TRAINING VS. BODY IMAGE. DOES TRAINING IMPROVE SUBJECTIVE ATTRACTIVENESS RATINGS?

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Abstract

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Appearance ratings were taken on 25 adult males before and after an exercise intervention program to determine the relationship between a 6-week training program and improved physical appearance and to identify a relationship between shoulder-to-waist ration and appearance scores. Adult male subjects (18-40 yr) who were previously sedentary were randomly assigned to one of three groups, cardiovascular, strength or control. Subjects participating in an exercise group performed assigned activities for an average of 34 minutes, 3 times a week. All subjects were pre and post tested on body composition, strength and cardiovascular fitness. Subjects were also digitally photographed from 4 angles. The photographs were rated by the subjects and a panel of 6 judges with an analog scale. This study shows that a 6-week training program is not sufficient to change self-rated or panel-rated attractiveness scores for adult males. In addition, insignificant changes in attractiveness precluded further analysis on the relationship between shoulder-to-waist ratio and appearance scores.

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THESIS FINAL ORAL DEFENSE FORM

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We recommend acceptance of this thesis in partial fulfillment of this candidate's requirements for the degree:

Master of Science in Adult Fitness/Cardiac Rehabilitation

The candidate has successfully completed the thesis final oral defense.

Signature of Thesis Chairperson	Department	Date
Signature of Committee Member	Department	Date
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This thesis is approved by the College of Health, Physical Education, Recreation, and Teacher Education.

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Introduction

Physical attractiveness is a powerful social variable in today's society. Physically attractive individuals have been shown to have several advantages over less physically attractive individuals. According to Dion, Berscheid, and Walster (1), physically attractive individuals have more socially desirable personalities, they will have more total happiness and live more successful lives. In addition, they showed that physically attractive individuals are more likely to find an acceptable life partner, marry sooner and be better spouses. Other studies have shown that physically attractive people are more likely to be recommended for hire during a job interview (2) they are more likely to have their written work evaluated favorably (3) and to be better psychological counselors (4).

When judging the physical attractiveness of members of both the opposite and same sex, men and women tend to prefer certain physical characteristics. When judging the physical attractiveness of women, both sexes take body scent, nose, lips, waist, thigh, body build, buttocks, appearance of eyes, breasts, cheeks/cheekbones, hips, figure, appearance of stomach, health, physical condition, face, weight and legs into consideration (5). In addition, men evaluate women based on their sex drive, sex organs and sex activities (5). Men tend to prefer moderately sized, evenly proportioned women with small buttocks (6). It has long been suggested that women are evaluated on characteristics related to reproductive success (7-9). Curvaceous women with waist-to-hip ratios of 0.7-0.8 have been shown to be preferable to men and in most cases are healthier, more fertile women (10).

The physical attractiveness of a male is similarly evaluated. In men, both sexes are critical judges of muscular strength, waist, thighs, body-build, physical coordination, physical condition, shoulder width, arms, chest, physique, appearance of stomach, weight, agility, sex drive, sex activities, and face. Men are more critical judges of masculine body scents, physical stamina, buttocks, appearance of eyes, legs, and health (5). Women have been shown to prefer men of moderate size with small buttocks and somewhat larger chests (6). More feminine women have been shown to traditionally prefer men with a larger shoulder width with an upper body tapering, classically known as the "V" or "atlas" physique (11,12).

In addition to knowing which body parts are evaluated when judging physical attractiveness, it has been shown that the ideal body form has changed over the years. A study by Garner, Garfinkel, Schwartz, and Thompson (13) showed a significant decrease in weight of *Playboy* centerfolds and Miss America Pageant contestants over a 20-year period of time (1959-1978). The changing ideal body form and social pressures have lead many Americans to feel dissatisfied with their appearance; men want to be bigger and women want to be thinner (14). "We are obsessed with being thin, beautiful, young and sexy, and we will go to extraordinary lengths to approach those ideals" (15). As a result, each day we are bombarded with infomercials, TV commercials, and internet ads promoting new fitness products with guarantees to see results in "just 6 weeks: 20 minutes per day, 3 times a week", (16) or ads promising lean, beautiful, sexy hips in just 3 minutes a day (17).

Physical activity is also responsible for improved psychological functioning, reduced amounts of anxiety and depression (18), improved mood state, improved self-sufficiency, improved self-efficacy and enhanced body image and healthier self-attitude (18-26).

Although the physiological and psychological benefits of exercise are plentiful, scales developed to determine personal incentives for exercise have shown that improved physical attractiveness is still "the major motivating factor for participation in an exercise program" (27-29). In addition, other studies have supported the idea that Americans exercise to enhance body appearance and to loose or control weight (21,30-32). Other similar motivating factors for exercise include improved romantic appeal (33) and muscle development (31).

While there is current literature to support the idea that exercise can improve self rated appearance (31,34), there are limited studies that include same-subject changes in appearance over a period of time. In addition, current research is lacking 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 the panel of judges. In addition, this study also examined the relationship between the shoulder-to-waist ratio and appearance ratings.

In this study, we hypothesized that self rated appearance scores would improve significantly following 6 weeks of cardiovascular or resistance training. In addition we expected the panel rated appearance scores to remain unchanged following an exercise

training program. It was also hypothesized that we would see an increase in objective measures as a result of the exercise program, including and increased VO_{2max} in the cardiovascular group and increased push-up max in the strength group.

METHODS

Subjects

Twenty-eight apparently healthy, previously sedentary (for 6 months minimum), males were recruited for this study. Participants were recruited through flyers posted on campus. Twenty-five subjects completed this study, with three subjects unable to stick with the program. Table 1 shows the average values for pre-intervention data for subjects completing this study.

Table 1. Means (± Standard Deviations) of Pre-Intervention Descriptives

	n	Ht (cm)	Wt (kg)	Age (yrs)
Cardiovascular Exercise	9	178.64 (5.23)	80.35 (10.79)	20.9 (2.4)
Resistance Training	9	181.46 (9.57)	90.96 (24.19)	26.4 (7.5)
Control Group	7	178.16 (8.03)	85.55 (9.65)	26.6 (6.50)
Total	25	179.43 (7.64)	85.63 (16.68)	24.5 (6.2)

In addition, a panel of 3 males and 3 females were also recruited to objectively rate the physical appearance of the participants in this study from standard photographs. Table 2 demonstrates the demographic data from the panel members.

Table 2. Means (± Standard Deviations) of Panel Member Descriptives

	n	Ht (cm)	Wt (kg)	Age (yrs)
Female Panel	3	171.03 (10.57)	67.42 (10.74)	24.33 (2.31)
Male Panel	3	192.19 (22.77)	90.30 (13.25)	24.33 (2.51)

PROCEDURES

Following approval from the University of Wisconsin-La Crosse Institutional Review Board for the Protection of Human Subjects, participants were provided with a documented informed consent (Appendix A) and a health history questionnaire. The participants were assigned code numbers and randomly assigned into one of three groups, the cardiovascular group, the strength group, and the 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, midaxilla), girths (11 sites; shoulder, arm relaxed, arm flexed, forearm, wrist, chest, waist, gluteal, thigh, calf and ankle), and breadths (2 sites; humerus, femur), shoulder-to-

waist ratio and VO_{2max} testing. A push-up max test was also completed as a measure of strength. The participants were photographed from 4 angles (anterior, posterior, right lateral, and left lateral) wearing swim briefs (Appendix B). 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 participants then began their assigned exercise programs. The exercise training sessions ran for 6 weeks. The cardiovascular group participated in cardiovascular exercise 3 days a week for 20 minutes each session. They trained at a heart rate equivalent to 60-80% of their VO_{2max} and were allowed to choose between running, walking, cycling or cross training. The strength group participated in exercise three days a week as well, however, the strength training protocol involved high-intensity, total-body strength training designed to last 30 minutes in duration. Subjects in the strength group completed 2 sets of each activity with 10-15 repetitions in each set. Appendix C provides an example training log for both the cardiovascular and strength training groups. The control group was asked to refrain from systematic physical activity for 6 weeks.

A mid-study caloric intake survey was taken to insure that appearance changes were the direct result of the exercise program. Following the 6-week training session the following tests were repeated; push-ups, VO_{2max} testing, body composition, shoulder-to-waist ratio, and objective and subjective appearance ratings.

