are more likely to be better psychological counselors (5). Several makers of fitness products and fitness programs make claims about the potential improvements in appearance and body composition in a relatively short time. Through the media, we are bombarded with infomercials, TV commercials, and Internet advertisements promoting new fitness products with guarantees to see results in "just 6 weeks, 20 minutes per day, 3 times per week" (26) or in 12 weeks, 30 minutes per day, 3 times per week (4).

Although the physiological and psychological benefits of exercise are plentiful, studies designed to determine personal incentives for exercise have shown that improved physical attractiveness is "the major motivating factor for participation in an exercise program" (11, 16, 23). Other studies support the idea that people exercise to enhance body appearance and to lose or control weight (6, 18, 19, 20). Other, similar motivating factors for exercise include improved romantic appeal (10) and muscle development (19).

Exercise is recommended as an important component of programs to modify body composition (1). However, it has been suggested that exercise alone is not as effective in causing weight loss and changes in body composition as is dietary modification (2). It has been recommended that if the primary purpose of training is to induce changes in body composition, then programs should have greater frequency and duration and be of moderate intensity (1). Most studies have investigated changes in body composition with training programs of longer durations (>8 weeks). There is, however, a paucity of research that has reported changes in body composition with short-term training programs.

While there is literature to support the concept that exercise can improve self rated appearance (19, 22), there are limited studies that include within-subject changes in appearance over a period of time. In addition, current research is lacking data regarding appearance ratings of the subjects by a panel of judges. Therefore, the purpose of this study was to determine if a short-term exercise program (6 weeks) could improve subjective physical appearance ratings by both the subject and a panel of judges.

METHODS

Experimental Approach to the Problem

In this study, previously sedentary men participated in a designed exercise program to determine if moderate exercise is adequate to change self-rated appearance scores as well as panel-rated appearance scores. We hypothesized that self-rated appearance scores would improve significantly following 6 weeks of cardiovascular or resistance training but that panel-rated appearance scores would remain unchanged following an exercise training program. We also hypothesized that we would see an increase in objective measures as a result of the exercise program, including an increased $\dot{V}O_2$max in the cardiovascular group and an increased push-up max in the strength group. A 6-week training intervention was used, since this is the length of time that several equipment

Table 1. Mean (±*SD*) preintervention characteristics of the subjects.

	n	Height (cm)	Mass (kg)	Age (years)
Cardiovascular exercise	9	179 (5)	80.4 (10.8)	20.9 (2.4)
Resistance training	9	181 (10)	91.0 (24.2)	26.4 (7.5)
Control group	7	178 (8)	85.6 (9.7)	26.6 (6.5)
Total	25	179 (8)	85.6 (16.7)	24.5 (6.2)

manufacturers claim is needed to significantly alter body composition and appearance.

Subjects

Twenty-eight apparently healthy, previously sedentary (for ≥6 months) men were recruited for this study. Twenty-five subjects completed this study, with 3 noncompliant subjects. Table 1 shows the average values for preintervention data for subjects completing this study.

In addition, a panel of 3 men and 3 women of similar age to the subjects were recruited to objectively rate the physical appearance of the participants in this study from standard photographs.

Procedures

Following approval from the University of Wisconsin-La Crosse Institutional Review Board for the Protection of Human Subjects, participants provided informed consent and completed a health history questionnaire to exclude subjects with contraindications to exercise testing/training. The participants were assigned code numbers and randomly assigned to one of 3 training groups: a cardiovascular group, a strength group, and a control group.

Prior to the intervention program, all participants underwent body composition assessment using dual-energy x-ray absorptiometry (DEXA), skinfolds (10 sites: triceps, subscapular, biceps, iliac crest, supraspinale, abdominal, front thigh, medial calf, chest, and midaxilla), girths (11 sites: shoulder, arm relaxed, arm flexed, forearm, wrist, chest, waist, gluteal, thigh, calf, and ankle), and breadths (2 sites: humerus and femur) using well-accepted methods (15). Coefficients of variation on repeat scans on a group of men and women in our laboratory for fat mass and lean body mass were 1.4 and 0.5%, respectively.

