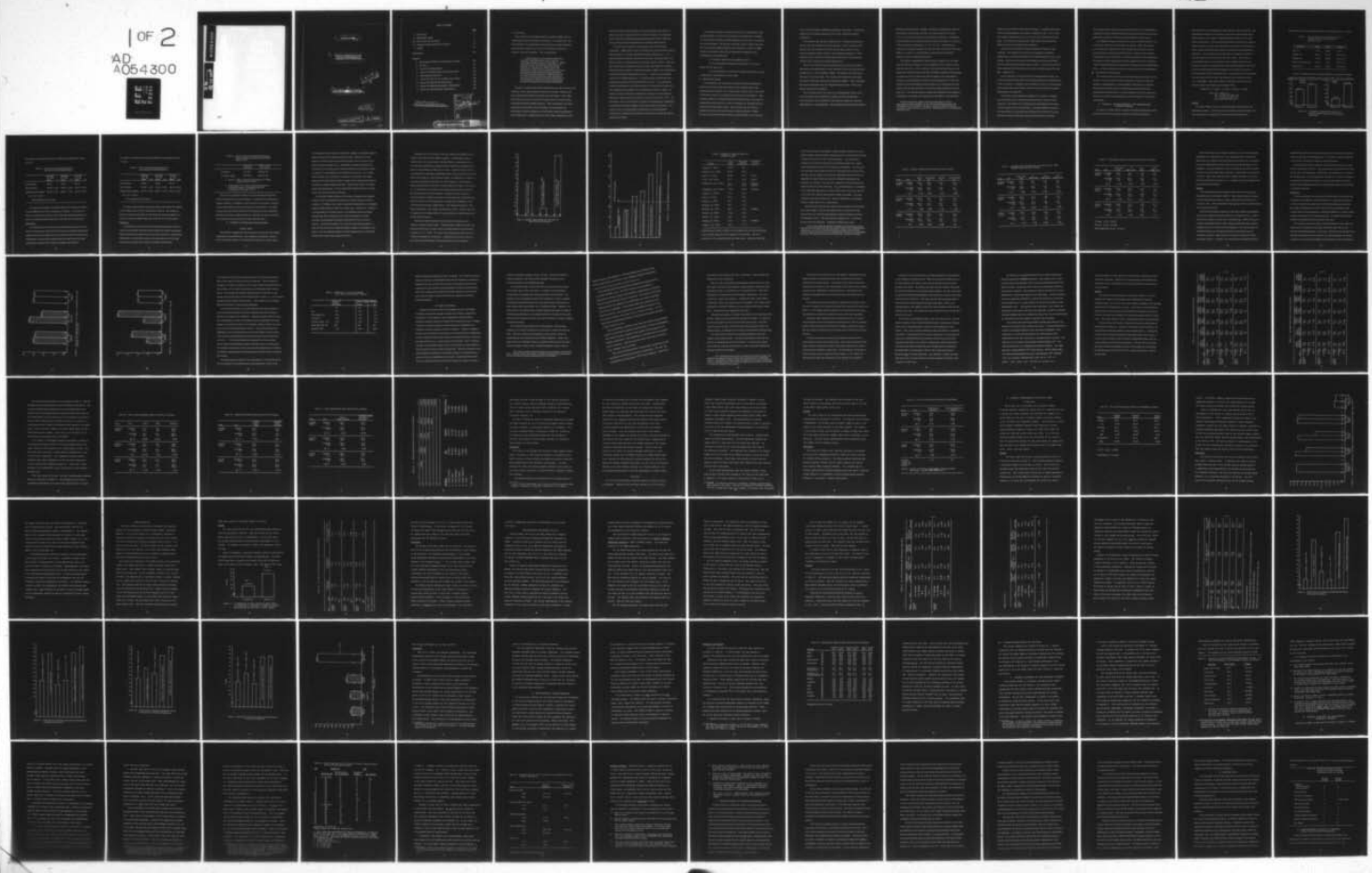
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PROJECT 60: A COMPARISON OF TWO TYPES OF PHYSICAL TRAINING PROG--ETC(U)
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(9) SUMMARY REPORT,

(6) *Project 60: A Comparison of Two Types of Physical Training Programs on the Performance of 16-18 Year-Old Women*

MAY 22 1976

By

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I. Introduction

Every year the United States Military Academy (USMA) selects approximately 1400 individuals for admission. On October 8th, 1975, the President of the United States signed into law a bill directing that beginning with academic year 1976-77 that women be admitted to America's service academies. The law states that:

> . . . the Secretaries of the military departments concerned shall take such action as may be necessary and appropriate to insure that (1) female individuals shall be eligible for appointment and admission to the service academy concerned, beginning in calendar year 1976, and (2) the academic and other relevant standards required for appointment, (admissions) training, graduation, and commissioning of female individuals shall be the same as those required for male individuals, except for those minimum essential adjustments in such standards required because of physiological differences between male and female individuals.

In order to identify what minimal adjustments are both necessary and justified, several major questions need to be resolved. What are the basic physiological differences between men and women? How might these differences affect the ability of women cadets to perform within established and future USMA programs? What adjustments in training programs and procedures will be necessary to accommodate for performance variances between men and women cadets resulting from these differences? Assuming that even with certain adjustments in the

physical education and Cadet Basic Training programs there will be at least a few women cadets who will be unable to perform at an adequate level, what types of physical training programs will provide them with the necessary physical development and individual improvement?

The search for answers to these questions has involved many individuals. USMA staff, faculty, and cadets have visited several locations where women are currently undergoing military training (e.g., U. S. Merchant Marine Academy, Women's Army Corps training centers, and Reserve Officer Training Corps coeducational summer camps). Input has been solicited from appropriate sources within and outside the military. Personnel from the Office of Physical Education, USMA, have administered the Physical Aptitude Examination (P.A.E.) - a test of physical ability required of all USMA applicants - to several groups of women who were undergoing training at the aforementioned locations. Four outstanding women professionals in the fields of medicine and physical education have been employed as consultants on the admission of women to USMA. An extensive review of literature (Appendix A) relating to the physiological differences between men and women was conducted (Peterson, 1975). Unfortunately, much of the research relating to the physiological capabilities of women has focused on olympic-caliber performers and athletes. As a result, there is a general lack of information on the physiological performance capabilities and limitations of the type of women who will be applicants to USMA.

Accordingly, because of the general absence of reliable data on the physical abilities of 16-18 year old women and the difficulty of relating the existing data on women to USMA programs and concerns, the present study was developed. Its goal was to provide at least a partial data base for sound decision making relating to the admission of women to USMA. Three of the primary factors which influenced the approach of the investigators to the study were:

(1) the basic uniqueness of the USMA mission;

(2) the institutional commitment to maintain a "one track" system for all cadets; and

(3) the institutional commitment to high level physical, as well as intellectual, development by every cadet.

II. Experimental Design

The chairperson for the women's physical education department at two local area high schools was asked to solicit approximately sixty volunteer women students, 16-18 years of age, to participate in the study. As selection criteria, the chairpersons were given two guidelines. Each volunteer should be an individual perceived as possessing a high sense of responsibility and should be, as much as possible, an individual who had previously been physically active. Both criteria were perceived as probably indicative of the general type of woman applicant to USMA. Seventy-one students expressed interest in participating in the study and

were invited to attend an explanatory briefing on the project. Having been informed of the purpose and extent of the study, sixty-three women volunteered.

In accordance with AR 70-25 (Appendix B), a combined briefing was given to all of the volunteers and their parents. At the conclusion of the session, both the volunteers and their parents were required to sign selected informed consent, privacy, and agreement statements. These statements were included in a packet which was given to each volunteer and was used to conduct the briefing (Appendix C).

Prior to the start of the pre-training testing, an extensive physical examination was administered to each volunteer for the study by personnel assigned to U. S. Army Hospital, USMA. The physical was identical to that given to each new cadet. The subjects had to meet the same health and medical standards required for admission to USMA. Three volunteers failed their examination and were dropped from the study. Sixty young women remained in the project.

For two weeks prior to the start of the experimental training, each of the 60 subjects was evaluated by a battery of tests and measures. These measures can be grouped into four general categories: physical, anthropometric, and demographic characteristics; physical fitness-related

qualities* (aerobic power, strength, endurance, and flexibility); physical performance-related items ($1\frac{1}{2}$ mile run, block-shuttle run, and the P.A.E. for women); and written psychological inventories. Information on the procedures for administering these tests is presented in section III of this study and in Appendix C, pp. C-11 to C-23. All testing was conducted by personnel assigned to either the Office of Physical Education, USMA, or to the U. S. Army Research Institute of Environmental Medicine, Exercise Physiology Division.

Two women, complaining of leg soreness, dropped out of the study after the first day of testing. For the remainder of the project no other subjects were lost. At the conclusion of the pre-training testing, the 58 women who remained in the study were randomly assigned to three groups: a control group of 18 subjects who did not engage in the experimental training; a training group of 20 subjects who participated in a three-day-a-week prescribed strength training program; and a training group of 20 subjects who became involved in a four-day-a-week program of reveille exercises. The reveille exercise training was identical to the program of calisthenics, rifle drill, and running which the Class of 1979 underwent

*Some researchers suggest that body composition is also a basic physical fitness quality. In the interest of lending order to the presentation of the results of this study, the data on percent body fat is included in the subsection on physical, anthropometric, and demographic characteristics.

during its seven weeks of Cadet Basic Training. A complete description of both training programs is included in Appendix C, pp. C-3 to C-6 for the strength training and pp. C-7 to C-15 for the reveille exercise program. All training was conducted by USMA cadets and monitored by Office of Physical Education faculty members.

During the seven weeks of training, additional information was collected. The subjects in the two training programs completed a questionnaire on the perceived effect of the experimental training on their menses. Data on the occurrence and treatment of all training-related injuries and physical discomforts was recorded. A written record of the daily observations of the OPE monitor for the reveille program was also kept. (Appendix D).

At the conclusion of the seven weeks of experimental training, the tests and measures given before the training started were readministered to all 58 subjects. In addition, the 40 members of the two training groups and the cadets who were involved with the training completed an opinion questionnaire on Project 60.

The results of the testing were analyzed by a number of methods. For all variables, pre- and post-training descriptive statistics were computed. The amount of net change and the percentage of that change for all variables were also determined. Using the BMD04V program, a one-way analysis of covariance was computed for the percent body fat, the aerobic power and the physical performance-related variables.

The aforementioned variables were selected because of the availability of comparative data on selected military groups (percent body fat and aerobic power) and the Class of 1979 (physical performance-related items).

The BMD04V program determines for a given variable whether or not a significant difference exists between two groups. When three groups are invovled, the comparison is made between the two groups with the greatest degree of between-group difference. In those instances where a significant F-ratio was found, an additional computation was performed. The Scheffe multiple comparisons test was applied in order to determine if other significant differences between the three groups existed (Kerlinger, 1964). .05 was selected as the level of significance for all computations.

III. Test Results and Discussion

The results of the pre- and post-training testing are presented in this section. For each of the four main categories of evaluation measures (physical, anthropometric, and demographic characteristics; physical fitness-related qualities; physical performance-related items; and psychological characteristics), a brief explanation of why the factor was tested, the results of the measurement, and a discussion of the findings is presented.

A. PHYSICAL, ANTHROPOMETRIC, AND DEMOGRAPHIC CHARACTERISTICS

In order to be better able to interpret the relative significance of the results of Project 60, descriptive statistics on selected physical,

anthropometrical, and demographic characteristics were calculated. Two demographic measures were obtained: age (to the nearest month) and a determination of the number of organized athletic teams on which each subject participated. The physical characteristics included each subjects' weight (in shorts, blouse, and stocking feet) and height (in stocking feet). Three selected skin-fold measurements comprised the anthropometrical evaluation. The skin-fold results were used to calculate the amount of lean body mass and percent body fat for each subject. Since there is considerable evidence in the literature which suggests that excess fat stored in the body is a limiting factor on physical performance, the effect of the two experimental training programs on the Project 60 subjects' level of percent body fat was determined. Percent body fat was calculated by subtracting the ratio of lean body weight to body weight from unity (1.0 - LBW/BW). Lean body weight was determined on the basis of a formula developed by Wilmore and Behnke (1970):

$$LBW = 8.629 + 0.680X_1 - 0.163X_2 - 0.100X_3 - 0.054X_4$$

Key: X_1 = weight, kg
X_2 = scapula skin-fold, mm
X_3 = triceps skin-fold, mm
X_4 = thigh skin-fold, mm

Results

The mean values for age and selected physical characteristics are presented in Table 1. The values for body weight, lean body weight, and percent body fat are similar to the data reported by Wilmore and

Behnke (1970), Durnin and Rahaman (1967), and MacMillan et. al. (1965).

Table 1. Age and Selected Pre-training Physical Characteristics of the Project 60 Subjects (N=58)

Variable	Mean	± SD	Range
Age, yr	16.59	±0.59	16-18
Height, cm	162.57	±6.71	147.7-179.0
Weight, kg	57.20	±8.40	41.0-74.1
Lean body weight, kg	43.21	N.A.	33.8-51.3
Body fat, %	24.46	±3.01	17.6-30.8

Figure 1 illustrates the pre-training differences in height and weight between the Project 60 subjects and the Class of 1979. As can be observed,

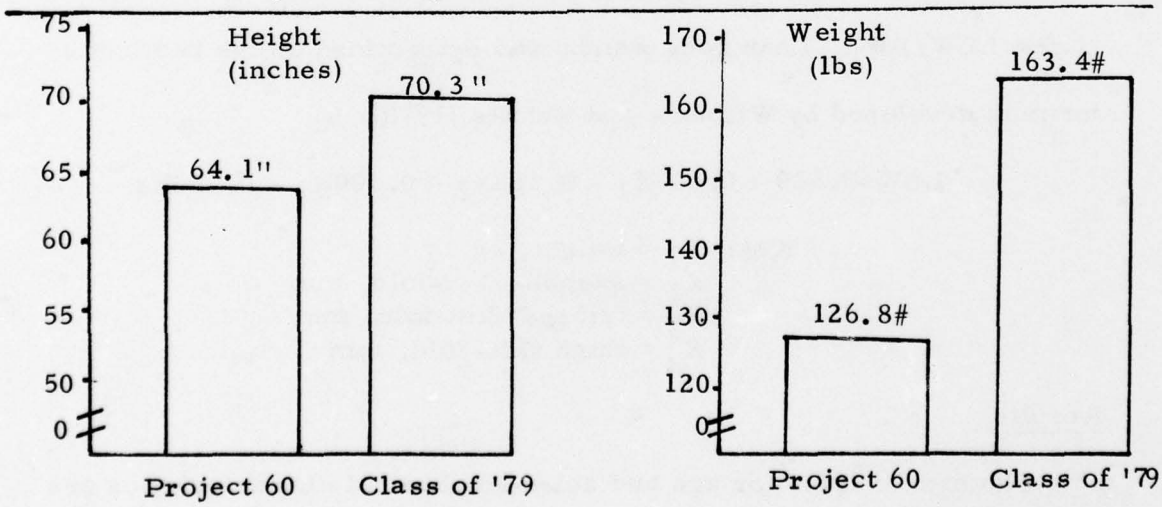


Figure 1. A Comparison Between the Project 60 Subjects and the Class of 1979 on Height and Weight

An analysis of covariance of the data yielded a non-significant F ratio of 0.921.