The appearance ratings were completed using an analog scale developed by the authors. Figure 1 shows the scale used by both the subjects and panel to rate the attractiveness of the subjects. Each line is 10 cm long, and represents a different angle. The far left side of the scale was labeled "very unattractive" and the far right side of the scale 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 pre-training photos and then shown their post training photos within the same session. The panel members were also shown the photographs and asked to rate the appearance of the subjects pre and post exercise respectively. Reliability of this scale has not been shown.

The following items were then statistically assessed; pre and posttest subjective appearance ratings between groups, pre and post test push-up scores, shoulder-to-waist ratio, VO_{2max} and body composition. In addition, statistical analysis was conducted to determine if an increased shoulder-to-waist ratio corresponds to improved attractiveness ratings. Repeated Measures ANOVA was used to compare pre and post test measures among groups.

Figure 1. Attractiveness-Rating Analog Scale

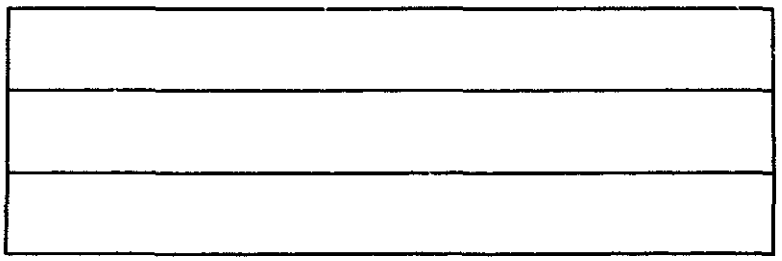
Very Unattractive Very Attractive

F

B

L

R



RESULTS

The data analysis showed a failure to change in objective measures pre and post activity among groups. There was no significant difference in the groups by trials interaction effect for pre and post VO_{2max}, 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 ($p = 0.052$), with the strength group showing a surprising decrease in lean tissue from 25.39kg to 24.90kg. DEXA body composition analysis was omitted for one subject due his large size and maximal size limits for accurate DEXA use. There was a significant increase in mean number of push-ups completed by all subjects ($p < 0.05$, means = 32.92 vs. 35.80), however there was no significant difference with the interaction effect ($p > 0.05$)

A comparison of the sum of skinfolds revealed no significant changes following the 6-week exercise program ($p > 0.05$). Shoulder girth increased (means = 114.46 vs. 116.16) pre vs. post-training, however there was no significant interaction effect. This increase in shoulder girth caused a significant difference in shoulder to waist ratio pre and

post-testing with an interaction effect ($p < 0.05$, means = pre-cardiovascular training 1.37 vs. 1.34, strength training 1.30 vs. 1.34, and control 1.29 vs. 1.32). Table 3 highlights major objective measures taken pre and post-intervention.

The mid-study caloric intake survey revealed no significant changes in the subjects eating patter throughout the duration of the study ($p > 0.05$).

There were no significant differences in the pre vs. posttest measures in self rated attractiveness scores ($p > 0.05$). The combined panel showed a significant change in pre vs. posttest appearance ratings; however, no significant interaction effect was noted ($p > 0.05$). When the panel was divided by gender, the female panel members did not show a significant difference in the pre vs. posttest appearance ratings ($p > 0.05$), however, when the male members of the panel rated the subjects involved there was a significant pre vs. posttest change ($p < 0.05$). There was no significance in the pre vs. posttest data by exercise program for the male rated appearance score ($p > 0.05$).

A comparison between 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 panel with average scores of 4.74 vs. 3.46, 4.26 vs.3.10, 4.61 vs. 3.49 for the cardiovascular, strength and control groups respectively. A comparison between male panel members and female panel members also showed a significant difference ($p < 0.05$). The male panel members rated the subjects significantly higher than the females with average scores of 4.61vs. 2.31, 4.13 vs. 2.06, and 4.53 vs. 2.18 for the cardiovascular, resistance and control groups respectively.

Figure 2 demonstrates the differences in mean appearance scores between the subjects and all aspects of the panel.

Table 3. Mean (± Standard Deviation) Values for Objective Outcome Variables

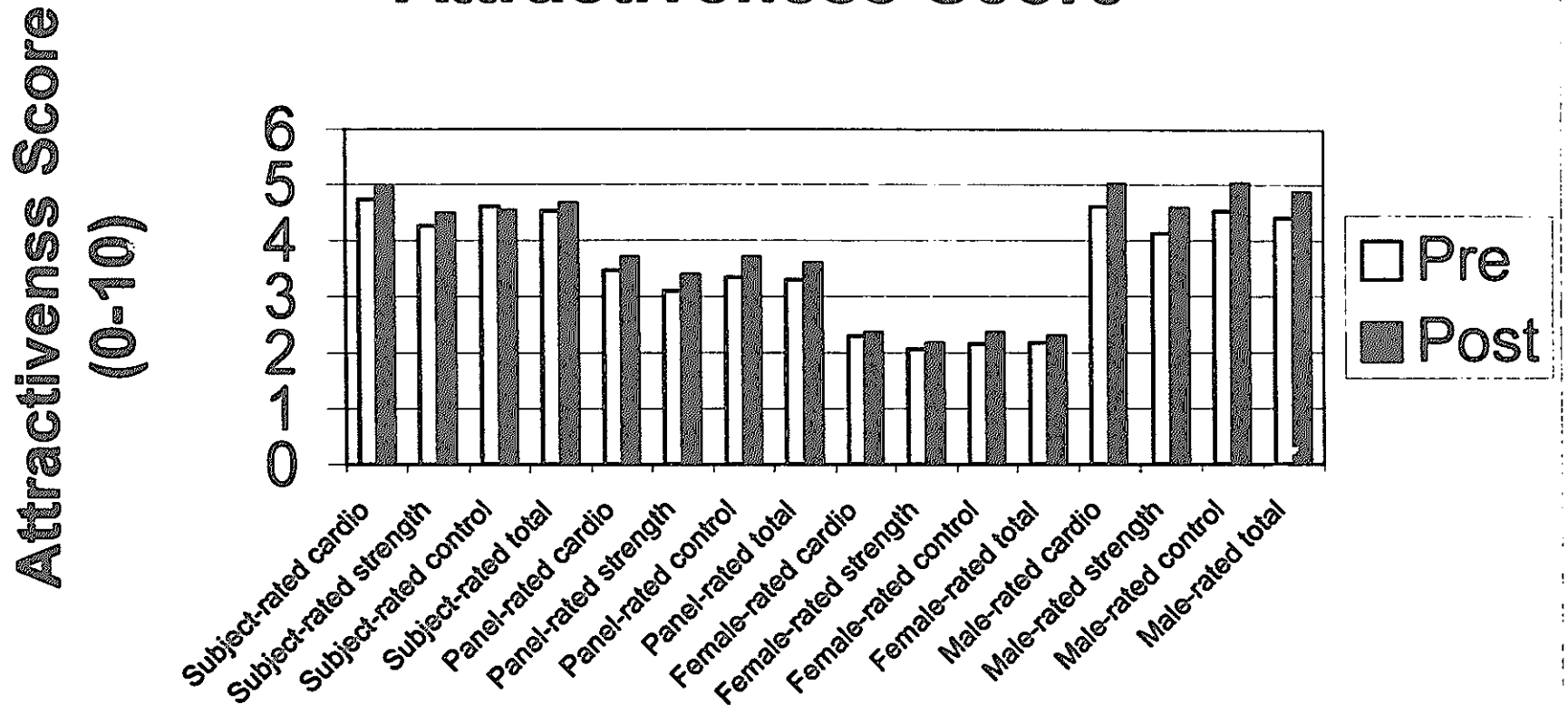
	Cardio Pre	Cardio Post	Strength Pre	Strength Post	Control Pre	Control Post
Weight (kg)	80.34 (10.79)	79.90 (11.94)	90.96 (24.19)	91.31 (23.32)	85.55 (9.65)	86.23 (10.95)
Sum of Skin-folds	154.66 (66.76)	156.40 (70.26)	198.16 (78.99)	202.79 (83.12)	187.73 (48.48)	190.59 (47.65)
Total % Fat	22.12 (8.33)	21.86 (9.03)	25.68 (7.91)	25.63 (7.50)	25.59 (4.31)	26.27 (4.22)
Total Lean Mass (kg)	58012 (5362)	5802 (4497)	58912 (8218)	59578 (7345)	59688 (7660)	60421 (8233)
Trunk % Fat	25.14 (10.45)	24.79 (11.37)	29.78 (9.78)	30.16 (8.81)	29.67 (4.84)	30.60 (4.37)
Trunk Lean Mass	59376 (98577)	27060 (1627)	27243 (3101)	27851 (2835)	27707 (3255)	69325 (111563)
Limb % Fat	38.01 (13.95)	37.31 (15.01)	41.79 (13.62)	40.34 (12.86)	42.39 (9.19)	43.29 (9.55)
Limb Lean Mass	25039 (6973)	24937 (6847)	25388 (8018)	24903 (7681)	25480 (8081)	25939 (8485)
SG (cm) +	113.44 (5.70)	112.83 (5.52)	117.06 (10.41)	119.06 (11.49)	112.43 (4.93)	116.71 (5.57)
Waist Girth (cm)	83.50 (9.04)	85.11 (10.89)	90.56 (11.70)	89.61 (11.82)	87.00 (3.03)	88.50 (3.65)