$\dot{V}O_2$max testing was performed with open-circuit spirometry during uphill treadmill running using an individually selected velocity and 2.5% increments in grade every 2 minutes. This test was used to determine the subjects' cardiorespiratory endurance. A push-up test was also completed as a measure of strength. Subjects completed a maximum number of full-lever push-ups, without time limitations or imposed rates. The participants were photographed with a digital camera from 4 angles (anterior, posterior, right lateral, and left lateral) wearing swim briefs. An example photograph of a subject is shown in Figure 1. Facial features and all identifiable skin blemishes, tattoos, and piercings were blocked to protect participant confidentiality. A caloric intake survey was also completed for later measures of quality control. The subjects were given no specific instructions regarding nutrition, other than being told to maintain their normal diet.

FIGURE 1. An example photograph of a subject from the anterior angle.

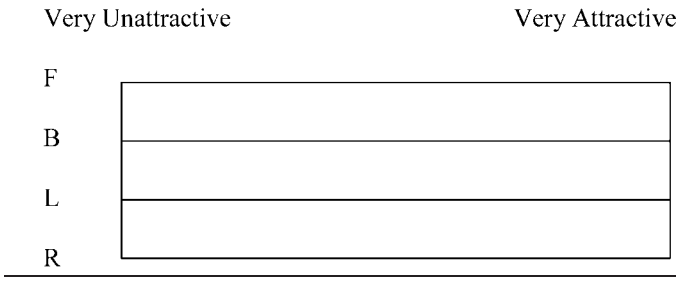

FIGURE 2. Attractiveness-rating analog scale.

Training Programs

The participants then began their assigned exercise programs. The exercise training sessions continued for 6 weeks. The cardiovascular group participated in cardiovascular exercise 3 days per week for 20 minutes each session. They trained at a heart rate equivalent to 60–80% of their $\dot{V}O_2$max and were allowed to choose between running, walking, cycling, or cross-training. The strength group participated in exercise 3 days per week as well. The strength-training protocol involved high-intensity, total-body strength training designed to be 30 minutes in duration. Subjects in the strength group completed 2 sets of each exercise with 10–15 repetitions in each set. The exercises consisted of both free-weight and machine exercises (Magnum Fitness Systems, Milwaukee, WI). The control group was asked to refrain from systematic physical activity for 6 weeks.

A mid-study caloric intake survey was taken to ensure that appearance changes were the direct result of the exercise program and not changes in diet. After the 6-week training session, the following tests were repeated: push-ups, $\dot{V}O_2$max testing, body composition, and objective and subjective appearance ratings.

Appearance Ratings

The appearance ratings were completed using an analog scale developed by the authors. Figure 2 shows the scale used by both the subjects and panel to rate the appearance of the subjects. Each line is 10 cm long and represents a different angle. The far left side of the scale was