Table 3. Pre- and Post-training Project 60 Percent Body Fat Measurements

	Strength (N = 20) Mean	%	Reveille (N = 20) Mean	%	Control (N = 18) Mean	%
Pre-training	24.48		24.55		24.15	
Post-training	24.80	+ 1.2%	24.36	- 0.8%	24.21	+ 0.2%
Adjusted post-training	24.70	+ 0.9%	24.21	- 1.4%	24.50	+ 1.4%

F (2, 52) = 0.921*

*Not significant at .05 level

The sports participation background data for the Project 60 subjects and the USMA Class of 1979 is presented in Table 4. The number of Project 60 subjects and Class of 1979 cadets who had participated on at least one organized athletic team was 81.0% and 79.3% respectively.

Discussion

An examination of the literature concerned with physical characteristics of young women indicates that the Project 60 subjects possessed a slightly lower-than-average level of body fat for women of a similar age. Undoubtedly, this favorable condition was due in part to the very high percentage of subjects with a history of athletic participation.

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Discussion

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Table 4. Athletic Team Participation Background of the Project 60 Subjects and the USMA Class of 1979[1]

	Project 60 (N = 58)	Class of 1979 (N = 1433)
No sports	11 (19%)	295 (20.7%)
At least 1 sport	47[2] (81%)	1138 (79.3%)

1. Source: Office of Institutional Research, USMA, Report #9B1-01-76-001

2. Additionally, 39 of these women participated on at least two teams. Similar data was not available for the Class of 1979.

The lack of a significant change in the percent body fat levels for either training group was not unexpected. No attempt was undertaken to modify, quantify, or regulate the eating habits of the subjects, except to caution them against excessive eating prior to the training. The slight change in percent body fat exhibited by all three groups can probably be primarily attributed to daily fluctuations, although the rigorous nature of the reveille training could have had some favorable effect.

B. PHYSICAL FITNESS-RELATED QUALITIES

Aerobic Power

The literature suggests that aerobic power is one of the most integral components of physical fitness. Also referred to as aerobic capacity, cardio-respiratory fitness or cardiovascular endurance, aerobic power

is that quality which enables an individual to engage in reasonably vigorous physical activity for an extended period of time. Basically, aerobic power is involved in those acitivites that require the use of much of the body's large musculature (e.g., swimming or running), because such activities force the heart and circulatory system and respiratory system to operate at a much higher level of efficiency than usual. As a result, aerobic fitness can be viewed as a measure of the ability of the lungs, heart and vascular system to deliver oxygen to the working muscle and its utilization to oxidize energy substrates. While aerobic power is largely genetically determined, it is also significantly influenced by age, muscle mass, and activity or state of training.

The need for soldier-leaders at all levels of command and responsibility to achieve and maintain a high level of aerobic fitness is mission essential. At USMA, every cadet is required to demonstrate an acceptable level of aerobic fitness at least once a year (e.g., 2-mile run). However, a strong emphasis on aerobic power is not limited to periodic testing. During Cadet Basic Training all new cadets participate in an early morning running program designed to develop their level of aerobic capacity. During the academic year, both the instructional program in physical education and the organized athletic program (intramurals, club sports, and intercollegiate athletics) include opportunities for individual involvement in large muscle group activities.

Questions arise concerning the aerobic capacities of women and how these levels might relate to USMA programs. Unfortunately, data on aerobic fitness in young women is limited (Table 5), particularly if the fact that most studies have employed indirect (predictive) techniques and often on small samples is taken into account. Levels of aerobic fitness in young women are generally substantially below young men based on a whole body, body weight or a lean body mass basis: for example, in a sample of young men and women entering Army basic training, it was found that aerobic fitness was 20-25% less in women (Patton and Vogel, 1975) (Figure 2). To what extent this reflects past physical activity and true physiological potential has not been resolved. Response of aerobic power to physical training in women is believed to be quantitatively and qualitatively similar to men but this is also based on limited data (Drinkwater, 1973, 1975; Katch and Michael, 1968; Kilbom, 1971; Sinning and Adrian, 1968; Witten and Witten, 1973; Yeager and Brynteson, 1970). Figure 3 provides a comparison of the mean values of VO_2 max levels of selected populations of both men and women.

The present study employed a direct measure of aerobic power capacity, maximal oxygen uptake. Maximal oxygen uptake (VO_2 max) was determined directly on a motor driven treadmill similar to the technique of Taylor, et. al. (1955). The subject first performed a warm-up run at 5 mph and 0% grade for six minutes. During the last minute of this run, the subject breathed through a large mouthpiece and low resistance

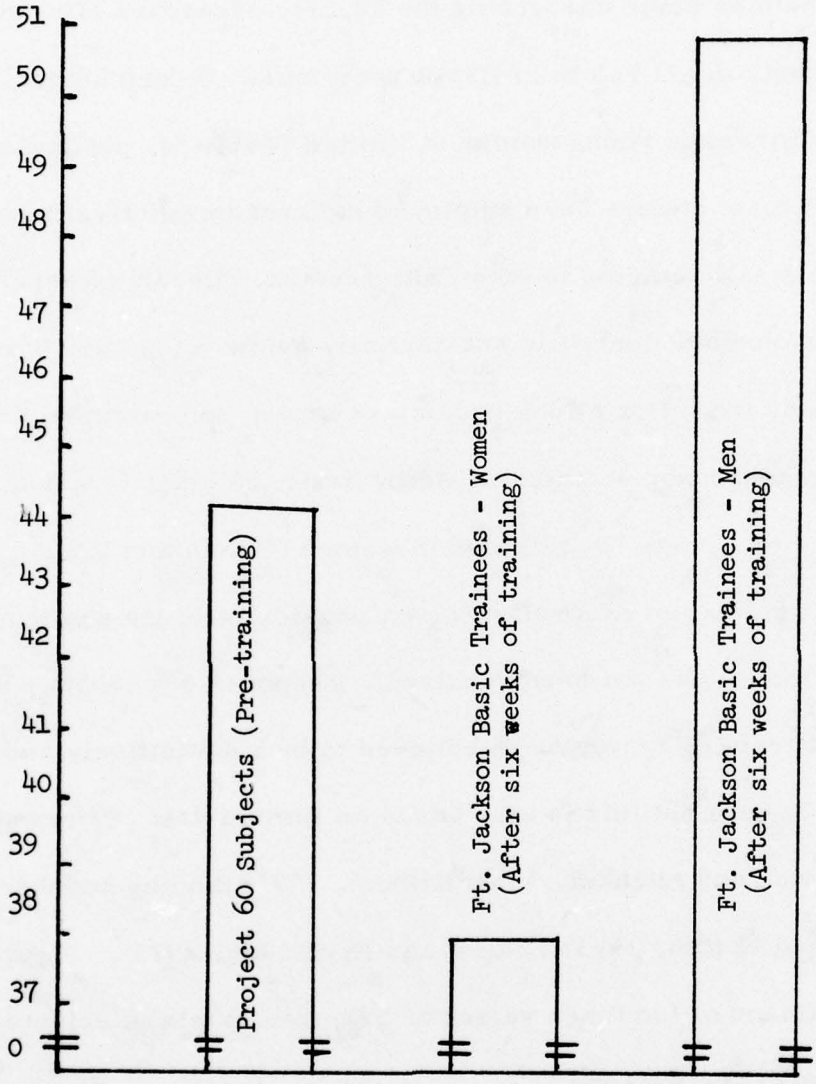


Figure 2. Maximum Oxygen Uptake (ML./KG./MIN) for Three Selected Populations

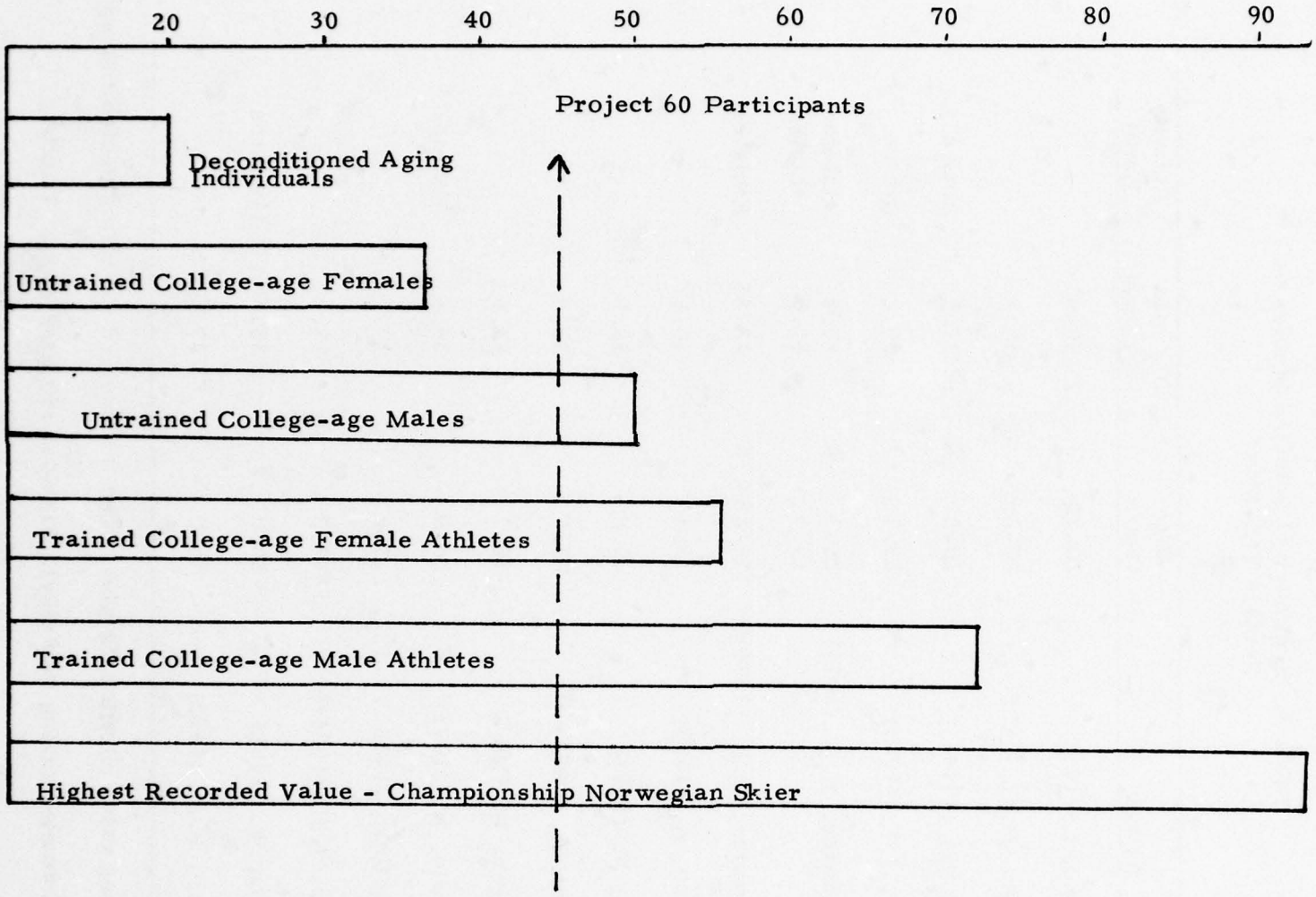


Figure 3. VO_2 Max (Ml/Kg/Min) of Selected Populations

Table 5. Summary of Selected Studies on Female VO_2 Max

Author	Age Years	VO_2 max ml/kg/min	Activity Level
Astrand, I. (1960)	20-29	39.9	
Astrand, P.O. (1952)	20-25	48.4	
Atomi, Y. (1974)	20-29	37.5	Active
Cotes, J.E. (1969)	23.7	39.2	Active
Drinkwater, B.L. (1973)	25.1	55.0	Athletes
	19.5	45.9	Athletes
Drinkwater, B.L. (1975)	16-25	42-55	Athletes
Jackson, A. (1976)	11.1	40.6	
Katch, F. (1973)	20.8	38.9	
Kilbom, A. (1971)	23.7	36.8	
Knuttgen, H. (1967)	16.7	33.6	
McArdle, W. (1971)	20.0	35.5	Athletes
Micheal, E. (1965)	17-22	29.8	
Patton, J.F. (1975)	19.9	38.1	
Sinning, W. (1968)	20.0	35.5	Athletes
Yeager, P.A. (1970)	18.0	37.3	

breathing valve (Collins Triple-J) and the expired air was directed through a $1\frac{1}{2}$" diameter tubing into vinyl (Douglas) 150 liter bags. Two bag collections of 30 seconds duration each were taken. Aliquots of each bag

were drawn through a paramagnetic oxygen analyzer (Beckman E-2) and infrared carbon dioxide analyzer (Beckman LB-1) to determine the percent fraction of these gases in the collected samples. The total volume collected in the bags was measured by evacuating the gas into a water-sealed spirometer and read to the nearest ten millileters. The VO_2 was then calculated using inspired (room air) and expired gas fractions of O_2 and CO_2, expired volume (corrected for temperature and pressure) and expressed in units of liters per minute at standard temperature and pressure, dry (STPD). VO_2 was also computed in terms of per kg body weight and per kg of lean body mass. VO_2 max ml/kg/min is a somewhat more meaningful expression of aerobic power than is VO_2 l/min because of size and work capacity differentials between individuals. VO_2 max ml/kg/min provides the basis for a relative comparison, for example, between a large person and a small person.

Lean body mass was found by subtracting the weight of body fat from gross body weight. Body fat was estimated by the prediction of body density from four skin fold measurements using the equation of Durnin and Rahaman (1967).* The skin fold sites employed were subclavian, tricep, bicep and suprailiac. Harpenden calipers were used.

*The aerobic testing employed a method for determining percent body fat which was different than the equation used for the anthropometric evaluation. The Office of Physical Education weight control officer followed USMA procedures on the anthropometric testing, while USARIEM personnel used their procedures and methods for the aerobic testing.