Table 3. cont. Mean (± Standard Deviation) Values for Objective Outcome Variables

	Cardio Pre	Cardio Post	Strength Pre	Strength Post	Control Pre	Control Post
Shlder to Waist Ratio++	1.37 (0.10)	1.34 (0.13)	1.30 (0.10)	1.34 (0.10)	1.29 (0.06)	1.32 (0.06)
Arm Flexed (cm) ++	34.22 (3.18)	33.72 (3.44)	35.79 (4.72)	36.56 (4.75)	35.64 (2.17)	35.86 (2.63)
Thigh Girth (cm) +	59.94 (5.87)	58.28 (21.44)	65.00 (6.26)	63.56 (6.50)	62.86 (3.76)	65.29 (4.14)

= sig. change pre vs. post ++ = sig. change pre vs. post with interaction
SG=shoulder girth SWR=Shoulder to Waist Ratio

Figure 2. Subject and Panel Rated Attractiveness Score



DISCUSSION

The failure to improve global attractiveness was the main area of interest for this study. The study by Williams and Cash (35), 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. Again 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 (19,20,22,24,36-41), but few who strictly examine appearance (31,34). 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 as well. 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 promising to show results in a relatively short period of time (16).

The second reason for failing to show change in attractiveness could be linked to the failure to show objective changes. Further research would be needed to evaluate this theory.

It is also interesting to note the difference in attractiveness ratings between the male and female panel members. It is known that both genders are critical judges of muscular strength, waist, thighs, body-build, physical coordination, physical condition,

shoulder width, arms, chest, physique, appearance of stomach, and weight (5). However, in addition, women have been shown to prefer men of moderate size with small buttocks and somewhat larger chests (6). Possible cause of the lower female scores 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, clinging 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.

Failure to show significant improvements in appearance invalidates further discussion on the link between shoulder-to-waist ratio and appearance ratings. Additional research will be required to identify ideal proportion sizes in males.

It is not the intention of this study to imply that a 6 week training program is unable alter physiological variables associated with training. However, the failure to change demonstrated by the subjects participating in this study suggest otherwise. A recent study by Williams and Cash (35) demonstrated significant strength grains in both 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 last year. Several reasons for the difference between these two studies present themselves 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, workload and intensity (Appendix C). According to the subject training cards, the subjects trained an average of 15-16 times out of a possible 18 workouts. Subjects participating in the study by Williams and Cash (35), were enrolled in a strength training class in which attendance and supervision of the training protocol was more tightly controlled. Studies have shown increased strength gains as the result of a directly supervised training program vs. an unsupervised training program (42).

The second reason involves the difference among the actual protocol. Subjects participating in this study were strictly assigned to participate in either strength training, cardiovascular training or to remain sedentary. No overlap in training was allowed. Subjects in the study by Williams and Cash (35) did allow 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 is likely to show different results. Subjects participating in this study were asked to evaluate intensity based on the Category-Ratio Borg Scale (0-10) with a 5 (hard) as an ideal score. Subjects in the Williams and Cash (35) study established ideal intensity through the use of 1RM assessment.

The last reason involves actual adaptations to training. The neuromuscular system requires activation of all of the available muscle fibers during maximal activity. The number and size of motor units increases with an increased workload on the active muscle (43). 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 (44). The exact duration of this process is dependant of the type and intensity of training (45). Muscle hypertrophy is dependent on the demands placed on the neuromuscular system (43) and appears to require a program longer than 16 workouts to increase the contractile proteins within the muscle cells (43). Therefore, the increase in strength measured by Williams and Cash 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 male adults. In addition, a 6 week program also fails to change panel-rated appearance ratings significantly. Therefore those seeking to improve their physical appearance should seek 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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APPENDIX A

INFORMED CONSENT

Documented Informed Consent

Training vs. Body Image. Does Training Improve Subjective Appearance Ratings?

I, _____ give my informed consent to participate in a research study designed to study the difference between subjective appearance ratings before and after different types of exercise training. I consent to presentation and publication of this study so long as the information is confidential and disguised so that no personal identification can be made.

Explanation of Tests

I have been informed that I will be asked to participate in the following tests at the beginning of the study and again 6 weeks after the study begins: body composition analysis (DEXA), shoulder to waist ratio, push-up test and a maximal treadmill exercise test. I have been informed that I will be asked to complete a written survey regarding my perceived appearance. I have also been informed that I will be photographed from four different angles while wearing swim briefs. I have been informed that I will then be randomly assigned to participate in a supervised exercise program consisting of either strength training or cardiovascular exercise or to refrain from exercise for 6 weeks. I will be responsible for completing exercise logs and turning them in on a weekly basis.

DEXA

I have been informed that my body composition (percent fat) as well as the bone density of my femur (upper thigh bone), and lumbar spine (lower spine) and total body bone density will be determined using an FDA-approved bone density machine (Prodigy, Lunar Corp., Madison, WI). I have been informed that I will be asked to lie face up, on a padded table for about a total of 10 minutes while the scanner arm passes over me. However, the DEXA scanner will not enclose me or touch me. I have been informed that I will be exposed to minimal x-ray radiation that is within an acceptable range as provided by the Wisconsin Department of Health and Family Services (DHFS) [Chapter HSS 157.03(1)(g)]. This study has been approved by the University of Wisconsin-La Crosse Institutional Review Board for the Protection of Human Subjects.

Any time an individual is exposed to radiation there is a potential risk, however, the amount of radiation (1 to 4 microSieverts) that I will be exposed to is quite minimal. For example, I would receive a radiation exposure of approximately 80 microSieverts on a transatlantic airline flight of 8 hours, 50 microSieverts living in Denver, Colorado, at an elevation of 5,000 feet for approximately 4 weeks, or 30 to 40 microSieverts during a typical chest x-ray.

Risks and Discomfort

I have been informed that by participating in this study I may be at risk for exercise induced musculoskeletal injury as well as cardiovascular events such as rapid or irregular heart rate, chest pain, heart attack or in extreme cases death. I have been informed that photographing may be personally revealing. I have been informed that photographs taken will be kept confidential and will not be published without consent. I have also been informed that that body composition analysis may also be personally revealing.

Benefits to be expected

I have been informed that by participating in this study I will be given the results of my body composition analysis, shoulder to waist ratio, exercise test and push-up test. I have been informed that if I am randomly assigned to an exercise group that I will receive the health benefits associated with exercise as well as free access to a supervised exercise session.

Confidentiality of Data Collected

I have been informed that I will be assigned a subject number to preserve my confidentiality. I have been informed that these numbers will be used in disseminating information and data from the study. I have been informed that the pre and posttest photographs will preserve my confidentiality by blocking out my face and removing any identifying peircings, tattoos or birth marks.

Voluntary Participation

I have been informed that my participation in this study is voluntary; that I will not receive monetary compensation. I have been informed that the study may be terminated at any time if musculoskeletal injuries or cardiovascular events occur. In addition, I have been informed that I may stop the study at any time without penalty.