Table 2. Mean (±*SD*) values for objective outcome variables.*†

	Cardio pre	Cardio post	Strength pre	Strength post	Control pre	Control post
Weight (kg)	80.3	79.9	91.0	91.3	85.6	86.2
	(10.8)	(11.9)	(24.2)	(23.3)	(9.7)	(11.0)
Sum of skinfolds	154.66	156.40	198.16	202.79	187.73	190.59
	(66.76)	(70.26)	(78.99)	(83.12)	(48.48)	(47.65)
Total % fat	22.12	21.86	25.68	25.63	25.59	26.27
	(8.33)	(9.03)	(7.91)	(7.50)	(4.31)	(4.22)
Total lean mass (kg)	58.01	58.02	58.91	59.58	59.689	60.42
	(5.36)	(4.50)	(8.22)	(7.35)	(7.66)	(8.23)
Trunk % fat	25.14	24.79	29.78	30.16	29.67	30.60
	(10.45)	(11.37)	(9.78)	(8.81)	(4.84)	(4.37)
Trunk lean mass (kg)	29.38	27.06	27.24	27.85	27.71	29.33
	(9.86)	(1.67)	(3.10)	(2.84)	(3.26)	(11.16)
Limb % fat	38.01	37.31	41.79	40.34	42.39	43.29
	(13.95)	(15.01)	(13.62)	(12.86)	(9.19)	(9.55)
Limb lean mass (kg)	25.04	24.94	25.39	24.90	25.48	25.94
	(6.97)	(6.85)	(8.02)	(7.68)	(8.08)	(8.49)
Shoulder girth (cm)	113.44	112.83	117.06	119.06	112.43	116.71
	(5.70)	(5.52)	(10.41)	(11.49)	(4.93)	(5.57)
Waist girth (cm)	83.50	85.11	90.56	89.61	87.00	88.50
	(9.04)	(10.89)	(11.70)	(11.82)	(3.03)	(3.65)
SWR++	1.37	1.34	1.30	1.34	1.29	1.32
	(0.10)	(0.13)	(0.10)	(0.10)	(0.06)	(0.06)
Arm flexed (cm)++	34.2	33.7	35.8	36.6	35.6	35.9
	(3.2)	(3.4)	(4.7)	(4.8)	(2.1)	(2.6)
Thigh girth (cm)	59.9	58.3	65.0	63.6	62.9	65.3
	(5.9)	(21.4)	(6.3)	(6.5)	(3.8)	(4.1)

* SG = shoulder girth; SWR = shoulder-to-waist ratio.
† + denotes significant change pre vs. post; ++ denotes significant change pre vs. post with interaction.

labeled "very unattractive," and the far right side of the scale was labeled "very attractive." Subjects were asked to place a mark on the scale showing how they perceived their own physical attractiveness for each photographed angle. They were first shown their pretraining photos and then their posttraining photos within the same session. The panel members were also shown the photographs and asked to rate the appearance of the subjects pre- and postexercise. The reliability of this scale has not been established.

Statistical Analyses

The following items were then statistically assessed: pre- and posttest subjective appearance ratings between groups, pre- and posttest push-up scores, $\dot{V}O_2$max, and body composition. Repeated-neasures analysis of variance was used to compare pre- and posttest measures among groups. The level of significance for all tests was accepted at $p \leq 0.05$.

RESULTS

The data analysis (Table 2) showed no change in objective measures pre- and posttraining among groups. There was no significant difference in the groups by trials interaction effect for pre- and post-$\dot{V}O_2$max, percent fat, total lean tissue, percent limb fat, percent trunk fat, lean trunk tissue, or lean limb tissue ($p > 0.05$). Changes in lean limb tissue were nearly significant ($p = 0.052$). There was a significant increase in the mean number of push-ups completed by all subjects ($p < 0.05$, mean = 32.92 vs. 35.80); however, there was no significant interaction effect.

A comparison of the sum of skinfolds revealed no significant changes following the 6-week exercise program ($p > 0.05$). Shoulder girth increased (mean = 114.46 vs. 116.16 mm) pre- vs. posttraining; however, there was no significant interaction effect. This increase in shoulder girth caused a significant difference in the shoulder-to-waist ratio pre- and posttesting with an interaction effect ($p < 0.05$, mean = precardiovascular training 1.37 vs. 1.34, strength training 1.30 vs. 1.34, and control 1.29 vs. 1.32).

The pre- vs. mid-study caloric intake survey revealed no significant changes in the subjects' eating patterns during the duration of the study.

There were no significant differences in the pre- vs. posttest measures in self-rated appearance scores (Figure 3). The combined panel showed a significant change in pre- vs. posttest appearance ratings; however, no significant interaction effect was observed. When the panel was divided by sex, the female panel members did not show a significant difference in the pre- vs. posttest appearance ratings ($p > 0.05$); however, the men of the panel rated a significant pre- vs. posttest change ($p < 0.05$).

A comparison of the subject-rated appearance scores and the panel-rated appearance scores revealed a statistically significant difference ($p < 0.05$). The subjects rated themselves higher than the panel, with average scores of 4.74 vs. 3.46, 4.26 vs. 3.10, and 4.61 vs. 3.49 for the cardiovascular, strength, and control groups, respectively. A comparison between the men and women of the panel showed a significant difference ($p < 0.05$). The men of the panel rated the subjects significantly higher than the women, with average scores of 4.61 vs. 2.31, 4.13 vs. 2.06, and 4.53 vs. 2.18 for the cardiovascular, resistance, and control groups, respectively.