Table 6. Physical Characteristics Before And After Training

Group	Test	Height cm	Body Weight kg	Body Fat %	Lean Body Mass kg
Strength (N=20)	Pre/Mean	165.3	59.5	26.3	43.6
	S.D.	6.7	8.8	4.2	5.2
	Post/Mean	165.6	60.4	26.0	44.4
	S.D.	6.8	9.1	4.4	5.3
	Δ %	+0.2%	+1.5%	-1.1%	+1.8%
Reveille (N=20)	Pre/Mean	160.5	56.0	27.2	41.0
	S.D.	6.3	7.3	3.6	5.1
	Post/Mean	160.7	55.9	26.1	41.5
	S.D.	6.5	7.1	3.1	5.0
	Δ %	+0.1%	-0.2%	-4.0%	+1.2%
Control (N=17)	Pre/Mean	161.7	54.9	25.6	41.5
	S.D.	6.8	11.7	4.5	5.8
	Post/Mean	162.0	56.3	25.8	41.5
	S.D.	6.9	9.3	4.4	5.9
	Δ %	+0.2%	+2.6%	+0.8%	0%

Table 7. Submaximal Physiological Data At A Fixed Load of 5 RPM, 0% Grade Before And After Training

Group	Test	Heart Rate bpm	V_E BTPS l/min	VO_2 STPD l/min	VO_2 ml/kg . min
Strength (N=20)	Pre/Mean	178.6	65.4	1.95	33.0
	S.D.	10.5	9.6	.25	2.4
	Post/Mean	172.2	61.2	1.90	32.1
	S.D.	12.8	7.6	.21	2.5
	Δ %	-3.6%	-6.4%	-2.6%	-2.7%
Reveille (N=20)	Pre/Mean	181.9	65.1	1.88	33.7
	S.D.	13.9	13.0	.23	1.9
	Post/Mean	162.2	56.4	1.84	33.0
	S.D.	13.0	11.2	.25	3.1
	Δ %	-10.8%	-13.4%	-2.1%	-2.1%
Control (N=19)	Pre/Mean	178.8	65.9	1.85	33.3
	S.D.	9.1	12.4	.31	3.5
	Post/Mean	177.1	61.9	1.89	33.2
	S.D.	8.6	13.9	.33	2.7
	Δ %	-1.0%	-6.1%	+2.2%	-0.3%

Table 8. Physiological Data At VO_2 Max Before And After Training

Group	Test	Heart Rate[1] bpm	V_E BTPS l/min	VO_2 l/min	VO_2[2] ml/kg . min
Strength (N=20)	Pre/Mean	195.6	91.7	2.51	42.1
	S.D.	7.2	14.6	.36	2.7
	Post/Mean	193.4	100.4	2.67	45.0
	S.D.	5.8	13.3	.36	3.7
	Δ %	-1.1%	+9.5%	+6.4%	+6.9%
Reveille (N=20)	Pre/Mean	196.6	88.8	2.41	43.3
	S.D.	5.6	19.9	.35	3.3
	Post/Mean	186.7	99.3	2.66	47.7
	S.D.	5.6	20.3	.35	4.2
	Δ %	-5.2%	+11.8	+10.4	+10.2
Control (N=17)	Pre/Mean	195.5	93.7	2.46	44.3
	S.D.	6.6	15.6	.36	4.2
	Post/Mean	194.7	99.0	2.49	44.4
	S.D.	7.1	17.2	.33	4.4
	Δ %	-0.4%	+5.7%	+1.2%	+0.1

[1] F ratio (2.52) = 8.827*

[2] F ratio (2.50) = 25.766*

*Both significant at the .05 level.

After the initial run, the subject rested for 5 to 10 minutes and then performed 2 to 4 additional runs, each interrupted with a rest period. Based upon the response of her heart rate from the first run, successive runs were performed at the same speed but at increasing grades on the treadmill. VO_2 was measured in each run during the last 45-60 seconds by two 20-30 second expired gas collections. These latter runs lasted for 3 minutes. Runs were continued until no further increases in VO_2 was achieved over the previous load, i.e., a plateau of VO_2 was obtained with increasing work performed.

Results

The anthropometric measurements taken at the time of VO_2 max determination are presented in Table 6. Body weight remained constant in both training groups while the control group had a mean increase of 2.6 kg (5.7 lbs). Only the Reveille training group showed a small decrease in percent body fat (-4%).

Selected physiological responses to less than maximal (submaximal) exercise are indicative and often predictive of relative fitness. Table 7 presents the response of heart rate, ventilation (V_E, BTPS) and VO_2 at a constant submaximal load of 5 mph, 0% grade before and after training. Changes did not occur in any of the parameters in the control group. In the Reveille group, an anticipated decrease in both heart rate and ventilation occurred. Both results are indicative of improved cardio-respiratory fitness. A smaller, but never-the-less substantial decline

(approximately half that of the Reveille group) also occurred in heart rate (Figure 4) and V_E in the Strength group. VO_2 did not change as expected in any group, indicating no change in running efficiency.

Results of VO_2 max and related indices of heart rate and V_E at VO_2 max are presented in Table 8. VO_2 max (Figure 5) increased by 10.4 and 10.2%, l/min and ml/kg/min, respectively, as compared to no change in the control group. The strength group exhibited a 6.4 and 6.9% increase, respectively. Substantial increases in V_E were also noted for both the Reveille and Strength groups while the Reveille group also had a decrease in maximal heart rate.

Discussion

A one way analysis of covariance for both the heart rate and the VO_2 ml/kg/min was computed. For both measures, a significant difference (.05 level) between the control group and the reveille group was found. The Scheffe test applied to the heart rate and the VO_2 ml/kg/min data revealed that for both measures, a significant difference (.05 level) exists between the Reveille and the Strength groups. No significant difference between the Strength and Control groups was found.

The response of aerobic power to training obtained in this study can arbitrarily be classified as very good (+10%) and mild (+6%) for the Reveille and Strength groups, respectively. While this training effect was expected and predicted for the Reveille or running program, the aerobic response to an exclusively strength training program is less predictable.

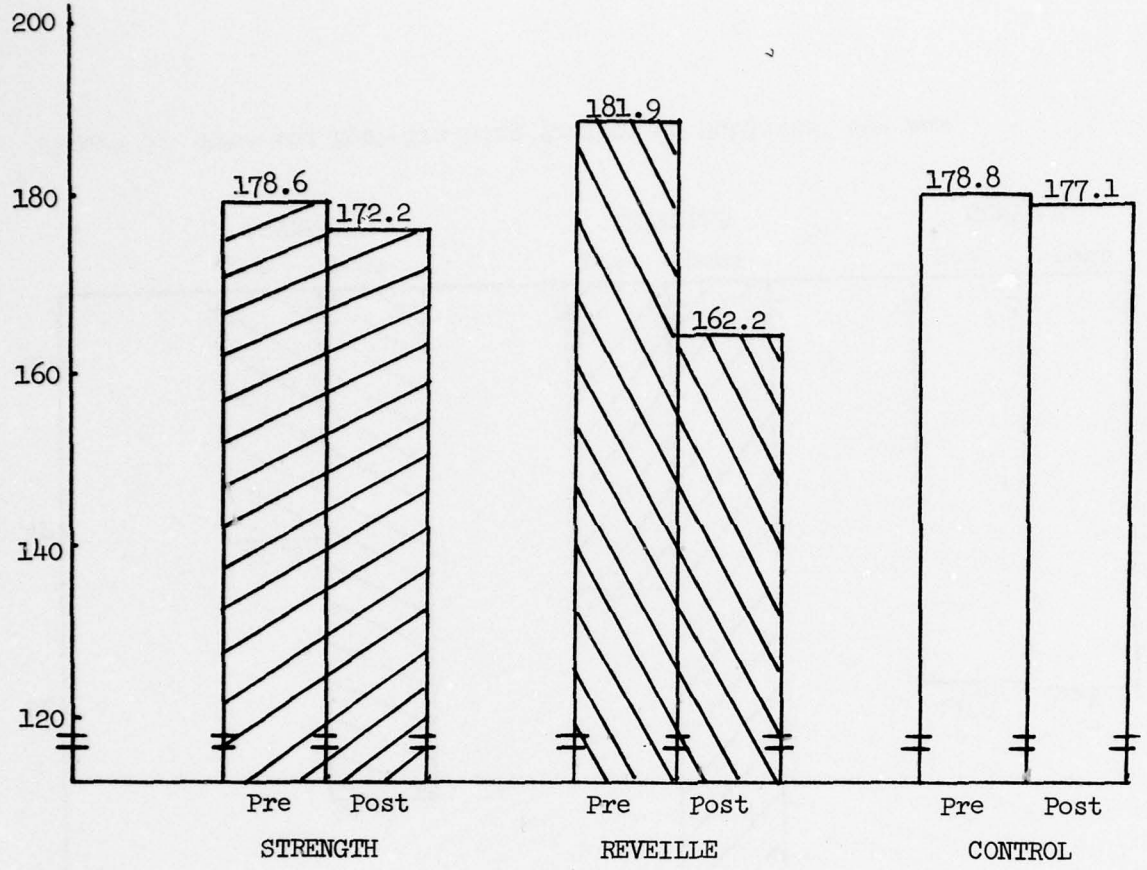


Figure 4: Pre- and Post-Training Project 60 Subjects' Submaximal Heart Rate Response to 5 mph, 0% Grade

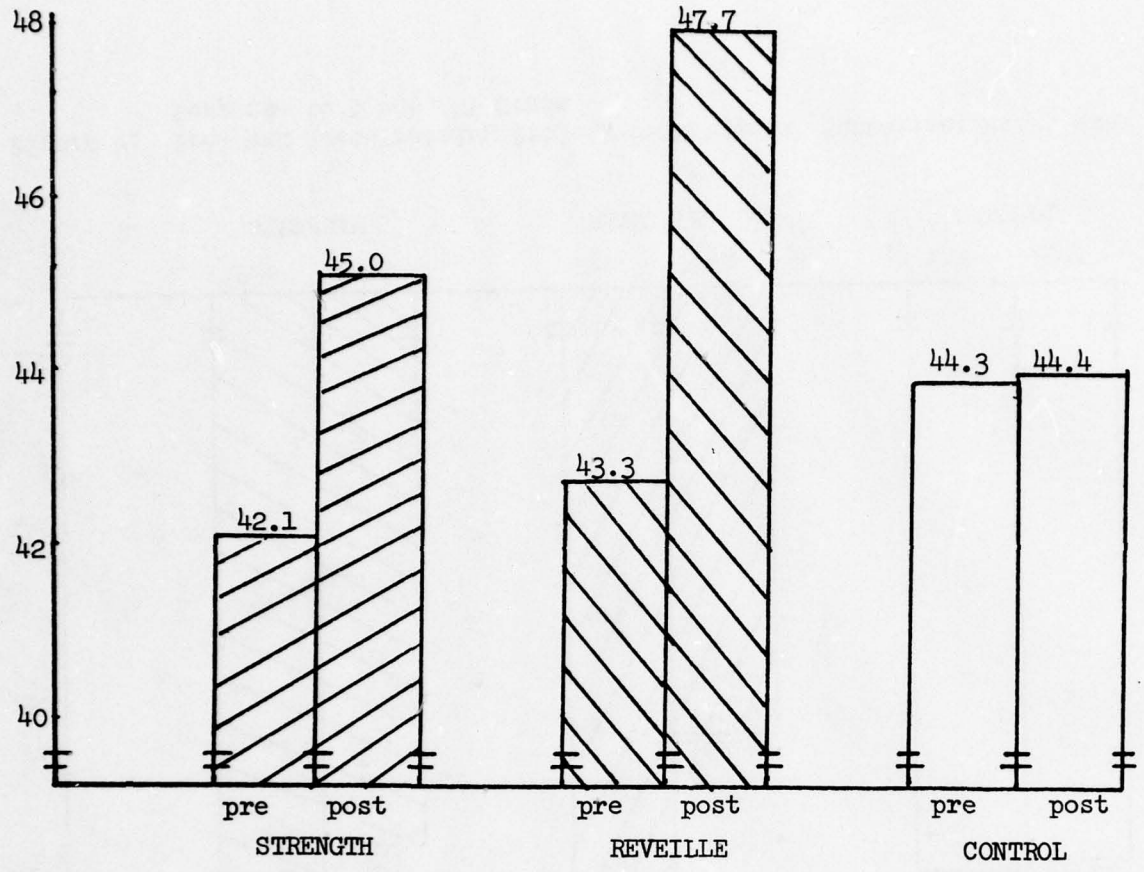


Figure 5: Pre- and Post-Training Project 60 Subjects' VO_2 max

The response of VO_2 max to weight training is a controversial question with a wide range of results found in the literature. With the primary exception of a study by Peterson (1975), there is minimal reliable data to lend credence to the claim that training can substantially effect aerobic power. The stimulus for enhanced aerobic power in training is a significant and sustained load on the cardiovascular system, i.e., an increased cardiac output of some minutes duration. This condition was apparently met for the subjects in both training programs.

The observed increase in VO_2 max with these training programs is even more significant when the initial relatively high levels of aerobic fitness of the subjects are considered. Although normative data is scarce for young females, a level of 43 ml/kg/min at the beginning of the study appears to clearly place them into the athletic category based on the summary of the literature presented in Table 5. Recent data collected by USARIEM on men and women entering the Army (Table 9) places women in the present study well above new female recruits but also well below young men. To what extent women can approach the level of aerobic fitness of men with prolonged intensive training is yet to be determined. The smaller muscle mass per unit of gross body weight places the female at a distinct disadvantage for developing relative aerobic fitness compared to the male.

The physiological response of the young women in the Reveille group can be classified as both quantitatively and qualitatively similar to the

Table 9. Comparison of Project 60 Findings with a Study of US Army Basic Trainees

	Project 60 Pre-Test All Groups	Start of Basic Training	
		Female	Male
n	57	92	92
Age	17.1	19.9	21.1
Body Weight, kg	56.9	59.0	72.0
% Body Fat	26.4	27.9	15.8
VO_2 max, ml/kg . min	43.3	38.1	50.8
Heart Rate max, bpm	196	189	191
V_E BTPS, l/min	91.3	92.0	145.6

better documented responses of men to training. The decrease in percent body fat, decrease in submaximal heart rate and ventilation, decrease in maximal heart rate and the 10% increase in VO_2 max are all typical of responses to a good aerobic training program in young untrained males. More valid comparisions of male and female responses to training will have to await studies in which both sexes are subjected to identical training programs.

Strength and Endurance

Although occasionally used interchangeable by some individuals, muscular strength and muscular endurance are usually considered by researchers to be separate, basic components of physical fitness. Strength is properly defined as maximal force exerted one time. Strength is specific to a given muscle or muscle group and is dependent upon whether or not the resistance is fixed or movable. Dynamic strength is the amount of resistance an individual can overcome during one application of force through the full range of motion of the particular joint or joints of the body involved (e.g., a bench press with a barbell). Static (isometric) strength is the maximal amount of force an individual can exert against a fixed resistance during one all-out application. Muscular endurance is the fitness quality that permits an individual to persist in localized muscle group activities for extended periods of time. Typical activities which must be suspended when the local muscle groups are unable to continue

further are pushups, pullups, situps, and dips. Given the demands of soldier leadership, high levels of both strength and endurance are necessary qualities for the USMA graduate.

In the present study, three of the body's five major muscle groups were tested: legs, arms, and chest*. In addition, the musculature involved with the handgrip and with plantar flexion was evaluated. The subjects' levels of handgrip strength were measured in order to examine the possible relationship between grip strength and task performance on those events involving the hands (e.g., flexed-arm hang). Similarly, the soleus muscle (the prime mover in plantar flexion) was tested in order to evaluate the possibility of a correlation between the strength of the soleus muscle and the frequency of lower leg injuries sustained by women engaging in physical training.

The muscle testing involved four measurements: peak strength, endurance, the amount of work done, and the rate at which the work was done. With the exception of the handgrips and the soleus testing, all measurements were performed using CYBEX equipment. Cybex is the trade name of an isokinetic system of equipment which permits the observation and quantification of basic strength through the range of motion,

*The other two main muscle groups are the shoulders and the lower back. Initially, plans were made to evaluate the lower back musculature but the necessary measuring equipment was not available.

explosive power, and endurance. All Cybex testing was conducted using the procedures which are outlined in the CYBEX II TESTING PROTOCOL.

A pen recorder provided an exact record of each test.

Peak strength level was determined by identifying the highest point on a recorded strength curve. Muscular endurance was calculated by determining how long a subject could maintain a predetermined, arbitrary level of recorded strength during a contraction. The amount of work done was provided by an integrator which totaled the area under the strength curve for each repetition. The resultant totals were computed in foot-pound increments. For the leg and arm measurements (angular) these foot-pound increments represent the ratio of torque overtime. For the bench press measurements (linear) the foot-pound increments represent a ratio of work over time.

The leg evaluation consisted of both static and dynamic measurements. In order to overcome the possible "learning effect" of using the equipment, each subject had three separate trials (at least 36 hours apart) on the dynamic contractions. Her performance on the final trial was the basis for her evaluation. Only one trial was used for the static contraction since "learning" was not a factor.