Costs to Participate

I have been informed that there is no monetary cost of participating in this study. I have been informed that I may be randomly assigned to participate in exercise four days a week for up to an hour for each session for six weeks or to refrain from exercise for 6 weeks. I have also been informed that I can expect to spend up to 2 hours for each pre and posttest measurements.

Responsibilities of the Participant

I have been informed that the use of anabolic steroids or supplements such as creatine may negatively affect my health and the results of this study. I have been informed that I

am to refrain from the ingestion of any such product throughout the duration of this study.

I have been informed that any information I possess about my health status or previous experiences of unusual feelings with physical effort may affect the safety or value of my exercise prescription. I have been informed of the importance of prompt reporting of unusual feelings with effort during the program. I have been informed that I am responsible to fully disclose information from my past or if anything should occur during testing.

In the unlikely even that any injury or illness occurs as a result of this research, the Board of Regents of the University of Wisconsin System, and the University of Wisconsin-La Crosse, their officers, agents and employees, do not automatically provide reimbursement for medical care of other compensation. Payment for treatment of any injury or illness must be provided by you or your third-party payor, such as your health insurer or Medicare. If any injury or illness occurs in the course of research, or for more information, please notify the investigator in charge. I have been informed that I am not waiving any rights that I may have for injury resulting from negligence of any person or the institution.

Contact Persons

This study is being conducted in partial fulfillment of a Masters Degree in Adult Fitness/Cardiac Rehabilitation at the University of Wisconsin-La Crosse. Questions regarding the protection of human subjects may be addressed to Dr. Dan Duquette, Chairperson of the University of Wisconsin-La Crosse Institutional Review Board for the Protection of Human Subjects, 608-785-8124

If you have any questions or concerns related to the study please call one of the following:

Principal investigator: Megan Anderson	608-793-1507
Thesis Committee Chairperson: Dr. Carl Foster	608-785-8687

Statement of Consent

I have read all the above, received answers to my questions I may have asked, and willingly give my consent to participate in this study. Upon signing this form, I will receive a copy.