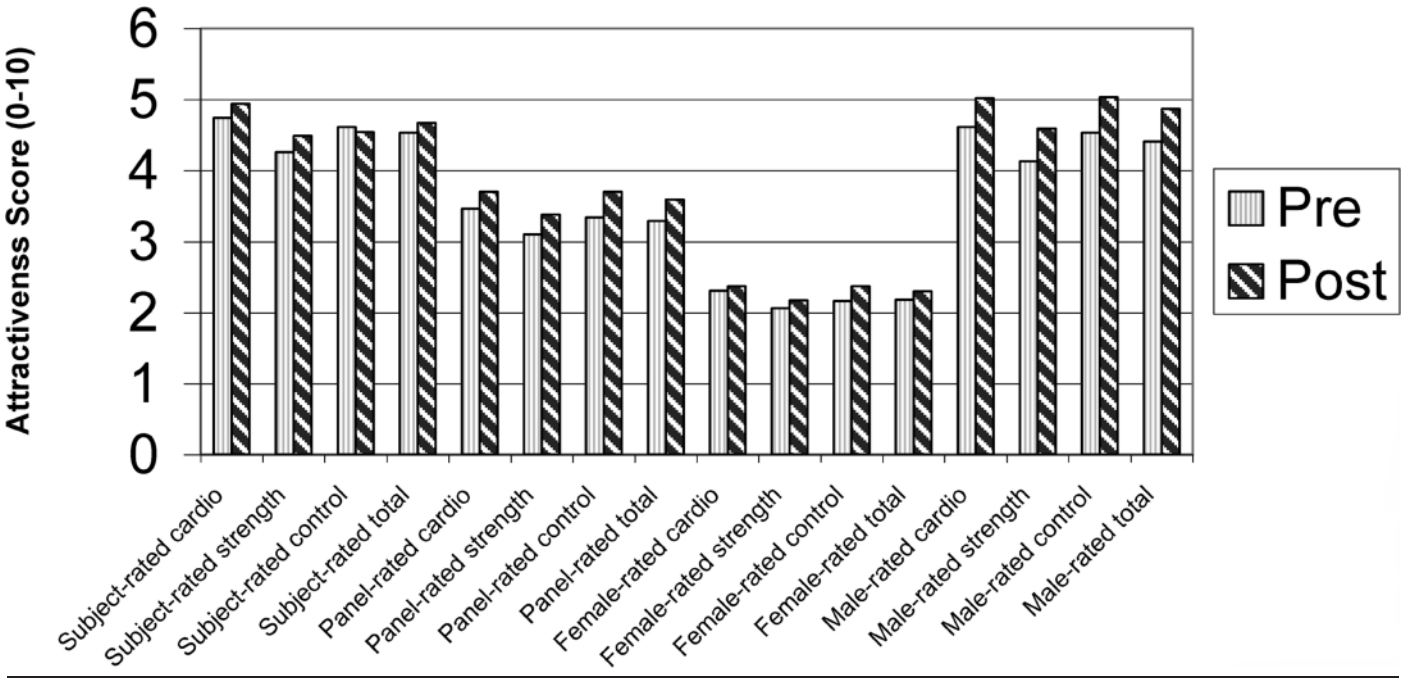

FIGURE 3. Subject- and panel-rated attractiveness scores.

DISCUSSION

The major finding of this investigation is that a short-term training program of either cardiovascular or strength training did not change either self-rated or panel-rated appearance scores for male adults. There were also no significant changes in body composition in either of the training groups after 6 weeks of exercise. The failure to improve global attractiveness was the main outcome of this study. Williams and Cash (27) showed improved body image following a circuit-weight training program. We failed to show an increase in attractiveness (a component of body image) with this study. There are several possible reasons for the differences. The first is that appearance is only one aspect of body image, and there are several studies to suggest that exercise improves overall body image (7, 13, 24) but few that specifically examine appearance (19, 22). This study suggests that a 6-week intervention program is not sufficient to improve self-rated appearance scores. In addition, the use of a panel of judges showed that there were no outward changes in appearance. Together, these findings imply that a 6-week intervention program is not sufficient to change appearance. These findings contradict the popular claims by products in the fitness industry that promise results in a relatively short time (4, 26).