Each subject performed three 5-second static contractions of both knee flexion (hamstring) and extension (quadriceps). All static leg contractions were measured at 120^{o} of knee extension. There was a

one-minute of rest between each static contraction. Peak strength was computed for each contraction.

After the static contractions and following a two-minute rest, three full range, knee flexion and extension, single dynamic contractions were performed at both 5 rpm (30^{o}/sec) and 15 rpm (90^{o}/sec). There was a one-minute rest between each of the dynamic contractions. For each contraction, torque was computed. Following the final single dynamic contraction, another one-minute rest was scheduled. Each subject then performed a 30 second* endurance bout of continuous full range contractions. Torque/time was computed for each bout.

During all leg testing, the subject was seated on the Cybex plinth with the back support and the lower plinth forming a 90^{o} angle. By means of a velcro strap placed across the distal third of the thigh, a seat belt secured across the hips, and a third strap transversing the thigh in an oblique manner, the position of each subject was stabilized during testing.

The Cybex axis of rotation was manually adjusted to match the rotation of the subject's knee. The lateral epicondyle of the femur was used as the landmark for the axis of rotation. A shin pad was placed on the anterior distal third of the tibia in order to preclude interference with the movement of the ankle.

*The initial trial of the first few subjects indicated strongly that requiring an endurance bout of longer than 30 seconds was counterproductive. Although the original plans had called for a 60-second endurance bout, the testing program was modified slightly (60 seconds to 30 seconds) to reflect the reality of the situation.

The protocol for testing the static and dynamic contractions for arm flexion (biceps) and extension (triceps) was identical to that used for evaluating the leg musculature. The position of the subject during arm testing was also similar to the leg evaluation except that each participant's shoulders were stabilized by a shoulder harness. This harness was positioned diagonally from the acromioclavicular joint toward the mid-sternum.

The Cybex torque arm was adjusted to align with the subject's arm. The axis of rotation of the elbow was aligned with the axis of rotation of the Cybex. A 360^{o} clamp, placed proximal to the carpal bones of the wrist, was attached to surround the styloid processes of the ulna and radius.

During the static testing for both the leg and the arm, the subjects were exhorted to exert force against the torque arm as "hard as possible". Similar instructions were given during the dynamic contractions except that each subject was told to move the torque arm "as fast and as hard as possible".

A Cybex bench press unit was used to evaluate the status of the pressing muscle groups of the upper body. Each subject performed three single dynamic contractions at both 10 rpm and 20 rpm and a 30 second endurance bout of dynamic contractions. For the former, the amount of torque achieved on each contraction was recorded. On the latter, the total amount of work done (expressed in foot-pounds) was computed.

During the bench press testing, the subject assumed a supine position on the isokinetic bench press seat. When the bench press handles were in the down position, the subject's back was flat against the bench and her feet flat on the floor. The handles were placed in the subject's hands with the wrist and forearm in the extended locked position. She was encouraged to point her proximal interphalangial joints toward the ceiling to discourage wrist flexion and extension. The upper arm was placed perpendicular to the body and the hands positioned shoulder width apart. When in the extended position, the subject's arms were fully extended and the bar was vertical to her chin. The subject was then instructed to push "as hard and as fast as you can".

On the soleus and handgrip testing, only one trial was used. For the soleus evaluation, three 5-second maximum static contractions of plantar flexion and one sustained static contraction were performed by each subject. Each of the 5-second contractions was preceded by a one-minute rest period. Following the final 5-second contraction, a five-minute rest period was scheduled before the sustained contraction was performed. During the next phase, each subject sustained static soleus contraction until which time that the observable peak strength level of contraction had diminished to a point equal to 50% or less of what was achieved during the best 5-second contraction. For example, a subject who had a 400# peak level 5-second contraction held the sustained contraction until it dipped to a 200# level.

The basic piece of equipment involved in the soleus testing was a machine designed by USARIEM personnel. Each subject sat in a chair facing the front with the ankle at 90° and knee flexed approximately 90°. When necessary, the position of the chair was mechanically adjusted to achieve these positions. Each subject's right foot was placed on a force platform and a metal shield placed on the right thigh. A chain was placed around the thigh and connected to a transducer which in turn sensed the exerted upward force. In this position, the soleus was isolated and the gastronemius heads (calf muscles) were neutralized. Each subject was instructed to push down on the ball of her right foot "as hard as possible". The peak strength level was computed for each of the 5-second contractions, and the toatl time of the sustained contraction was recorded.

The protocol for measuring handgrip strength and endurance was identical to the steps used to evaluate the soleus. The hand dynamometer used for the handgrip testing was also provided by USARIEM. Each subject sat on a chair that was adjacent to a table holding a hand dynamometer which was connected to a transducer and a recorder. The right arm of each subject was extended to approximately 135°. The right forearm was in the midpronation/supination position. The right palm was in approximately 15° of ulnar flexion. On the middle finger the metacarpal-phalangial joint was in approximately 150° of flexion while the proximal interphalangial joint was at 110° of flexion. Each subject was instructed to squeeze "as

hard as possible" for both the three 5-second static contractions and the sustained contraction. Similar to the soleus testing, peak strength and total time for the 5-second and the sustained contractions, respectively, were recorded.

Results

The results of the leg testing are presented in Table 10. As anticipated, the subjects in the strength group improved their overall strength levels. On six of the seven leg variables, members of the strength group achieved a performance increase. The results of the leg measurements for the reveille exercise group illustrate the opposite occurrence. On six of the seven leg variables, the reveille group performed at a lower level. The control group incurred a slight overall degree of improvement.

The mean values for the pre- and post-training arm measurements are presented in Table 11. Similar to the findings of the leg testing, the strength group exhibited a pattern of overall improvement. Although the reveille exercise subjects suffered a performance decrement on four of the seven arm variables, they did perform substantially better than the control subjects on all seven arm measures. The fact that the reveille group had a greater percentage increase on the endurance test than did the strength group (27.9% versus 14.5%) could be attributed, in part to the rifle drill.

Table 10: Leg Measurements Before and After Training

Group	Test	Static Flexion (Peak Str)	Static Extension (Peak Str)	Dynamic Flexion 5rpm (Torque)	Dynamic Extension 5rpm (Torque)	Dynamic Flexion 15rpm (Torque)	Dynamic Extension 15rpm (Torque)	Dynamic Endurance (Ft/Lbs)
Strength (N=20)	Pre/Mean	65.1	130.1	70.0	117.5	58.6	85.2	23.0
	S.D.		31.1	12.5	29.9	13.3	21.4	4.6
	Post/Mean	67.1	121.6	73.0	131.9	65.4	96.7	24.1
	S.D.		25.8	13.3	30.9	15.7	23.4	5.0
	Δ %	+3%	-6.6%	4.2%	12.2%	11.6%	13.5%	3.9%
Reveille (N=19)	Pre/Mean	58.8	125.7	67.6	106.7	56.2	77.4	21.9
	S.D.		27.0	18.3	25.1	13.8	18.1	4.1
	Post/Mean	57.9	100.6	65.6	101.5	56.9	76.2	21.7
	S.D.		18.0	13.3	25.7	10.6	15.8	3.1
	Δ %	-1.5%	-20%	-2.9%	-4.8%	+1.2%	-1.5%	-1%
Control (N=17)	Pre/Mean	62.6	121.7	64.4	115.9	55.1	84.1	22.6
	S.D.	14.9	27.0	13.7	21.2	11.7	16.1	4.8
	Post/Mean	64.0	111.8	66.8	117.1	56.9	86.5	22.5
	S.D.	14.7	18.0	16.3	21.2	13.0	16.0	4.9
	Δ %	+2%	-8%	+3.8%	+1%	+3.2%	+2.8%	0.4%

Table 11: Arm Measurements Before and After Training

Group	Test	Static Flexion (Peak Str)	Static Extension (Peak Str)	Dynamic Flexion 5rpm (Torque)	Dynamic Extension 5rpm (Torque)	Dynamic Flexion 15rpm (Torque)	Dynamic Extension 15rpm (Torque)	Dynamic Endurance (Ft/Lbs)
Strength (N=20)	Pre/Mean	27.2	18.7	20.2	17.4	18.8	16.4	6.9
	S.D.	5.8	4.3	3.8	4.9	3.7	4.4	3.4
	Post/Mean	27.6	20.1	20.3	18.4	18.4	16.9	7.9
	S.D.	5.8	4.7	4.1	4.8	4.0	4.5	3.4
	Δ %	+1.4%	+7.4%	+0.4%	+5.7%	-2.1%	3%	+14.5%
Reveille (N=19)	Pre/Mean	25.6	18.2	19.3	17.4	18.6	16.8	6.1
	S.D.	5.0	4.4	3.8	3.4	3.6	3.4	1.8
	Post/Mean	25.8	19.4	17.9	16.3	16.1	15.1	7.8
	S.D.	5.4	4.2	3.0	2.5	2.5	2.3	2.3
	Δ %	-0.4%	+6.5%	-7.2%	-6.3%	-8.1%	-10.1%	+27.9%
Control (N=17)	Pre/Mean	26.7	18.1	20.4	17.2	19.4	16.1	6.5
	S.D.	6.0	3.8	4.3	3.7	4.4	3.6	1.7
	Post/Mean	24.9	17.7	17.9	16.0	16.2	14.3	7.0
	S.D.	6.1	3.3	4.0	3.2	3.6	2.2	2.1
	Δ %	-6.7%	-2.2%	-12.2%	-7.0%	-16.4%	-11.2%	+7.7%

The bench press measurements are presented in Table 12. Both the strength and the reveille groups recorded substantial improvement. The across-the-board higher performances by the strength subjects was expected since the strength program included the bench press exercise. The improvement by the reveille group can be partially attributed to the fact that conditioning drill includes exercises (e.g. push-up, 8-count push-up) which stress the pressing muscle groups of the upper body. Two of the three changes in the mean bench values for the control group were minimal. There was a 7.5% decrease by the control group on the bench press at 20 RPM.

The results of the handgrip testing are presented in Table 13. The largest percentage increase in the peak strength level on the static contraction was achieved by the reveille group (+7.8%). The other two groups incurred a similar degree of improvement on the 5-second static contraction. The strength and reveille subjects improved their mean performance by 35% and 13.1% respectively on the sustained static handgrip contraction. There was a slight decrease in the performance of the control group on the sustained handgrip test.

The mean values for the pre- and post- training soleus measurements are presented in Table 14. The strength group incurred a substantial improvement on the sustained contraction and a minimal

Table 12: Bench Press Measurements Before And After The Training

Group	Test	10rpm	20rpm	Endurance
Strength (N=20)	Pre/Mean	74.9	13.0	971.5
	S.D.	11.4	5.8	252.4
	Post/Mean	92.7	16.3	1260.0
	S.D.	16.5	7.2	281.4
	Δ %	+23.8%	+25.3%	+29.8%
Reveille (N=20)	Pre/Mean	76.5	12.3	969.5
	S.D.	17.8	6.9	308.3
	Post/Mean	85.6	12.9	1078.5
	S.D.	19.3	6.3	266.5
	Δ %	+11.9%	+4.9%	+11.2%
Control (N=17)	Pre/Mean	73.3	13.4	960.0
	S.D.	15.5	5.7	316.2
	Post/Mean	75.7	12.4	990.6
	S.D.	16.4	5.7	259.8
	Δ %	+3.3%	-7.5%	+3.2%

Table 13: Handgrip Measurements Before And After The Training

Group	Test	5-Second Static (Peak)	Sustained Static (Seconds)
Strength (N=20)	Pre/Mean	77.9	30.6
	S.D.	13.3	13.8
	Post/Mean	82.9	41.3
	S.D.	15.7	14.6
	Δ %	+6.4%	+35%
Reveille (N=20)	Pre/Mean	75.6	37.5
	S.D.	12.7	16.5
	Post/Mean	81.5	42.4
	S.D.	11.8	22.3
	Δ %	+7.8%	+13.1%
Control (N=17)	Pre/Mean	74.0	35.6
	S.D.	12.7	18.2
	Post/Mean	77.3	33.8
	S.D.	14.8	16.1
	Δ %	+4.5%	-5.1%

Table 14: Soleus Measurements Before And After The Training

Group	Test	Static (Peak Strength)	Sustained Static-Contraction (Seconds)
Strength (N=20)	Pre/Mean	342.7	74.2
	S.D.	78.4	24.5
	Post/Mean	355.8	85.8
	S.D.	83.3	35.5
	Δ %	+3.8%	+15.6%
Reveille (N=19)	Pre/Mean	349.6	88.3
	S.D.	60.6	32.5
	Post/Mean	348.5	79.9
	S.D.	64.7	32.8
	Δ %	-0.3%	-9.5%
Control (N=17)	Pre/Mean	298.3	96.8
	S.D.	69.4	25.5
	Post/Mean	317.4	87.7
	S.D.	68.1	26.3
	Δ %	+6.4%	-9.4%

Table 15. Correlation Matrix Between Selected Project 60 Variables

	1	2	3	4	5	6
1		.1329863	.1598686	-.1276686	.0627014	.245691
2		1	-.4026636	.455234	-.1931109	-.0648581
3			1	-.1902706	.3520228	-.0280291
4				1	-.189751	.141167
5					1	-.1738809
6						1

Variables	Mean	Variance	Standard Deviation
1. Flexed Arm Hang	18.27894	146.7217	12.11287
2. Grip (Peak)	75.94737	174.0508	13.11681
3. Grip (Endurance)	34.50877	275.183	16.58864
4. Soleus (Peak)	331.8772	5470.645	73.96381
5. Soleus (Endurance)	87.6228	1068.69	32.69083
6. Injury	.1578947	.1353383	.3678836

(0-No, 1-Yes)

percentage increase in peak strength on the 5-second contraction. The reveille subjects recorded negligible changes on both measures, while the control group achieved a mild increase on the 5-second static contraction and a substantial decrease on the sustained contraction measurement.

In order to identify the possible relationship between grip strength and tasks requiring the use of the hands and between soleus strength and injury incidence, a correlational analysis was completed. The six-item correlation matrix is presented in Table 15. Except for the relatively strong relationship between the two measures of endurance and between the two strength variables, no correlation exists between the other factors.

Discussion*

The results of the strength and endurance testing suggest several points. In general, a well supervised program of strength training which is based on sound scientific principles can produce across-the-board improvement in the strength of young women. On those measures for which the training program included a direct exercise (e.g. bench press, leg press, and leg extension), substantial changes were achieved.

The general decrease in performance by the reveille group on

* A more detailed examination and discussion of the strength training program in general is presented in Section IV of this paper.

the leg and arm testing may be related to a phenomenon which appears to occur during the summer training for new cadets. Traditionally, the level of performance of new cadets on strength and endurance-related items (e.g. pull-ups) decreases over the course of the seven week summer training program. This change has been generally attributed to the composite stresses (both physical and mental) placed on the new cadet and to the fact that the exhaustive new cadet schedule precludes the opportunity to recover from the resultant level of fatigue. Once the academic year starts, most cadets gradually not only regain but improve their level of physical performance. The leg and arm test results for the reveille group suggest that the reveille subjects may also have been slightly effected by the "fatigue syndrome" associated with reveille training. Given the fact that several of the Project 60 subjects generally performed at a level considered already below acceptable standards on USMA-related tasks (e.g. carrying the rifle during the running program) and the fact the Project 60 training subjected each woman to only a few of the physical stresses of the CBT summer program, the "fatigue syndrome" may have profound implications for the CBT performance of women cadets.