Participant's signature: _____ Date: _____

Researcher's signature: _____ Date: _____

APPENDIX B

EXAMPLE PHOTOGRAPHS

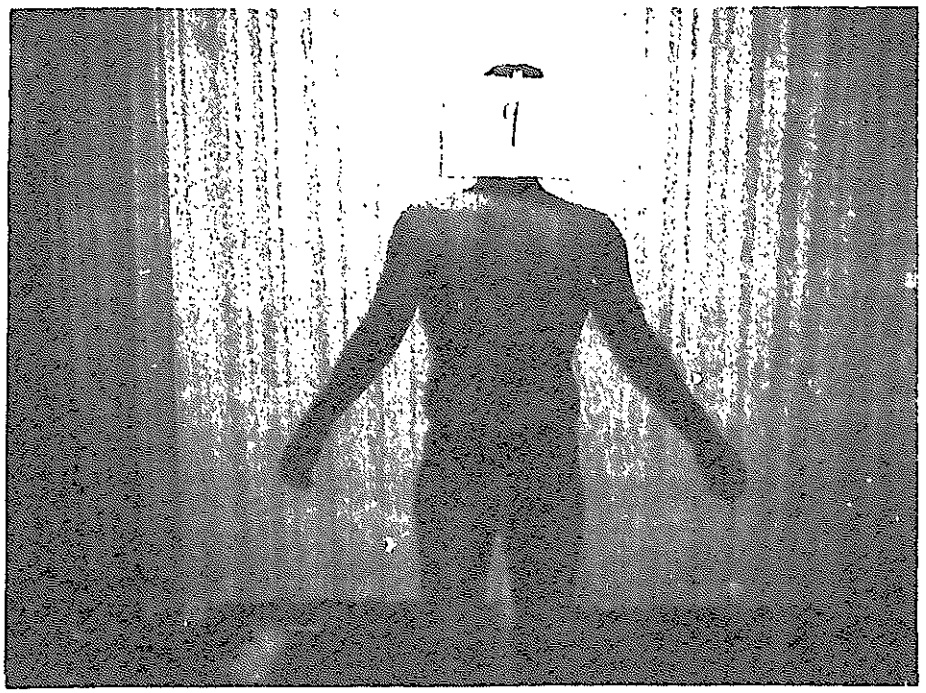
ANTERIOR ANGLE

PRE

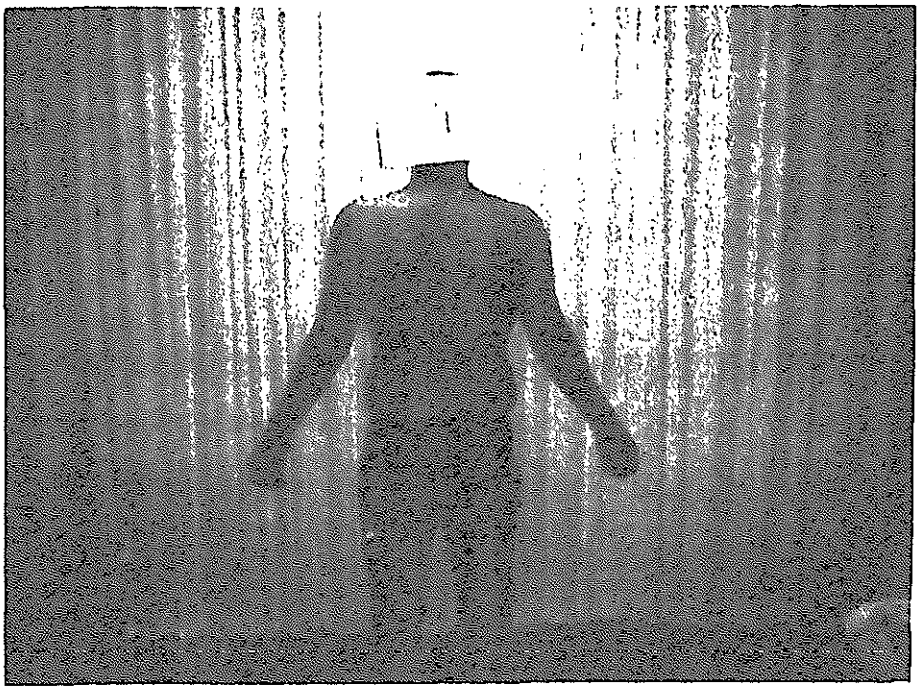
POST

POSTERIOR ANGLE

PRE

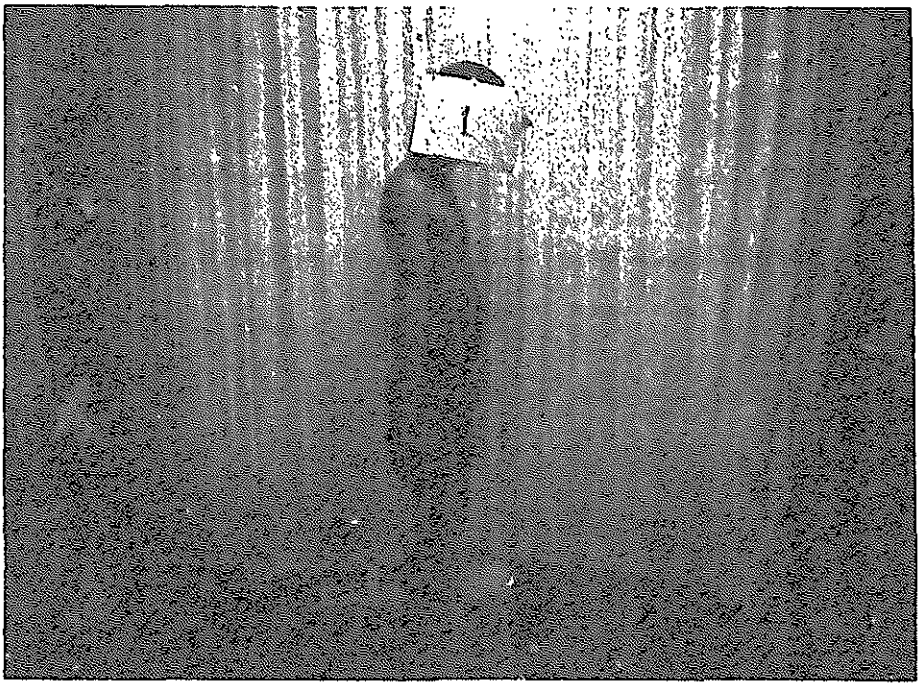


POST



LEFT LATERAL ANGLE

PRE



POST

RIGHT LATERAL ANGLE

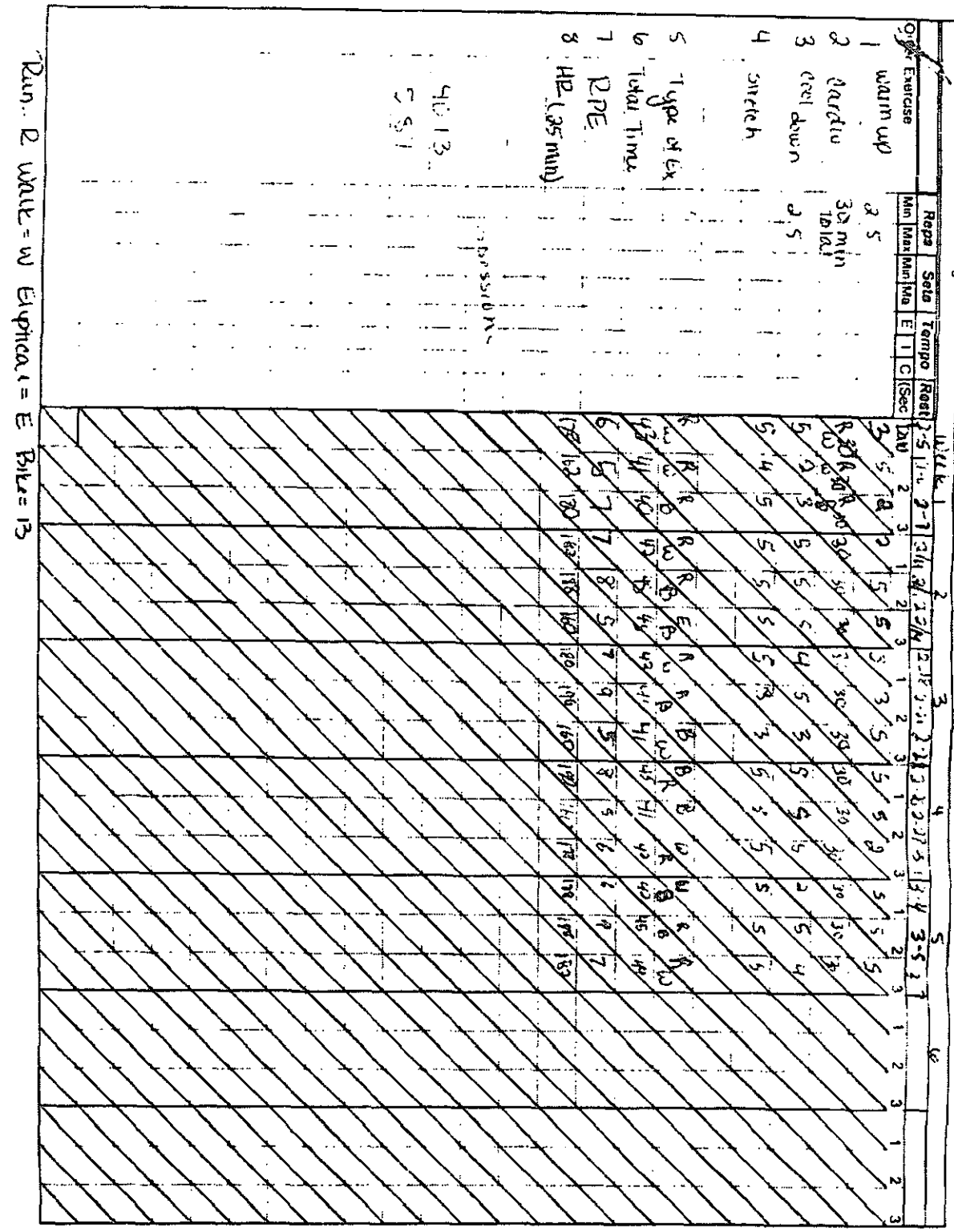
PRE

POST

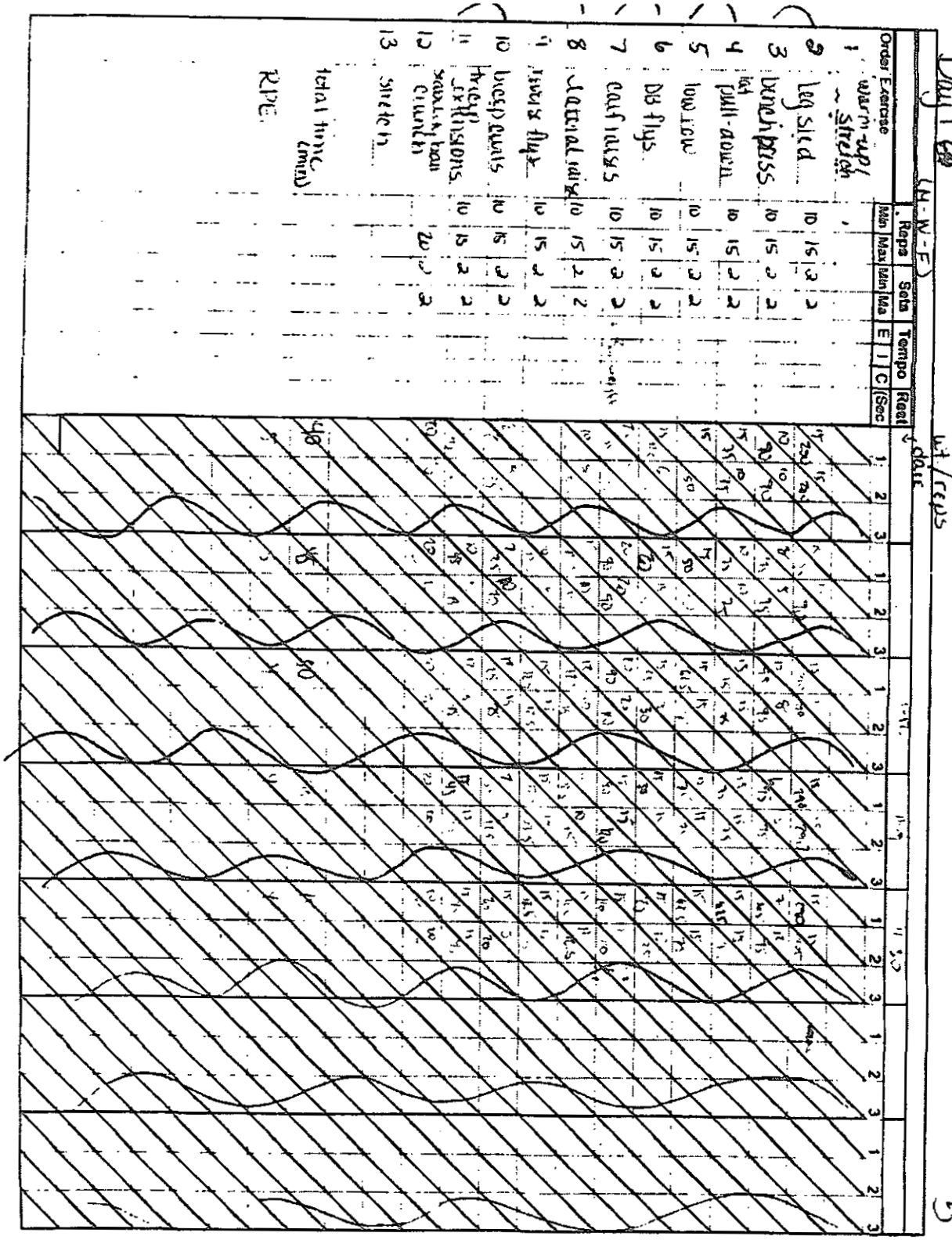
APPENDIX C

TRAINING PROTOCOL CARDS

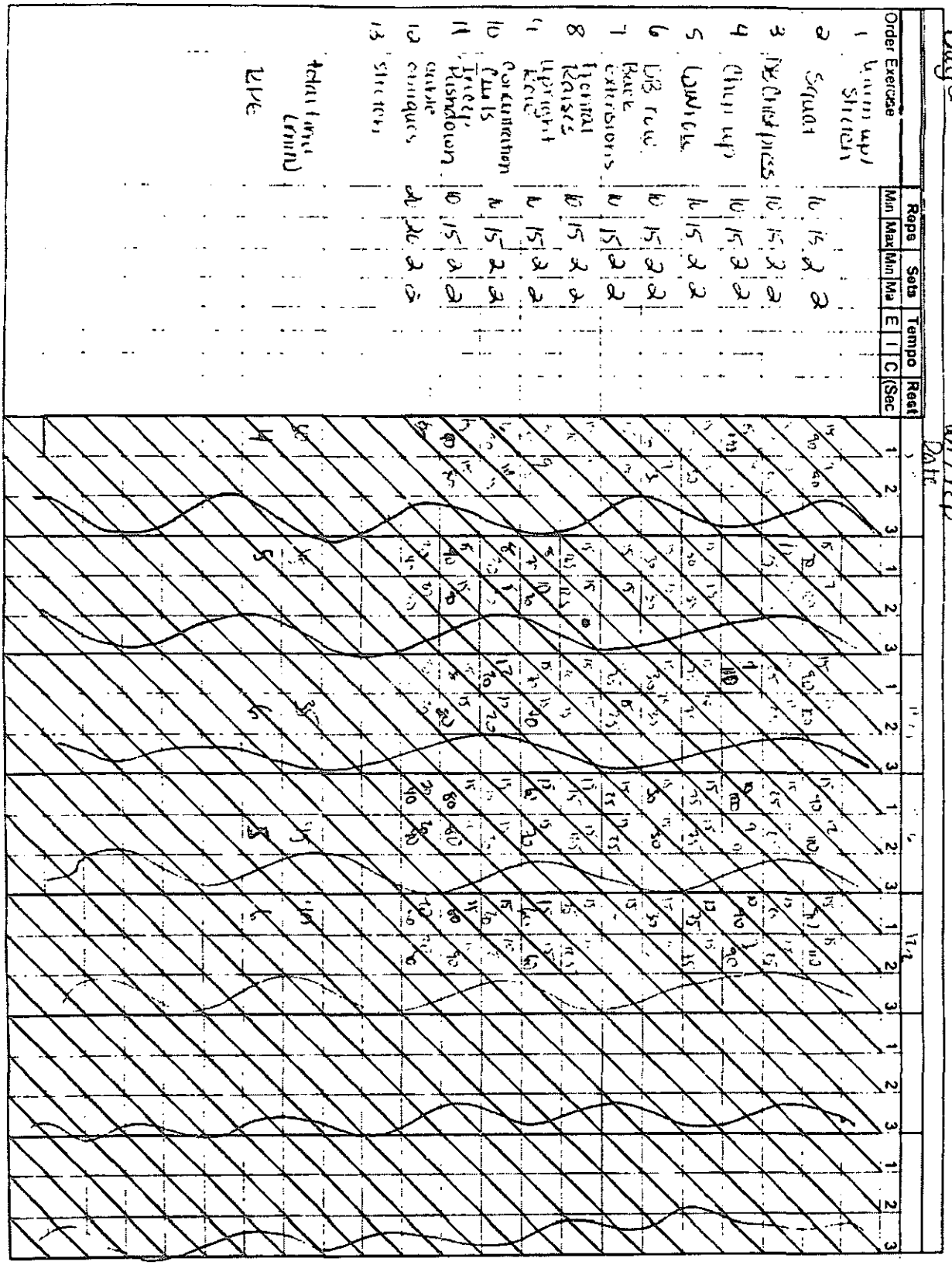
CARDIO PROTOCOL



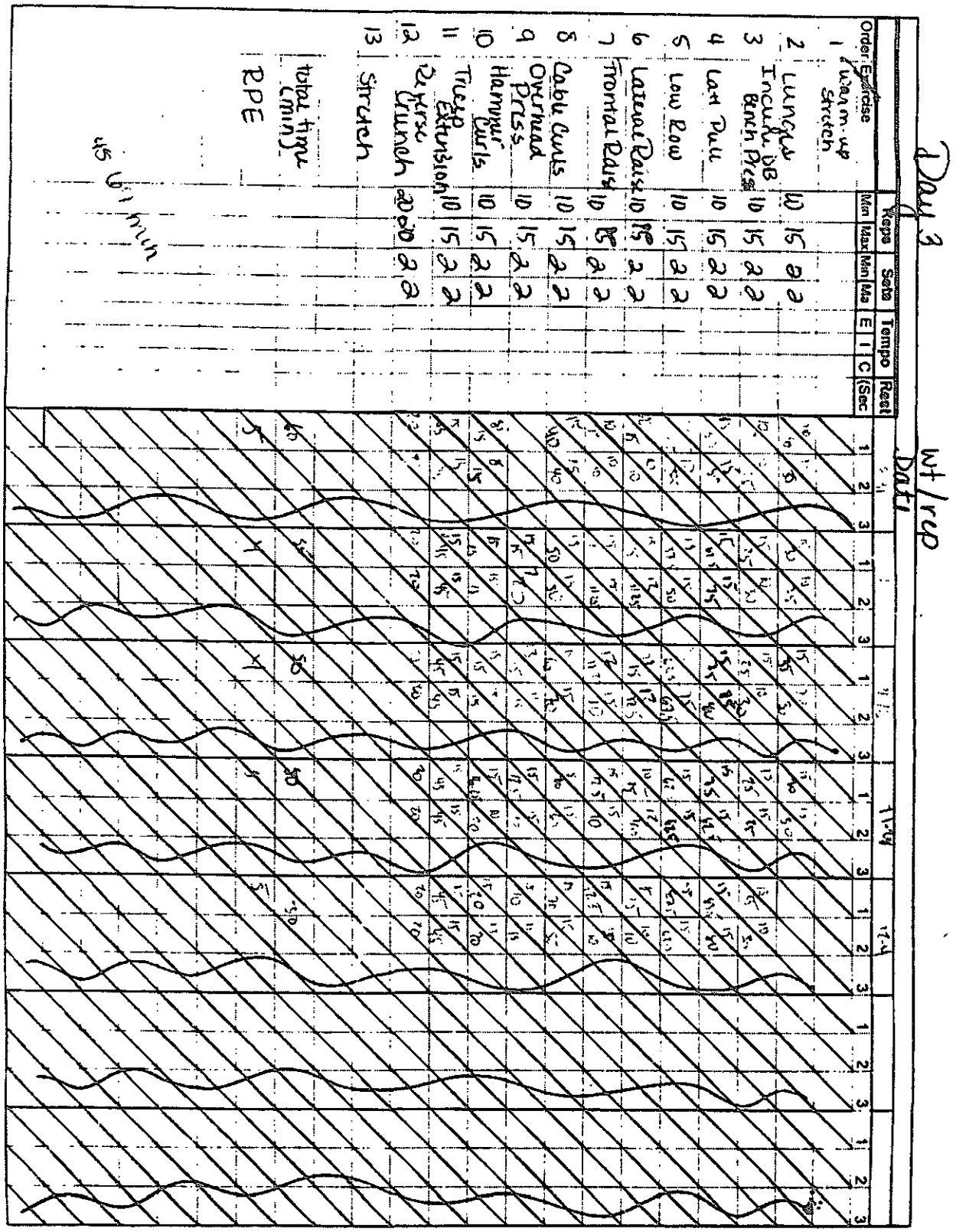
STRENGTH PROTOCOL-DAY 1



STRENGTH PROTOCOL-DAY 2



STRENGTH PROTOCOL-DAY 3



APPENDIX D

REVIEW OF RELATED LITERATURE

REVIEW OF RELATED LITURATURE

Body Image and Associated Body Image Disturbances

Investigation into the field of body image reveals many individual topics, however, this paper focuses solely on body image as defined by Cash and Henry; (1) a facet of self-concept and self-attitudes, particularly toward appearance, that consists of self-perceptions, cognitions, affect, and behaviors in exchange with one's physical attributes. Thompson (2) adds that an appearance-related formulation of body image includes a perceptual component, which refers to an estimation of body size, and an attitudinal component, which refers to self-satisfaction and social anxiety.