Note the difference in attractiveness ratings between the men and women of the panel. It is known that both genders are critical judges of various dimensions of appearance (12). Women have been shown to prefer men of moderate size with a somewhat V-shaped physique (3). The possible cause of the lower scores from the women is the size of the subjects involved in this study. Most of the subjects in this study varied in size and shape, partially the result of their sedentary lifestyles, polarizing to the extremes of extremely thin and extremely overweight. The reason for the difference between panel-rated appearance scores and subject-rated appearance scores is unknown and presents an interesting topic for further research.

It is not the intention of this study to imply that a 6-week training program is unable to alter physiological variables associated with training. However, the failure to change demonstrated by the subjects participating in this study suggests otherwise. A recent study by Williams and Cash (27) demonstrated significant strength gains in both the upper and lower body with a 6-week circuit weight-training program. Subjects participating in this study were also screened to exclude those who had participated in a regular strength-training program within the past year. Several reasons for the difference between these 2 studies exist and warrant further discussion.

The first of these reasons, and perhaps the largest, is the issue of adherence. Subjects participating in this study were encouraged, although not required, to exercise in a supervised setting, and exercise program cards were to be turned in at the end of the week. These cards provided information as to the length of the workout, the number of exercise sessions, the workload, and the intensity. According to the training logs, the subjects trained 15–16 times of a possible 18 workouts. Subjects participating in the study by Williams and Cash (27) were enrolled in a strength-training class in which the attendance and supervision of the training protocol were more tightly controlled. Studies have shown increased strength gains as the result of a directly supervised training program vs. an unsupervised training program (17).

The second reason involves the differences among the actual protocol. Subjects participating in this study were assigned to participate in either strength training or cardiovascular training or to remain sedentary. No overlap in training was allowed. The study by Williams and Cash (27) allowed for overlap in training modes, and 49% of the subjects in their study also engaged in cardiovascular exercise on a regular basis. Exercise programs involving

cardiovascular training and strength training, as well as a reduction in daily caloric intake, are likely to show different results. Further, many of the commercially popular programs that promise results within 6 weeks have highly detailed and specific dietary adjuncts to the exercise program.

The last reason involves actual adaptations to training. The neuromuscular system requires an activation of all of the available muscle fibers during maximal activity. The number and size of motor units increase with an increased workload on the active muscle (21). There is debate whether untrained individuals are able to produce maximal recruitment. However, there is evidence to suggest the ability to recruit all of the available muscle fibers is an adaptation associated with exercise training (21). The exact duration of this process is dependent of the type and intensity of training (25). Muscle hypertrophy is dependent on the demands placed on the neuromuscular system and appears to require a program longer than 16 workouts to increase the contractile protein within the muscle cells (25). Therefore, the increase in strength measured by Williams and Cash (27) was likely the result of increased neuromuscular adaptation, and the failure to increase strength in the resistance-trained participants in this study was likely the result of insufficient demand placed on the working muscles.

According to the results of this study, we can conclude that 6 weeks is not sufficient to change self-rated subjective appearance ratings in previously sedentary men. In addition, a 6-week program fails to change panel-rated appearance ratings significantly. Whether a longer or more demanding program, or a program coupled with extensive nutritional modification, would be more effective remains to be demonstrated.

PRACTICAL APPLICATIONS

The practical applications of this study include a heightened awareness to nonsupportable claims made by the makers of fitness products and fitness programs. This study showed that a moderate exercise program similar to those advertised on television and the Internet is not capable of significantly changing physical appearance within a 6-week timeframe. Health and fitness professionals should use caution when approached with products or programs promising to do so in or under 6 weeks using a single mode of exercise.

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