Flexibility

One of the less-commonly-recognized qualities of physical fitness is flexibility. Defined as the functional capacity of a joint to move

through a normal range of motion, flexibility is specific to given joints and is primarily dependent upon the musculature surrounding a joint rather than on the actual bony structure of the joint itself. A review of the literature suggests that flexibility is one aspect of fitness of which women typically possess higher levels (Clark, 1960; Morehouse and Miller, 1976). The measurements of selected flexibility items was included in the present study in order to determine the effects of the two experimental training program on the flexibility levels of high school age women.

Two measures* of trunk flexibility were obtained: standing trunk flexion and trunk hyperextension. On the trunk flexion testing, each subject stood on a step bench with her knees fully extended. On command, she flexed at the trunk and reached with both hands as far downward as possible. Her flexibility was computed to the nearest 1/10th of an inch in terms of her ability to reach to a point even with the top of the bench. Score-wise, she received a minus score for failing to reach the level of the bench and a positive score for reaching past the level of the bench.

On the trunk hyperextension test, the subject assumed a front lying position with her arms extended at her sides and her head held in extension. The subject raised her trunk (head to waist) as far

* Initially, an additional measure of flexibility, shoulder hyperextension, was included in the study. Because of operational difficulties indicating that the resultant data might be unreliable, the measure was eliminated.

backward as possible. Her flexibility was computed as the most direct distance (to the nearest whole inch) from the floor to the base of the adam's apple portion of her neck.

Results

The mean values for the trunk flexion and trunk hyperextension measurements are presented in Table 16. The direction of the changes is inexplicable. The strength group recorded a slight increase on one measure and a slight decrease on the other variable. The subjects in the reveille training incurred almost no change on either test, while the control group exhibited a slightly higher level of flexibility on both measures. All three groups demonstrated levels of flexibility which were higher than the National average.

Discussion

The Project 60 subjects have relatively high levels of flexibility which were not substantially affected by either the reveille exercise or strength training programs. The OPE personnel monitoring both training programs reported that the women perform very well on those physical tasks requiring flexibility. It is doubtful that the existing USMA physical education program would ever place a sufficient enough demand on the flexibility of above-average women physical performers to generate flexibility improvement.

Table 16. Pre- And Post-Training Flexibility Measurements

Group	Test	Trunk Flexion (inches)	Trunk Hyperextension (inches)
Strength (N=20)	Pre/Mean	9.58	19.39
	S.D.	N.A.	2.14
	Post/Mean	9.06	20.51
	S.D.	N.A.	2.26
	Δ %	-5.4%	+5.8%
Reveille (N=20)	Pre/Mean	9.84	19.28
	S.D.	N.A.	1.79
	Post/Mean	9.65	19.23
	S.D.	N.A.	1.61
	Δ %	-1.9%	-0.3%
Control (N=18)	Pre/Mean	10.47	18.24
	S.D.	N.A.	3.44
	Post/Mean	10.81	18.78
	S.D.	N.A.	3.06
	Δ %	+3.2%	+3.0%
National average for college-age women*		+3.5"	+18"

*Source: Johnson and Stolberg, Conditioning, Englewood Cliffs, New Jersey: Prentice Hall, 1971, p.50.

C. PHYSICAL PERFORMANCE-RELATED ITEMS

$1\frac{1}{2}$ Mile Run

The $1\frac{1}{2}$ mile run is an excellent test of aerobic capacity. Generally speaking, although the elapsed time for completing this event is usually well under 15 minutes, the individual who engages in an all-out effort for this test is required to place an intensive demand on her circulatory and respiratory systems. The literature is replete with somewhat comparable maximum effort measures of aerobic capacity (Kenneth Cooper's 12 minute run, 1968; Bruno Balke's 15 minute run, 1961; FM 21-20's 2 mile run, 1975). A run $1\frac{1}{2}$ miles long was selected because of its use during CBT for the class of 1979. To perform the $1\frac{1}{2}$ mile run test, each subject ran slightly-less-than nine laps on the tartan-covered indoor track in the USMA field house. Only 1 trial was allowed.

Results

The mean values for the pre- and post-training $1\frac{1}{2}$ mile run results are presented in Table 17. Both training programs produced a substantial change in the $1\frac{1}{2}$ mile run times. The reveille and strength groups decreased their times by 133.5 and 71.8 seconds respectively. The control group incurred only a slight improvement. Adjusting for the initial differences between the groups a significant difference (.05 level) was found between the reveille and control

Table 17. Pre- And Post-Training 1½ Mile Run Performances (Seconds)

Group	Strength (N=18)	Reveille (N=17)	Control (N=16)
Pre/Mean	973.6	842.4	851.0
S.D.	71.82	137.64	93.49
Post/Mean	793.2	707.1	847.3
S.D.	81.94	87.93	123.45
Δ %	-9.2%	-16.1%	-0.4%
Adjusted/Mean	84.7	715.2	848.3
Δ %	-10.2%	-15.1%	-0.3%

F (2.47) Ratio = 13.840*

*Significant at .05 level.

groups. The Scheffe multiple comparison test determined that a significant difference (.05 level) also existed between the strength and control groups and between the reveille and strength groups.

Figure 6 illustrates the comparison between the $1\frac{1}{2}$ mile run performances of the Project 60 subjects and the Class of 1979's CBT performances. These comparisons support the validity of the numerous physiological differences relating to cardio-respiratory capabilities between men and women which are outlined in Appendix A. Although substantial improvement was achieved by the reveille group (15.9%), the post-training mean value for the reveille program subjects was over $2\frac{1}{2}$ minutes slower than the average August, CBT performances of the Class of 1979. The best two Project 60 performances of the $1\frac{1}{2}$ mile run (both reveille group members) occurred on the post-test when two subjects broke ten minutes (9:39 and 9:51 respectively).

Discussion

The results of the $1\frac{1}{2}$ mile run test are consistent with the findings related to aerobic power. As expected, the rigorous running program which was part of the reveille exercise training produced a significantly large improvement in the $1\frac{1}{2}$ mile run performances. The substantial decrease in $1\frac{1}{2}$ mile run times for the strength group members can be attributed primarily to two factors. The first concerns the relatively demanding nature of the strength training.

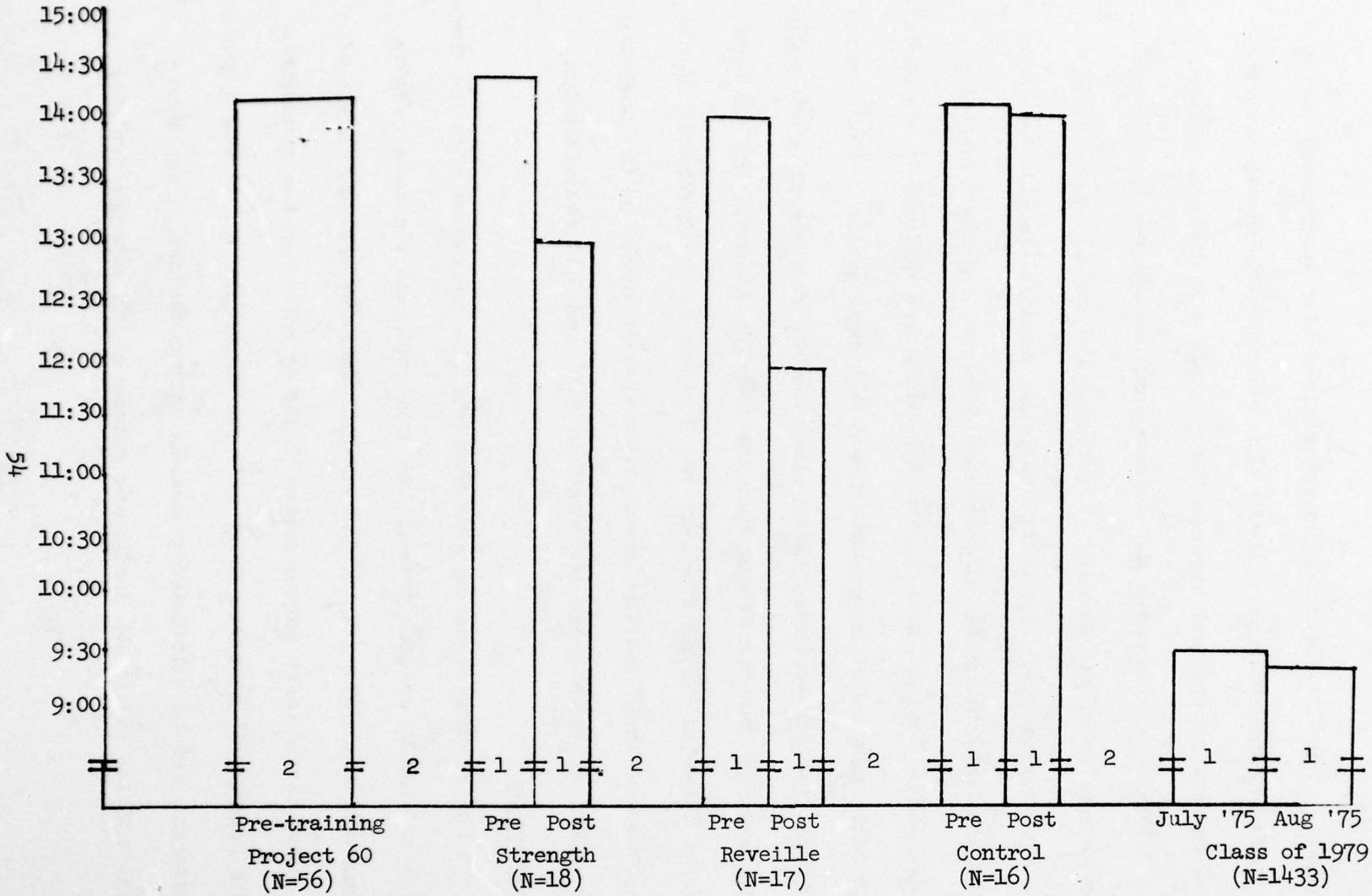


Figure 6: Comparison of $1\frac{1}{2}$ Mile Run Performances Between Project 60 Subjects and USMA Class of 1979

The subject worked so hard, her heart rate remained at a high level for an extended period of time. The second factor (and the one which probably predominates) relates to pain-tolerance. The rigorous nature of the strength training required the subjects to "push themselves" past previously perceived limits of effort, fatigue, etc. This increased their tolerance for "pain" and obviously heightened their awareness that they could overcome tasks requiring a great individual effort, such as the $1\frac{1}{2}$ mile run.

Two additional factors should be considered in the interpretation of the Project 60 $1\frac{1}{2}$ mile run results. In general, running a mile and one-half at maximum effort is more difficult when done in the field house than it would be out-of-doors. Psychologically, the women had a greater task on their $1\frac{1}{2}$ mile run than they would have had outside on the Shea Stadium quarter-mile track. A final confounding aspect concerning the Project 60 $1\frac{1}{2}$ mile run performances was the lack of proper running form exhibited by the women. For whatever reason- cultural, societal, or physiological- the subjects had relatively poor running form. Quite possibly, the $1\frac{1}{2}$ mile run times of women cadets can be substantially improved by means of instruction in basic running techniques.

Block Shuttle Run

The block shuttle run is basically an anaerobic (not requiring oxygen) test which purports to measure speed, agility, and manual dexterity. On the block shuttle run, an individual is required to transport as quickly as possible six blocks from one line to another and then sprint past the line which originally held the blocks. The lines are 10 yards apart. The block shuttle run was included in the present study for two reasons: (a) no other item evaluated either agility or manual dexterity; and (b) it provided an additional basis for direct comparison with the class of 1979.

All testing was conducted on the hardwood surface of the basketball course in the USMA field house. Subjects wore gym clothes and tennis shoes. Each subject used a spring, crouch, or stand up start behind the strating line. On the command, "Get Set, Go!", she ran as close to the opposite line as necessary to pick up a block, returned it to the starting line and put it down so that it touched the starting line. She continued until all six blocks were touching the starting line, then sprinted across the finish line. Blocks could be adjusted to touch the starting line at any time during the test, but if any block was accidentally kicked or if the subject fell causing an appreciable loss of time, she was stopped and, after a brief rest, was given another trial. Only one correctly executed trial was allowed.

Time was recorded to the nearest 1/10th of a second.

Results

The mean values for the pre- and post-training block shuttle run times are presented in Table 18. Both the reveille and the control groups decreased their level of performance. On the other hand, the strength training subjects improved their performances by 0.43 seconds. An analysis of covariance yielded a non-significant F-ratio of 0.260.

Figure 7 illustrates a comparison between Project 60 post-training and USMA Class of 1979 block shuttle run performances. The Class of 1979 mean time is based on the results of the PAT #2 OPE test given to the Class of 1979 in January, 1976. The Class of 1979 mean

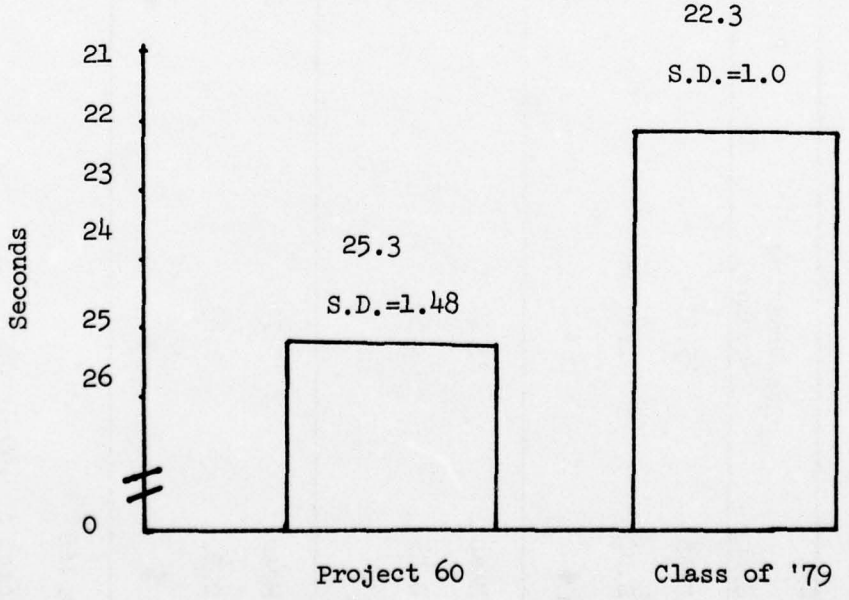


Figure 7. A Comparison of mean values for block shuttle run performances between the Project 60 subjects (post-training) and the Class of 1979, USMA.

Table 18. Pre- and Post-Training Block Shuttle Run Measurements

Test	Group	Pre-Training (Seconds)	Post-Training (Seconds)	Adjusted Post-Training (Seconds)
Strength (N=18)	Mean	25.27	25.39	25.17
	S.D.	1.47	1.15	*
	Δ %	*	-1.7%	-2.5%
Reveille (N=18)	Mean	25.27	25.39	25.46
	S.D.	1.34	1.87	*
	Δ %	*	+0.5%	+0.8%
Control (N=16)	Mean	25.11	25.28	25.43
	S.D.	1.83	2.01	*
	Δ %	*	+0.7%	+1.3%

$F(2,48) = 0.260$[a]

[a] Not significant at .05 level.

time for the block shuttle run is over 3 seconds lower than for the Project 60 participants. On one hand, the best time for a Project 60 subject was equal to the average time for the Class of 1979, while the slowest time for a Class of '79 cadet was equal to the mean performance for the Project 60 women.