The assessment of body image has progressed to include several different scales. Popular scales include "silhouette scales", which use figural stimuli or schematic contours to measure body-size, shape, weight, and satisfaction with appearance. These scales are popular because they link weight-related size and shape to body image (3). These scales typically contain 5-12 schematic figures for each gender. Subjects are then asked to choose the image that most correctly represents their own body size as well as the image that represents their ideal size. This difference between ideal size and actual size is widely accepted as a measure of body dissatisfaction (3).

Gardner et al, (4) reported several discrepancies in the use of these scales to measure body image. They demonstrated poor reliability and scale coarseness as a result of a limited number of images to choose from. They established the following guidelines to diminish the coarseness and improve reliability.

1. If a discrete number of drawings are used, there should be a large number of them and the amount of the size distortion between adjacent figures should be kept small.
2. An interval scale should be constructed by keeping the amount of change constant between adjacent figures.
3. All body regions of the figural drawings should change in size at the same rate, mimicking what is done with distorting mirror, distorting photograph, and video techniques.
4. The development of a "continuous" or analogue figural scale with interval properties should be undertaken. A continuous line would connect two figures, distorted width "too wide" and "too thin" by a set percentage. A subject could place a vertical mark on the line between the two distorted figures that represented their perceived or ideal body-size (4).

Within the field of body image, self-concept can be thought of as how an individual perceives themselves in relation to the world around them or as what is valued in the self (5). Pargman (6) demonstrated the role of physical activity in the development of personality and mental health. He combined the idea of body image with self-concept to postulate an interpretive process integrating the physical and social environment with personal characteristics and experiences.

Within the study of body image, the term body esteem is used as a reflection of a person's satisfaction with their own body and a measure of how their appearance may be evaluated by others (7,8). According to Franzoi and Shields (9), body esteem is an important aspect of general self-esteem and should be measured using multidimensional constructs that differ for men and women.

Diagnosable clinical implications, such as anxiety, depression, or eating disorders, can result from a disturbance in one's body image. Thompson (7) used a continuum model of severity levels of body image disturbance ranging from none to extreme to describe and measure body image issues. This continuum can be used to associate these

issues with basic appearance concern at one end of the scale and specific diagnosable criteria at the other end of the scale.

The anxiety one feels in response to others' evaluation of their physique has been termed social physique anxiety (SPA) (10). Physique is an important aspect of the overall self, and therefore favorable evaluations are desired. When an individual is unable to make that favorable evaluation a negative SPA is likely to occur (11). The Social Physique Anxiety Scale (SPAS) is a scale to assess the severity of the SPA. Hart et al (10) showed that females with a high SPAS score responded to physique evaluation with more stress than those who scored low on the test.

Creating Body Image

From a psychological perspective, body image is the result of an integrated body self and psychological self. When there is a disruption in the otherwise healthy integration process, it is shown to alter psychic representations of the body (12). Ellmo and Graser (5) felt that a poor self-concept was the result of a series of failures that negatively changed their confidence level in new tasks, relationships and decision-making.

According to Heinberg, (13) the sociocultural model is the most popular method of explaining body image disturbance in Western societies. This model upholds the theory that current social standards of beauty influence the general population's opinion of ideal. Through the media, we learn at an early age that thinness and beauty go hand in hand, and as we age it becomes more evident that beauty equals power.

Physical Attractiveness as a Social Variable

Physical attractiveness is a powerful social variable in today's society. Physically attractive individuals have been shown to have several advantages over less physically attractive individuals. According to Dion, Berscheid, and Walster (14), physically attractive individuals have more socially desirable personalities, they will have more total happiness and live more successful lives. In addition, they found that physically attractive individuals are more likely to find an acceptable life partner, marry sooner and to be better spouses. Other studies have shown that physically attractive people are more likely to be recommended for hire during a job interview (15), they are more likely to have their written work evaluated favorably (16) and to be better psychological counselors (17).

Defining Physical Attractiveness

When judging the physical attractiveness of members of both the opposite and same sex, men and women tend to prefer certain physical characteristics. When judging the physical attractiveness of women, both sexes take body scent, nose, lips, waist, thigh, body build, buttocks, appearance of eyes, breasts, cheeks/cheekbones, hips, figure, appearance of stomach, health, physical condition, face, weight and legs into consideration (18). In addition, men evaluate women based on their sex drive, sex organs and sex activities (18). Men tend to prefer moderately sized, evenly proportioned women with small buttocks (19). It has long been suggested that women are evaluated on characteristics related to reproductive success (20-22). Curvaceous women with waist-

to-hip ratios of 0.7-0.8 have been shown to be preferable to men and in most cases are healthier, more fertile women (23).

The physical attractiveness of a male is similarly evaluated. In men, both sexes are critical judges of muscular strength, waist, thighs, body-build, physical coordination, physical condition, shoulder width, arms, chest, physique, appearance of stomach, weight, agility, sex drive, sex activities, and face. Men are more critical judges of masculine body scents, physical stamina, buttocks, appearance of eyes, legs and health (18). Women have been shown to prefer men of moderate size with small buttocks and somewhat larger chests (19). According to traditional media, the image of the ideal male would be one with a large upper body that tapered down to a thinner waist, hips, and legs. Men themselves also find this description ideal (24), and associate this physique with masculinity (25). Interestingly enough, Darden (25) found that women judged men with a less massive physique as most masculine. One study examined the female preference for male physiques (26) found that women's preferences for the male figure could be based on sex-role stereotypes. They found that women who are more feminine tend to prefer men with a larger shoulder width with an upper body tapering, classically known as the "V" or "atlas" physique (26,27). This study also showed that less traditional women showed less stereotypical preferences. Together these studies suggest that the ideal male falls within a specific range of shoulder-to-waist ratio. However, at this time, there are no studies to place an exact number on this measurement.

In addition to knowing which body parts are evaluated when judging physical attractiveness, we also know that the ideal body form has changed over the years. A

study by Garner, Garfinkel, Schwartz, and Thompson (28) showed a significant decrease in weight of *Playboy* centerfolds and Miss America Pageant contestants over a 20-year period of time (1959-1978). The changing ideal body form and social pressures have led many Americans to feel dissatisfied with their appearance, men want to be bigger and women want to be thinner (29). "We are obsessed with being thin, beautiful, young and sexy, and we will go to extraordinary lengths to approach those ideals"(30). As a result, each day we are bombarded with infomercials, TV commercials, and internet ads promoting new fitness products with guarantees to see results in "just 6 weeks: 20 minutes per day, 3 times a week", (31) or ads promising lean, beautiful, sexy hips in just 3 minutes a day (32).

Motivation to Exercise

Three popular surveys have been devised to assess and evaluate the reasons people exercise. The surveys include; Personal Incentives for Exercise Questionnaire (33), the Reasons for Exercise Inventory (34), and the Exercise Motivations Inventory (EMI) (34). All three surveys included common factors such as weight control and management, physical fitness and appearance. Information from these surveys as well as evidence from several other studies (12,33-36), suggest that the potential to improve appearance as a result of exercise is rated as a highly important motivator for exercise. Willis and Campbell (37) also linked the desire for the ideal appearance with motivation to exercise. Many people participate in regular physical exercise as a method of body image management or to improve their physical appearance and to lose or control weight (38-41).

A study by Cash, Novy and Grant (38) found four main factors for exercise patterns in women. They included appearance/weight management, fitness/health management, stress/mood management, and socializing. This group of researchers also found that in women with a more negative body image, independent of actual mass, was the only motivating factor for frequency of exercise.

A study by Davis and Cowles (42) examined the relationships and comparisons between physically active men and women. The participants in this study were compared based on variables related to body image, weight and diet concerns, as well as the degree of exercise participation. Their results showed that men and women were overall equally dissatisfied with their weight. This study also found that most women wanted to lose weight, while the men were evenly split between those who wanted to lose weight and those who wanted to gain weight. In general women were more dissatisfied with their bodies and placed a greater importance on the way that appearance affected their feeling of well-being. This study did not show differences among the sexes when comparing the degree of physical activity, however the women were more likely to exercise in an attempt to lose or control weight compare to men. According to this study, the degree to which the women and older men exercised was not associated with any of the body image variables, however, this was not the case in the younger male. Greater body satisfaction was associated with increase in the amount of physical exercise. This improved satisfaction is affected by social influences.