Discussion

The results of the block shuttle run are equivicol. The improvement by the strength group subjects may be attributed to their engaging in leg exercises in the strength training program. The strength group participants exhibited across-the-board improvement on the tests relating to leg strength (see page). The reveille group results could have been anticipated somewhat because of the poor showing by the reveille program participants on the post-training leg testing. Undoubtedly, their time decrement is also related to the fatigue syndrome associated with the reveille exercise training which was alluded to in the discussion of the strength and endurance test findings.

An additional factor affecting the block shuttle run results concerns the fact that performance on this event depends on proficiency in certain motor skills as much or more than it reflects specific physical fitness qualities. Event technique, as well as physical ability influences the results. Neither training program provided instruction on how to do the event. Unquestionably, such instruction

would have substantially improved the performances of the Project 60 subjects.

Physical Aptitude Examination (P.A.E.)

Over the years, the P.A.E. has been utilized as an integral criterion in the process for evaluating individuals for admission to USMA. Numerous studies have supported both the validity and the reliability of the P.A.E. as an effective measure for predicting an individual's ability to handle the physical demands of the USMA program. For the male applicants, the P.A.E. is a four item test consisting of pull-ups, modified basketball throw, standing long jump, and 300 yard shuttle run.

Because of apparent physiological differences between men and women and collected data which indicates that the mean performance by women on the four items on the men's P.A.E. is generally much lower than that achieved by men, the P.A.E. for women candidates has been modified slightly. The flexed-arm-hang has been substituted for the pull-ups. Another adjustment concerns the utilization of a different normative scale for admission for women applicants. The 450 P.A.E. score which is generally the lowest acceptable score for a male candidate would preclude all but a very few of the women who apply for admission to USMA. The specific determination of the minimal acceptable P.A.E. score for women is still being considered. In order

to help identify the basic capabilities and limitations of women possessing a wide range of physical abilities, the USMA P.A.E. for women was administered to the Project 60 subjects.

The procedures for administering the P.A.E. to the Project 60 subjects were identical to those prescribed in the Physical Aptitude Examination Manual for USMA candidate testing. All testing was conducted in the USMA gymnasium.

For the flexed-arm-hang, the subject grasped the bar with her hands approximately shoulder width apart. The back of her hands were toward her face and her thumbs were under the bar. Two OPE spotters, one on either side of the subject, raised her to where her chin was level and above the bar. In this, the flexed-arm-hang position, the subject's elbows were flexed and her chest was positioned close to the bar. At the command "Go", the spotters released the subject. She then held the flexed-arm position as long as possible. The time for the event started at the command "Go" and stopped when: a) the subject's chin rested on the bar (inadvertent touching of the bar did not halt the test); b) the subject's head tilted backward to keep her chin above the bar; or c) the candidate's chin fell below the level of the bar. The subject's time was recorded to the nearest tenth of a second. Only one trial was allowed.

For the standing long jump, the subject stood with both feet

behind a starting line. By bending the knees and swinging the arms one or more times, she jumped forward to cover the greatest distance possible. She could not take a preliminary hop. She had to take off with both feet simultaneously and to land on both feet simultaneously with the heels approximately even. If she lost her balance and fell backward, she was allowed another trial. After one practice trial, each subject had to complete three correctly executed jumps. The best of the three was recorded as her score on this event. All measurements were made from the starting line to a point where the back of the rearmost heel touched and were recorded in two inch increments.

For the modified basketball throw, the subject assumed a position on the knees on a mat which was close to and directly behind a throwing line. The knees were parallel to the throwing line. She was allowed three legal overhand throws from this position to attain as great a distance as possible. She could use her non-throwing hand to steady the ball in preparation for the throw. She could not touch on or over the throwing line during or after any throw. Three fair trials and one practice throw were allowed. All throws were measured to the nearest foot of achieved distance. A ball landing to one side of an area directly in front of the subject was measured by extending an imaginary straight line from the point of impact to the nearest point on the scaled line directly in front of the mat.

For the 300 yard shuttle run, the subject ran six complete round trips between two lines which were 25 yards apart. A sprint, crouch, or stand up start with both feet behind the start line was used by each subject. On making each of the turns, she was required to place at least one foot on or over the line. On her final trip, she sprinted past the finish line. The subject's time was recorded to the nearest tenth of a second. Only one trial was allowed.

A subject's final P.A.E. total represents a composite score of her performance on each of the four test events. The basis for the P.A.E. computation is identical to that used to evaluate women candidates for admission to USMA.

Results

The mean values for the pre- and post-training P.A.E. scores and the performances on each of the four P.A.E. items are presented in Table 19. Both training programs produced substantial improvement on all five measures. With the exception of a slight improvement on the modified basketball throw, the control group subjects performed more poorly on all of the post-training PA.E. testing.

Adjusting for pre-training differences between the groups, significant differences (.05 level) were found on three of the five measures - flexed-arm-hang, 300 yard shuttle run, and the composite P.A.E. score. Using the Scheffe multiple comparisons test, an

Table 19. Pre- And Post-Training PAE Measurements (Mean Value)

Group	Test	Flexed-Arm Hang (seconds)	Modified Basketball Throw (feet)	Standing Long Jump (inches)	300 Yd Shuttle Run (seconds)	PAE Score
Strength (N=19)	Pre Training	15.0	38.3	71.6	69.3	193.9
	Post Training	23.6	40.8	73.6	68.6	240.0
	Δ %	+57.3%	+6.5%	+2.8%	-1.0%	+23.8%
	Adjusted Mean	27.0	39.4	73.4	68.7	243.2
	Δ %	+80%	+2.9%	+2.5%	-0.9%	+25.4%
Reveille (N=19)	Pre Training	20.9	34.4	68.9	70.2	177.7
	Post Training	24.7	36.5	70.6	69.4	208.3
	Δ %	+18.2%	+6.1%	+2.5%	-1.1%	+17.2%
	Adjusted Mean	23.7	38.3	72.4	68.8	224.7
	Δ %	+13.4%	+11.3%	+5.1%	-2%	+26.4%

Table 19 (cont'd)

Group	Test	Flexed-Arm Hang (seconds)	Modified Basketball Throw (feet)	Standing Long Jump (inches)	300 Yard Shuttle Run (seconds)	PAE Score
Control (N=18)	Pre Training	22.9	37.2	73.6	68.8	223.4
	Post Training	21.4	38.7	73.3	70.3	209.5
	Δ %	-6.5%	+4.6%	-0.4%	+2.2%	-6.2%
	Adjusted Mean	18.9	38.2	71.7	70.8	188.8
	Δ %	-17.5%	+2.7%	-2.6%	+2.9%	-15.5%
F-Ratio		6.246*	0.634	1.038	4.842*	8.168*

*Significant at the .05 level.

investigation of the source of the significance (.05 level) for each item was computed. On the flexed-arm-hang, while a significant difference existed between the control and strength groups, no significant difference was found between either the reveille and control subjects or the strength and reveille groups. On the 300 yard shuttle run and the composite P.A.E. score, both the reveille and strength groups performed significantly better than did the control group. No significant difference existed between the reveille and strength groups.

Figures 8-11 illustrate the relative performances of selected women populations on the four P.A.E. events. The Project 60 subjects compare favorably on every measure. Table 20 presents, perhaps, a more meaningful comparison. Although the results for the Project 60 subjects are substantially lower than the performances achieved by the Class of 1979 (male cadets), the Project 60 participants did perform at a higher level than that exhibited by the first 470 women applicants to USMA. A comparison of the P.A.E. results between the Project 60 groups and the Class of 1979 is shown in Figure 12. Even though the strength group performed substantially better than either of the other two groups, the mean value for the strength group subjects was still more than three standard deviations below

Table 20. Mean Values For Selected Groups On PAE Events And Composite Score

Test		Project 60[1] (N=57)[4]	Women USMA Candidates[2] (N=470)	Class of 1979[3] (N=1433)
Flexed Arm Hang	Mean	23.32	19.57	47.91
	S.D.	11.99	13.90	N.A.
Standing Long Jump	Mean	72.53	70.00	88.40
	S.D.	6.36	7.74	N.A.
Modified Basketball Throw	Mean	38.68	36.36	69.10
	S.D.	6.74	8.07	N.A.
300 Yd Shuttle Run	Mean	69.39	72.56	59.10
	S.D.	3.97	5.77	N.A.
PAE	Mean	219.43	162.3	553.2
	S.D.	85.97	115.1	74.57

[1]Post-training performances.

[2]Data based on the PAE performances of the first 470 women applying for admission to USMA.

[3]Data based on the entrance PAE performances.

[4]N=56 for both the 300 yd shuttle run and the PAE score.

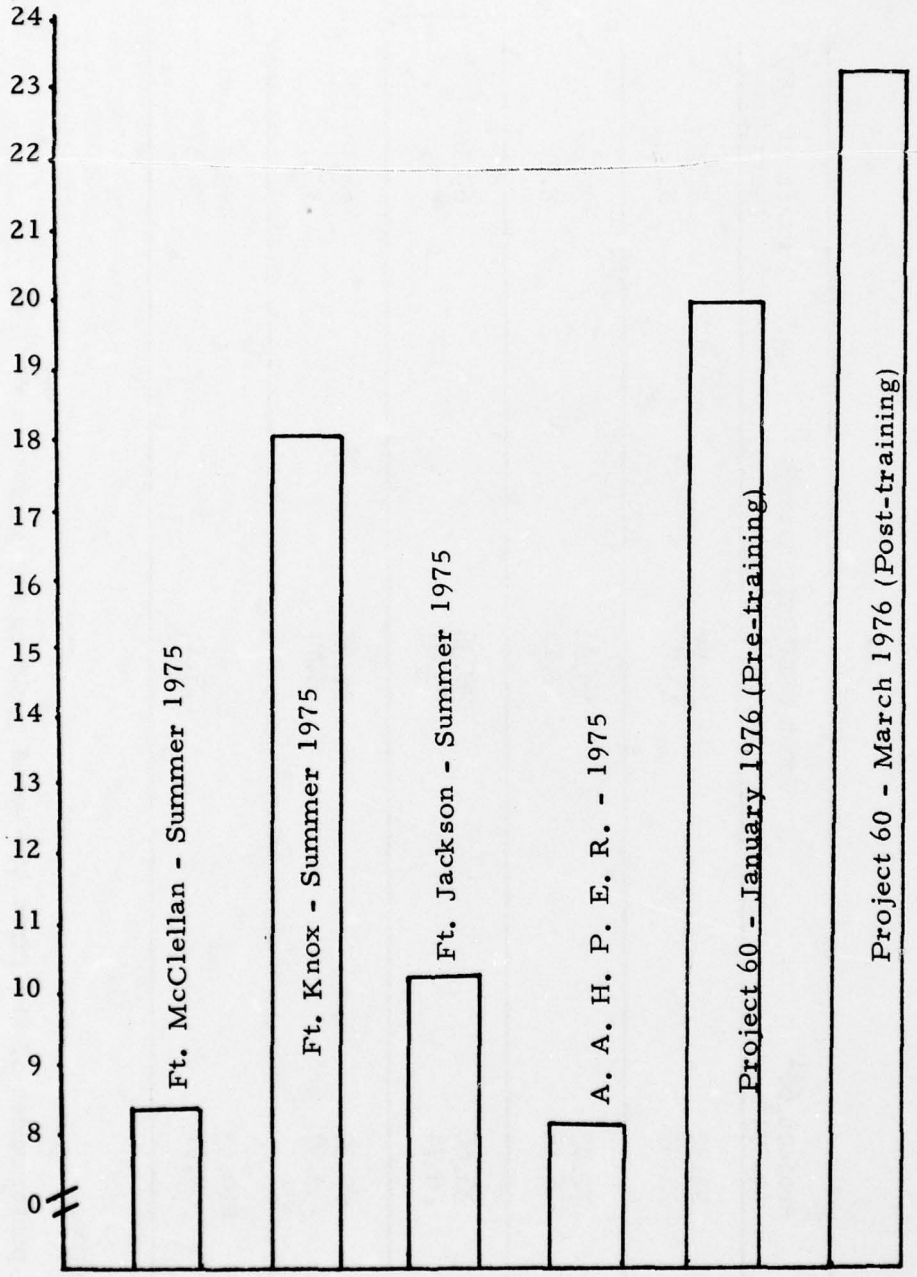


Figure 8. Mean Values of Flexed Arm Hand Performances of Selected Populations

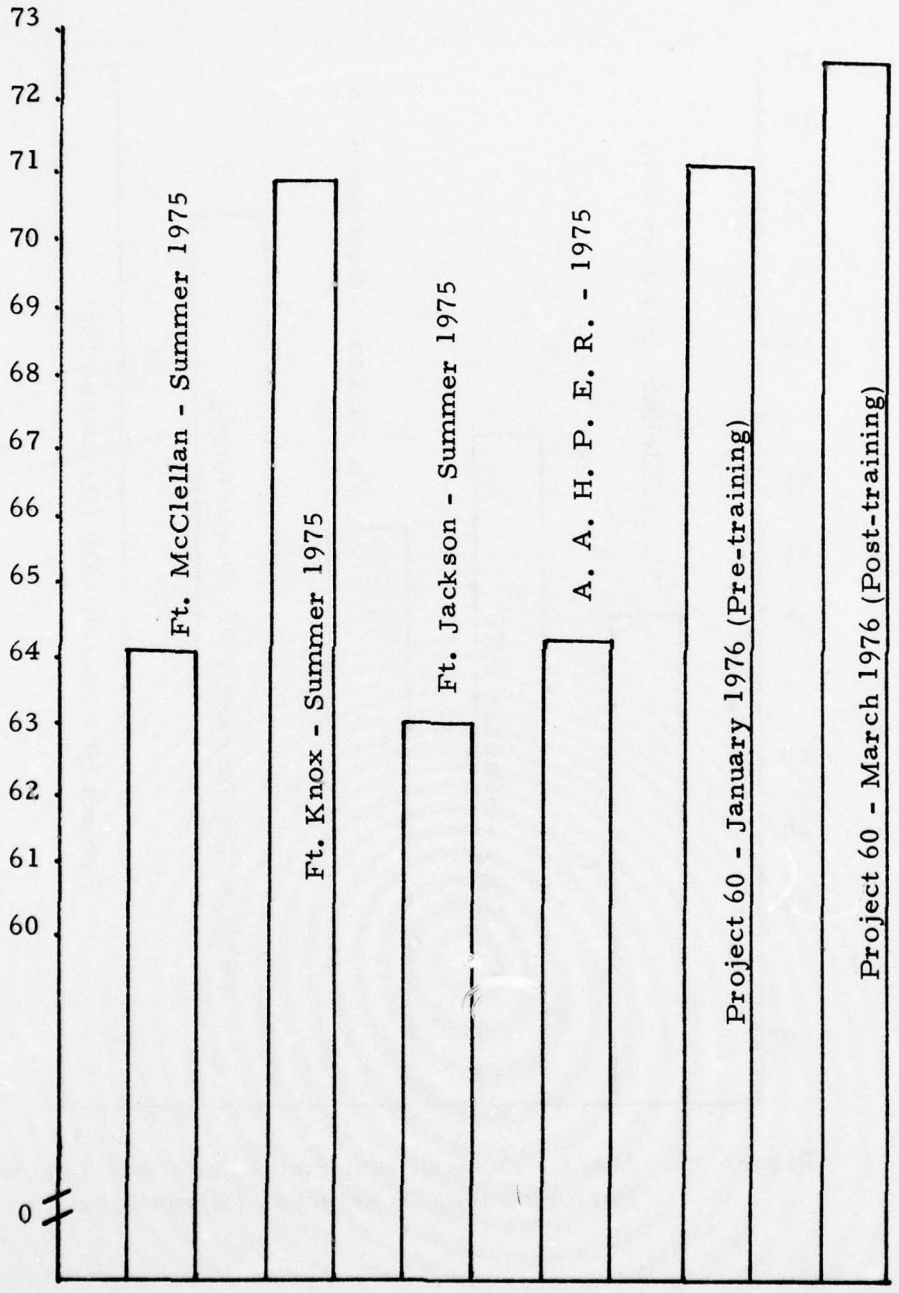


Figure 9. Mean Values of Standing Long Jump Performances of Selected Populations

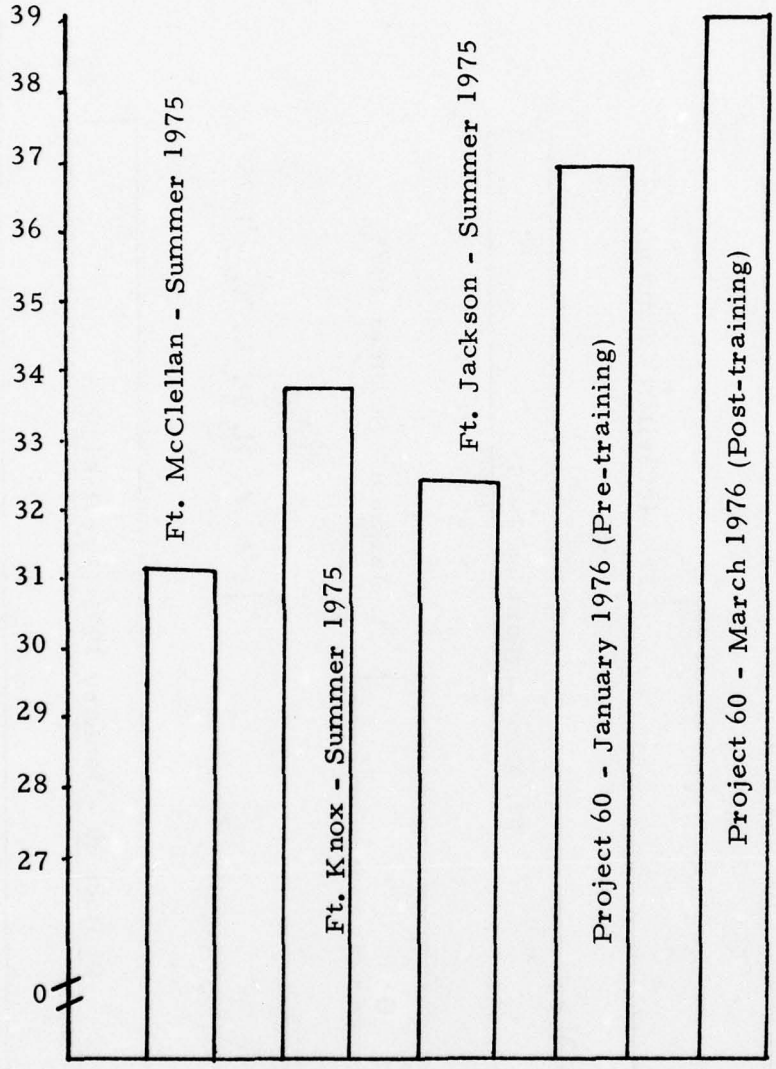


Figure 10. Mean Values of Mosified Basketball Throw Performances of Selected Populations

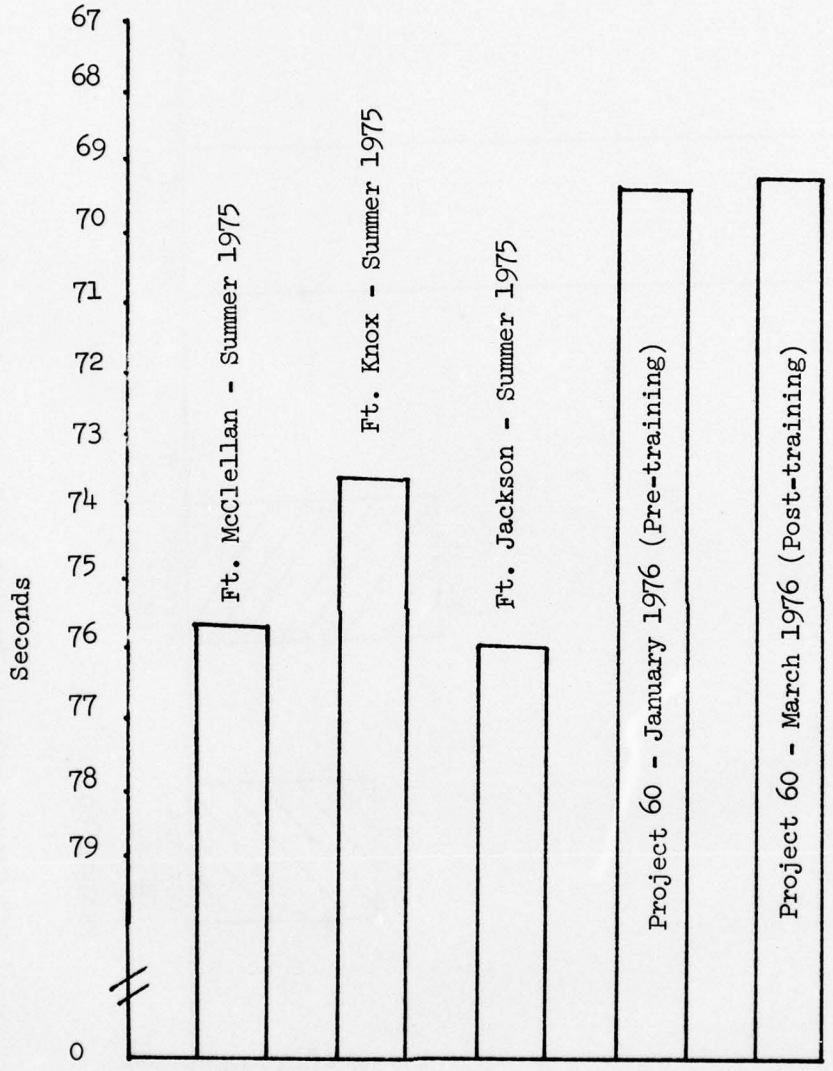


Figure 11. Mean Values of 300 yd. Shuttle Run Performances of Selected Populations

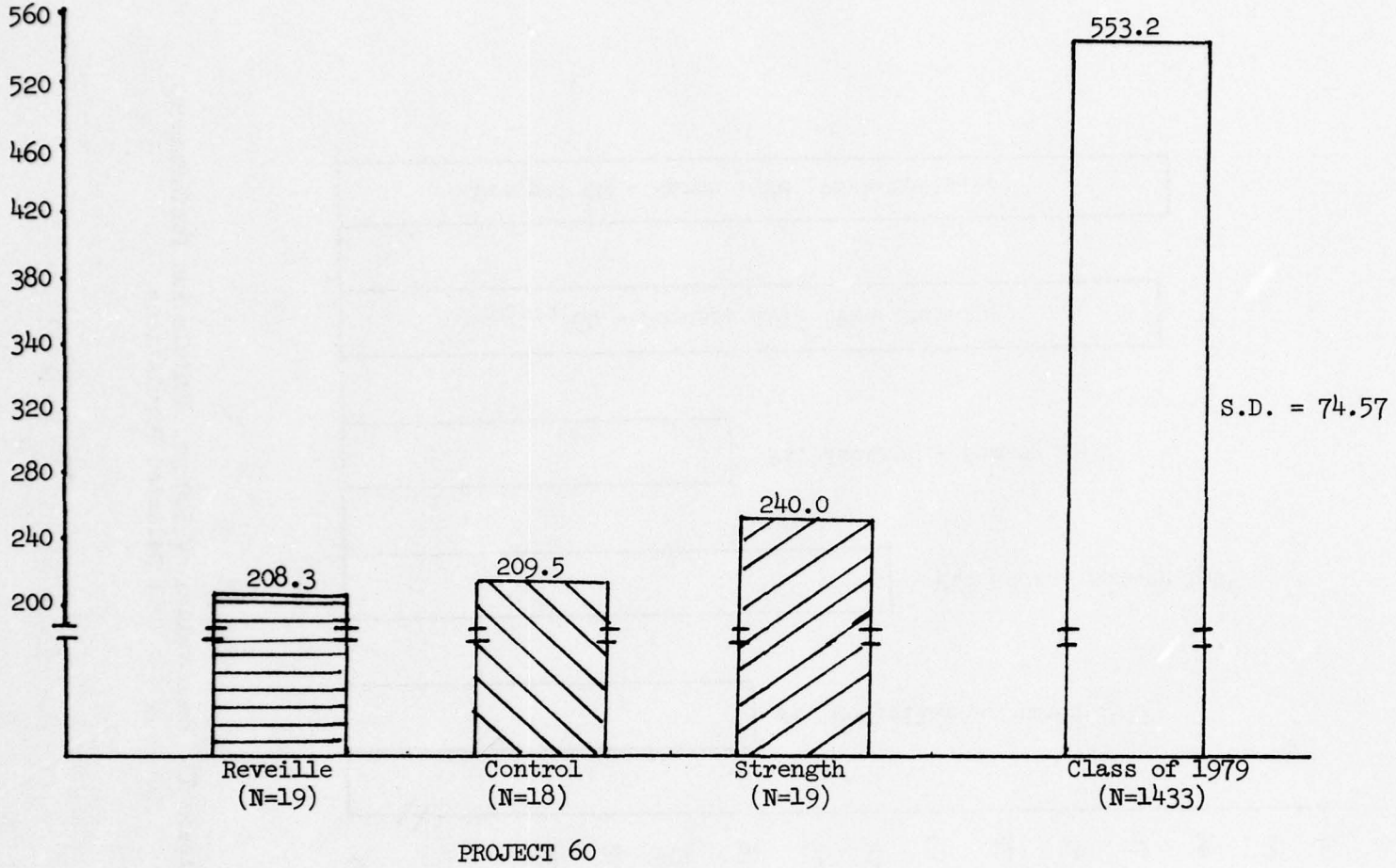


Figure 12: A Comparison of PAE Scores Between Project 60 Groups and The Class of 1979, USMA
(mean values)

the average performance by the Class of 1979 *.

Discussion

The P.A.E. results are somewhat inexplicable. The substantial improvement achieved by the strength group was anticipated in light of the scope of the strength training, the nature of the four P.A.E. events, and the across-the-board improvement exhibited by the strength training subjects on the laboratory measurements of strength and endurance.

The performance of the reveille exercise group is more difficult to explain. In light of the reveille exercise "fatigue syndrome" discussed in earlier sections of this paper and the decreased performances of the reveille exercise group members on the laboratory leg and arm strength testing, the overall improvement by the reveille group on the P.A.E. testing was not anticipated. Quite possibly, the multidimensional nature of "functional performance" measurement is one of the primary reasons for the unexpected increase in P.A.E. scores. The dimensions which affect individual performance include physical ability, motor skill, event technique and motivation. Any combination of these factors could account for the improvement by the reveille group. The decrement in the performances of the control

* Additional analyses and comparisons of the P.A.E. measurements are included in the next section of this paper - Training Program Results and Discussion.

group are undoubtedly due to decreased motivation.

The non-significant ANOCOVA results for standing long jump and modified basketball throw are equally inexplicable. The strength training program included exercises which are directly concerned with developing leg power and shoulder girdle strength. One possible explanation concerns the fact that the training produced a significant change in the one event requiring static strength (flexed-arm-hang) and did not significantly influence the events utilizing dynamic strength (standing long jump and modified basketball throw). Another factor which affected the modified basketball throw results is the fact that, by- and-large, the Project 60 subjects experienced considerable difficulty holding on to the basketball before throwing it.

D. PSYCHOLOGICAL CHARACTERISTICS

In recent years, attention has been directed towards the investigation of how various training programs and factors affect the development of selected physical fitness factors. However, relatively few investigations have been concerned with alterations of psychological states and well being in women produced by physical training programs. There have been post-hoc studies that have suggested that alterations do occur as the result of such programs, (Hanson and Nedde, 1974; Morgan et al, 1970; Morgan, 1973), but the direction of these changes in self-concept, personality characteristics and attitudes as a product

of participation in a prescribed physical training program is equivocal. A few individuals suggest that the depersonalized, group oriented nature of rigorous physical training programs produces undesireable psychological changes in the participant. Other individuals claim that the opposite is true. The present study investigated the effect of a strength training program and a reveille exercise program on selected psychological characteristics in young women.

Each subject completed a series of five written psychological inventories before and after the seven weeks of training (Appendix E). The five psychological tests were: the Spielberger State-Trait Anxiety Inventory (STAX); the Profile of Mood States (POMS); the Eysenck Personality Inventory (EPI); the Physical Estimation and Attitude Scale (PEAS); and the Personal History Inventory.

The STAX yielded a measure of state (situational) and trait (enduring) anxiety. The POMS yielded measures of tension, depression, anger, vigor, fatigue and confusion. The EPI provided measures of introversion-extroversion and neuroticism-stability, as well as a psychometric lie score. The PEAS provided a measure of attitude or attraction toward physical activity and estimation of physical ability. The personal history inventory provided demographic and physical activity participation information.

Results and Discussion

The pre- and post-training mean values for each variable are presented in Table 21 . A mixed model, two way analysis of variance was performed on the data and significant F values were noted.

Inspection of the table reveals that there was a shift in the psychological measures following seven weeks of training. However, while significant changes did occur on several of the mood measures, no significant differences (.05 level) were found between the three groups on either pre- or post-training as indicated by the lack of a significant interaction term. These findings suggest that the variables that were significant did so across all groups regardless whether they were involved in training or not. This finding documents the pervasiveness of the Hawthorne phenomena* that so often plays havoc with behavioral research.

It is noteworthy that the mean levels of tension, depression, anger, and confusion decreased significantly ($p=<.05$) as measured by the POMS. This suggests that overall levels of mental health improved. These findings have little relevance to the training program, however, since the control group also improved in these measures.

A significant decrease in vigor and an increase in anxiety

* The Hawthorne phenomena relates to the fact that in some instances the mere knowledge by a subject that she is participating in a study will cause the subject to change.

Table 21. Psychological Characteristics Before and After Training

Variable		Strength (n=20) Pre	Strength (n=20) Post	Reveille (n=20) Pre	Reveille (n=20) Post	Control (n=18) Pre	Control (n=18) Post
STAX 1	$\bar{M}$	35.1	39.0*	33.6	36.3*	32.4	39.0*
	SD	8.6	11.1	3.1	8.1	7.9	12.9
STAX 2	$\bar{M}$	41.9	38.8	40.8	42.4	38.4	40.6
	SD	9.3	7.8	7.7	8.2	8.6	8.6
Extroversion	$\bar{M}$	14.5	12.8	13.9	13.8	14.6	14.4
	SD	3.2	4.5	3.6	4.0	2.8	3.4
Neuroticism	$\bar{M}$	12.9	11.2	11.6	11.9	12.0	11.7
	SD	4.7	5.4	5.0	3.8	4.6	3.7
Attraction to Phy Activity	$\bar{M}$	42.3	35.3	41.5	40.8	38.4	38.2
	SD	8.2	11.1	6.8	8.2	4.9	6.4
Estimation of Physical Ability	$\bar{M}$	22.7	23.0	22.2	24.2	22.8	23.4
	SD	7.0	7.1	6.2	4.9	4.9	5.2
Tension	$\bar{M}$	11.4	9.8*	9.8	6.3*	8.8	6.9*
	SD	4.3	5.9	5.8	4.1	5.3	5.2
Depression	$\bar{M}$	10.5	7.5*	12.9	7.4*	9.8	7.4*
	SD	8.0	8.2	8.7	7.2	8.4	8.1
Anger	$\bar{M}$	10.6	5.0*	11.6	4.4*	11.9	6.9*
	SD	8.4	7.2	7.9	4.5	10.2	7.3
Vigor	$\bar{M}$	20.4	17.6*	22.1	15.2*	23.4	16.9*
	SD	4.6	6.9	3.9	6.2	5.1	10.5
Fatigue	$\bar{M}$	7.5	7.8	5.8	6.1	6.6	7.4
	SD	6.0	6.0	3.0	4.5	4.6	6.6
Confusion	$\bar{M}$	9.4	6.6*	9.2	7.5*	8.1	6.2*
	SD	4.2	5.9	5.3	5.4	4.8	3.8

*Significant at the .05 level.