Finkenberg, Dinucci, McCune and McCune (43), studied the relationship between personal incentives for exercise and body esteem. They found that for women, personal

incentives for exercise had a modest predictive power for weight concern and physical conditioning dimensions of the body esteem scale and very little predictive power for the sexual attractiveness dimensions of the scale. In addition, the body esteem variables had a slight predictive power for the competition and weight management aspect of exercise incentives. For men, this study showed personal incentives for exercise had a modest predictive power for the physical condition aspect of the body esteem scale and a slight predictive power for physical attractiveness. In addition, the male personal incentives for exercise did not show any predictive power towards upper body strength, while the body esteem variable has a modest predictive power for the weight management dimension of incentives for exercise and slight predictive power and appearance and affiliation.

Another study (44) examining the psychological determinants of adolescent exercise adherence found that high school males (9^{th}, 10^{th}, and 11^{th} grades) indicated perceived romantic appeal as a predictive measure of exercise adherence while females indicated perceived athletic competency, perceived global self-worth and perceived physical appearance. The results of this study therefore suggest that there is a link between self-competency and exercise adherence, as well as between personality/sport congruence and exercise adherence in greater depth among teens (44).

Body Image and Exercise

With society's role in creating these motivating factors in place, the health club and fitness industry has rapidly grown. In the industry's favor, research has shown that endurance and moderate exercise training lead to an improved self-perception (45) and positive changes in body image (46-48). Tucker (49) found that a regular weight-training

program positively influenced self-concept, despite the level of success of the actual training program. These changes are thought to be the result of an improved body awareness (45). Tucker also found that the college-aged males participating in this study perceived the body changes associated with weight training positively. Tucker felt that these positive scores were connected to the idea that a muscular male body is most socially desirable (19,24,26,27).

Research has suggested that exercise has beneficial effects on body image (46-52). In 1991, Wilkins and Boland found that athletes were less likely to perceive themselves as being overweight; they had higher body esteem and expressed an overall greater satisfaction with their bodies than those who were not athletes (53). Another study examined the scores on the Body Esteem Scale among athletes and nonathletes (54). This study found that female athletes showed a more positive feeling toward their body weight and functions compared to nonathletic women. The authors in this study also found significantly lower ratings by the nonathletic women; they felt that this was related to the high social standards presented by the media.

A recent study by Williams and Cash (55) examined the effect of a 6-week circuit training program on the body image of college-aged students. In this study 78 college students were pre- and posttested on the Multidimensional Body Self-Relations Questionnaire, the Physical Self-Efficacy Scale and the SPAS. The group was then divided in half and 39 students served as the control group while 39 students (12 men and 27 females) served as the training group. The training group was also assessed on muscular strength and reasons for exercise participation. The training group showed a

significantly improved upper- and lower-body strength and when compared to the control group also showed a significant improvement in body satisfaction, appearance evaluation, improved physical self-efficacy and a reduced SPA. This study concluded that a brief weight-training program could create advancements in multiple aspects of body image.

Studies have investigated the improved physical self-efficacy with exercise as mentioned above. Research has shown that changes in physical self-efficacy with exercise are associated with competence-based feedback that improves with changes in fitness levels (56,57).

Some research has suggested that there may be a negative link between exercise and body image (58-60). These studies suggest that low body images are linked with a pattern of excessive exercise. A study by Krane, Stiles-Shipley, Waldron and Michalenok (58) pursued the relationship among body satisfaction, SPA, and eating behaviors in female athletes and exercisers. This study found that body dissatisfaction and drive for thinness were the strongest predictors of SPA in both the athletes and exercisers. While most of the subjects in this study scored within the "healthy" range on the eating disorder inventory, this study suggested that the risk of excessive exercise in women is highly prevalent.

Managing Body Image with Exercise

Kirkcaldy and Shephard (52) were among the early pioneers to thoroughly and critically investigate the therapeutic implications of exercise. The concluded that despite many technical problems associated with the evaluation, that there was indeed evidence to suggest that physical activity enhanced psychological health. In addition, they

recommended exercise as a more "pleasant and less labor-intensive" alternative form of psychotherapy. Their recommendation was based on the roles of increased arousal and secretion of beta-endorphins, which positively alter mood. In addition, they found that in a community based exercise program the psychological gains were likely the result of a change in body image and social interaction.

Fisher and Thompson (50) compared exercise therapy and cognitive-behavioral therapy for treating body image problems in college aged women without eating disorders. Women participating in this study were assigned to one of three groups: control group, exercise therapy, or cognitive behavioral therapy. The exercise therapy consisted of one session of body image and exercise education and five exercise sessions. These exercise sessions contained both aerobic exercise and strength training components. Both the cognitive behavioral therapy and exercise therapy participants showed an overall decline in body image dissatisfaction and depression and the authors of this study recommended combining both treatments to combat the problems associated with body image dissatisfaction. In addition, the authors suggested using physical activity as a preventative measure for body image dissatisfaction.

Adaptations to Training

The physiological changes associated with exercise have been studied extensively. As a result several principle theories have been developed and are widely accepted. Adaptations to the skeletal muscle can occur through two separate modes of activity. The first is endurance training, which involves an increase in muscle fiber recruitment frequency and a modest increase in the load that that the motor unit contracts

against. Muscular endurance training typically involves activities such as walking, running or cycling.

While endurance training affects the cross-sectional area of the muscle and muscle fibers, several metabolic adaptations can be made. These changes include an increase in the number of mitochondria and glycolytic enzymes, which facilitate oxidative metabolism in the skeletal muscle (61). Endurance training also increases the capillarity within the skeletal muscle by approximately 5-10%. This allows for a longer transit time for red blood cells through the capillary network, which allows for additional opportunity to diffuse across the cellular membranes and allows for a greater extraction of oxygen into the working muscle (61). This will cause a delayed onset of metabolic acidosis allowing the working muscle to perform longer before fatiguing. In addition, the increased capillarity will allow for an enhanced ability to oxidize the free fatty acids and other fuels and conserver carbohydrates (61). The adaptations to endurance training are more pronounced with an increase in intensity and duration of training. Low-level beginners show greater improvement that those who have pre-trained as well (61).

Resistance training commonly referred to as weight training or strength training involves lifting free weights or the use of resistance machines. Resistance exercise causes an increase in the frequency of motor unit recruitment and an increase in the load that the motor unit is contracting against (61). The major mechanism of adaptations with resistance training is hypertrophy. Hypertrophy is the increase in cross-sectional area of a muscle. An increase in muscle hypertrophy results in an increase in maximum force generating capacity. The primary cause of muscle is cellular hypertrophy or an increase

in the cross-sectional area of the muscle cells (61). Mitochondria volume density and capillary density will decrease with a resistance training program as the result of an increased cell volume that dilutes the mitochondria and capillary network (61).

Cardiovascular adaptations to training also occur, however most adaptations are the direct result of endurance training, and resistance training plays a minor role. An increased volume load placed on the heart during endurance training causes an increased stroke volume (61). During training, there is increased parasympathetic tone to the SA node in the heart; therefore during submaximal exercise heart is lower for trained individuals. Resting heart rate is also lowered as a result of increased innervation and a decreased intrinsic rhythmicity of the heart (61). Endurance training will also decrease the metabolic load on the heart at rest and submaximal activity. This occurs as the result of the increased stroke volume and a decreased heart rate while allows for a more efficient pumping mechanism (61).

The best determinant of cardiovascular fitness is the ability to take up and utilize oxygen during exercise (VO_2max). VO_2max typically improves up to 20% following intense endurance training. The amount of improvement is determined by type of training, age and current fitness levels (61).

Other notable cardiovascular improvements include an improved arteriovenous oxygen difference at submaximal and maximal exercise, increased maximal work capacity, possible decreases in both diastolic and systolic blood pressure at rest and submaximal activity, increased coronary blood flow at maximal exercise and decreased

flow at submaximal activity and rest and a decrease in total peripheral resistance at submaximal activity.

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