(situational) was also found. These results were both unanticipated and undesireable in light of the improvement in the other mood states. These findings may simply reflect the normal decrement in psychic state that accompanies a protracted period of hard work or constant demand and may have little to do with the effect of the exercise program per se. The fact that the measures of attraction toward physical activity and estimation of physical self also demonstrated no improvement or a decrement following training may also reflect this "letdown phenomena". However, the decrement in the attitude toward physical activity should warrant concern since such changes are not only important for the immediate evaluation of the present program but from the long term standpoint as well. In other words, an exercise program which is associated with a decrement in "attitude toward physical activity" probably will not enjoy a high adherence following removal of such a forced program. This possibility would be counter productive to the OPE goal of promoting physical fitness maintenance in USMA cadets and graduates by means of regular physical activity.

IV. Training Program Results and Discussion

This section examines four aspects of Project 60: a general overview* of both the strength training and reveille exercise programs; the injuries and major physical discomforts resulting from the training; the Project 60 participants' perceptions of menstrual changes during the training; and responses to a post-training questionnaire which was administered to the Project 60 subjects assigned to the two training groups and to all of the USMA cadets who were involved in conducting the training.

A. GENERAL OVERVIEW OF THE STRENGTH TRAINING

In the limited number of comparative strength training studies involving college-age men and women, a few researchers have hypothesized that while women achieve minimal muscular hypertrophy from strength training, they possess equal potential for strength development. On one hand, hypertrophy is related to the quantity of testosterone (male hormone) present. On the other hand, these researchers claim that the general existence of a more-defined musculature on men than women does not preclude the possibility that much of strength difference between the sexes is the result of cultural or societal influences. The present study attempted to identify some

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* By necessity, as well as design, this section includes a subjective interpretation of the parameters of the training as related through the perceptions of the primary investigators of the study and the OPE personnel who supervised the training.

of the basic parameters related to women and strength training.

None of the subjects had previously participated in a strength training program of any kind. In general, all of the women appeared to start the program with a commendable level of enthusiasm and personal commitement which they sustained throughout the seven weeks of training. This observation is supported by the regular attendance by all twenty subjects at the training and the fact that no one quit during the seven weeks of the program.

The strength levels of the subjects were correctly anticipated for some areas of the body and unexpectedly high in other parts. As the review of literature relating to physiological differences between men and women suggested, the level of resistance that the subjects were able to lift in the upper body exercises was extremely low. On the other hand, the Project 60 women exhibited relatively high capabilities in the lower body exercises. A workout sheet of one of the subjects showing the progression that she followed is presented in Appendix F. The initial amount of resistance for each exercise was arbitrarily determined. Subsequent progression was based on raising the resistance once the subject was able to perform 10 repetitions of an exercise and on the personal evaluation of the subject's cadet supervisor. If, for example, the subject performed 10 repetitions of an exercise, but had considerable difficulty doing it, the supervisor

could arbitrarily maintain the exercise load at the existing level.

Table 22 presents the mean values of the amount of resistance which the subjects were able to lift for each exercise on their last workout.* In comparison to the levels typically achieved by male

Table 22. Resistance Levels Performed by the Subjects During Their Last Workout of the Strength Training (in pounds). **

Exercise	Mean Value	Range
Super Hip & Back	152.1	125-170
Leg Press	212.3	165-260
Bench Press	70.4	60-90
Bicep Curl	27.5	$17\frac{1}{2}$-45
Leg Extension	87.8	60-110
Leg Curl	71.3	45-$87\frac{1}{2}$
Heel Raise	190.5	140-250
Lat Pulldown	58.6	45-$82\frac{1}{2}$
Triceps Extension	27.8	15-$45\frac{1}{2}$
Wrist Curl	47.1	35-55

** N=20 for all exercises except for the Super Hip and Back. 10 subjects used the Nautilus Super Hip and Back, while 10 women used the Nautilus Duo-Poly Hip and Back.

* The subjects in the Monday, Wednesday and Friday strength group elected to have a "light" day on their last workout before the post-training testing. In those cases, the data on their next-to-last workout was used for Table 22.

cadets engaged in strength training, some of the values are abyssimally low (e.g. 70.4 lbs. average for the bench press), while others compare favorably with observable cadet performances (e.g. 212.3 lbs. average for the leg press).

The following additional observations are presented for the consideration of the reader:

a) The subjects worked much harder when they were "pushed" by the cadet supervisors.

b) Several of the cadets appeared to be reluctant to push the subjects. As noted in a), such a patronizing attitude was counter productive to the subject's actual potential for improvement.

c) The initial level of tolerance for "pain and strain" exhibited by the strength subjects was somewhat low. Over the course of the training, this level improved considerably but could still be viewed as slightly below average when compared to male cadets.

d) Despite the relatively low mean value for the final levels of resistance used in the upper body exercises, the strength subjects improved substantially percentage-wise.

e) Subject size did not appear to have a significant bearing on subject enthusiasm, intensity, or effort.

f) In general, due to many interrelated but inevitable factors, the strength training program did not receive the overall level of OPE supervision and general attention that the reveille exercise program did. As a result, to a certain extent, the strength subjects did not (in the opinion of the primary investigator) maximize their potential for improvement.

B. GENERAL OVERVIEW OF THE REVEILLE EXERCISE TRAINING

Because the USMA reveille exercise training is unique, no method

exists to accurately forecast how young women will perform in a reveille exercise program. Certainly from the existing information on the physiological limitations of women, major difficulties with those reveille events requiring significant levels of upper body strength can be expected. On the other hand, common sense dictates that the level of exertion and ability required for many of the reveille training tasks is readily within the performance capabilities of the above-average woman performer. One of the primary objectives of the present study was an attempt to determine what aspects of the reveille exercise training would be difficult for young women.

In general, the enthusiasm and sense of commitment to the program exhibited by the subjects were remarkedly high. Despite the sometimes rigorous nature of the four-times-a-week program, no one dropped out. While a major effort was made to accommodate the logistical needs of the subjects, the type of young woman who volunteered for Project 60 was consistently and commendably of high quality.

events were not as proficient.

In general, about 40% (8 of 20) of the subjects could correctly perform the conditioning drill exercises. The other 60% of the women exhibited consistent difficulties in doing the exercises in either the correct form or at the proper pace. After approximately ten repetitions of the upper body exercises (e.g. push-ups), even the top 40% encountered strength and endurance problems.* Two of the subjects appeared to be able to handle all aspects of the conditioning drill (pace, repetitions, etc.). On the exercises requiring flexibility (e.g. the bottoms up and the trunk twister), the subjects appeared to perform at a higher level than the average male cadet.

Not unexpectedly, the reveille group subjects on-the-average performed better on the rifle drill than they did on the conditioning drill. Rifle drill, as incorporated in the reveille exercise program, is not physically demanding. Except for the upper body strength required to hold the rifle and for the flexibility essential to do two of the rifle exercises (the side lunge and bend and the straddle jump), rifle drill accomplishes little more than familiarizing the individual with handling the weapon. Approximately half of the subjects could perform rifle drill correctly. All of the subjects performed at a reasonably respectable level. Only a few subjects could correctly

perform 14 repetitions of those exercises which required the rifle to be held in the front-extended position for any length of time. Obviously, lack of adequate shoulder girdle strength was the limiting factor. On one day of rifle drill, the M-16 was substituted for the M-14, resulting in a substantial overall improvement in rifle drill performances.* The better performers reported that they had a much easier time with the M-16, while the subjects who had previously experienced difficulties improved their performances.

The running program appeared to present the most difficult challenge to the reveille subjects. Initially, about half of the women could run an uninterrupted mile at an 8:30 pace. On most of the longer runs, however, only a limited number of subjects could perform the run in formation and at the prescribed pace. Once the subjects started wearing boots during the run, the number of participants who could successfully handle the run dropped even further. Table 23 presents the statistics on the number of subjects who completed the run at the prescribed pace and in formation. Data on the number of fallouts during the summer 1975 N.C.T. running program is also presented. The usefulness of the latter information for comparison purposes is somewhat questionable, however, given the definition of

* On one hand, the 2-lb. difference between the M-16 and the M-14 might not be expected to produce the major changes which resulted. On the other hand, given the relative size and strength levels of the women, the improvement is understandable. The fact that both rifles are given handicaps in 7 lb. increments places the 2-lb. gap in a somewhat different perspective.

Table 23. Fallout Statistics For The Project 60 Reveille Running Program And The 1975 NCT Running Program

Day	Project 60		NCT[a]	
	#Starting Run	#Finishing The Run In Formation	#Companies Running	#Of Fallouts
1	No Run Today	--	8	1
2	20	10	8	N.A.
3	14	10	8	8
4	17*	6	8	5
5	16	8	5	5
6	19	11	5	8
7	16	15	5	5
8	20*	6	7*	7
9	19	8	4	5
10	20	12	3	1
11	18	11	5*	5
12	16*	10	7	4
13	17	8	3	2
14	16	7	8**	17
15	17	9	3	11
16	15*	7	3	6
17	No Run Today	--	3	8
18	16**	0[b]	3	8
19	18	5[c]	5	8
20	18*	6	3*	8
21	17	10	2	8
22	18	7	4	32
23	19	0[d]	1	6
24	15*	4[e]	5	15
25	19	8	3*	0
26	16	7	6*	26
27	18	10[f]		
28	15*	6[g]		

*Saturday on 30 minute run.
**Began running with rifles and wearing boots.

a. Each company had approximately 120 cadets (subtracting 40+ to allow for attrition, sick call, etc.). The largest number of fallouts for 1 company was 14 or about 9%. This total corresponds to about 2 of the 20 reveille women falling out. The average NCT fallout rate was 1½ per day, per company.
b. At perscribed pace.
c. Stopped using rifles.
d. At perscribed pace with M16.
e. At a slowed pace.
f. At a slowed pace.
g. At a slowed pace.

a "fallout". A fallout is defined as someone who failed to finish the run with his company. In a number of cases, cadets who were unable to keep up the pace in formation either doubled back to pick up their company towards the end of the run or were met by their company on the return portion of a loop of the run.* One other factor which confounds comparison efforts concerns the fact that almost all of the Project 60 running program was conducted in the field house, whereas the N.C.T. running was held outdoors. Running indoors on a less-than-quarter mile track is considerably more arduous than running outdoors for an extended distance.

Running in boots, with the rifles, produced the worst performances of the reveille exercise training. No one was able to handle the requirements. Even the substitution of the M-16 for the M-14 and the concurrent elimination of the wearing of boots did not result in anyone successfully negotiating the scheduled run. Quite simply, the aerobic demands of the training, coupled with the strength level required to carry a rifle while running, results in what appears to be an impossible task for young women.

In general, in the opinion of the OPE monitors, there were eight subjects who could effectively handle most of the reveille exercise training. The other twelve subjects experienced varying degrees of

* The senior author of this report observed an average of 6-8 cadets daily doing this practice in the company he monitored during 1975 N.C.T.

Table 24. Comparison Between "Top 8" Reveille Group Performers and Class of 1979 on PAE Events

Test	"Top 8" Performers	Class of 1979* (N=1433)
Flexed Arm Hang:		
Pre-	29.4 sec.	47.9 sec.
Post	35.7 sec.	
Modified Basketball Throw:		
Pre-	39.6'	69.1'
Post-	41.2'	
Standing Long Jump:		
Pre-	74.5"	88.4"
Post-	74.25"	
300 Yd Shuttle Run:		
Pre-	66.1 sec.	59.1 sec.
Post-	65.2 sec.	
PAE Score:		
Pre-	276.4	553.2
Post-	306.7	

*Stated based on entrance PAE performance.

extreme difficulty. Table24 presents a comparison between the top 8 reveille subjects and the Class of 1979 on the P.A.E. events and score. The mean P.A.E. values of these subjects provides a strong guideline for determining what should be considered an acceptable score for women applicants to USMA. Given the fact that C.B.T. experience will undoubtedly compound the physical stresses on a young women, any applicant with a P.A.E. score of less than 250 would have to be considered a definite performance risk. Anyone with a sub-200 P.A.E. score would encounter physical demands which would be (as a general rule) impossible to meet.

The following additional observations concerning the reveille exercise program are presented for the consideration of the reader:

a) Only 2 or 3 subjects could handle an extended run at an 8:15 pace wearing boots.

b) Heavier subjects encountered more difficulties with the training than did the lighter women.

c) The shorter subjects experienced greater difficulties with the rifle drill than did the taller participants. A reveille subject who was 4'10" could not hold the rifle in the front-extended position for any length of time.

d) Subjects responded to enthusiastic, demanding cadet leadership to a much greater degree than to the lackdaisical, patronizing direction provided by some cadets.

e) Once the subjects became acquainted with the proper method and procedures for accomplishing a task, they exhibited a lack of tolerance for cadets who failed to demonstrate or instruct properly.

f) Many subjects reported that a major reason for their difficulty in running while carrying the rifle was the perceived lack of sufficient grip strength.

g) Over the course of seven weeks, the subjects' level of tolerance to pain increased substantially. Frankly, the better reveille performers appeared to push themselves equally as hard, if not harder, than the average cadet.

h) Constructive reinforcement appeared to be an effective key to individual improvement. Given the "biophysical" limitations of women, the value of negative verbal feedback relating to improving performance is questionable.

i) The C.B.T. (N.C.T., Beast Barracks, etc.) fatigue syndrome apparently will have a similar affect on the performance of women.

C. INJURIES DURING THE TRAINING PROGRAMS

A limited amount of information exists concerning the medical problems arising from women participating in a rigorous exercise program. In the present study, an extensive effort was made to monitor, treat, and document all injuries and general physical discomforts experienced initially high levels of muscle soreness (myositis). Considering the demanding nature of both types of training and the fact that all of the subjects had not previously been involved in this type of exercise, the myositis was not unexpected. After approximately three workouts, the basic soreness subsided for the strength group. Although most of the myositis quickly went away for the reveille subjects, the progressively demanding and constantly changing nature of the reveille training induced an occasional recurrence of the soreness. Subsequently, both training groups developed more serious injury-related problems.

Most of the injuries and physical discomforts arising from the reveille training were leg-related. Almost 3/4 of the subjects experienced blisters and sore feet. The wearing of boots only compounded these types of problems. Eventually during the training, the point was reached when the leg and foot soreness became so great that the wearing of boots had to be discontinued.

Other medical problems arose during reveille training. Near the end of the first week of training, a subject suffered a mild inversion sprain of her right ankle, causing her to miss the running portion of three sessions. After approximately two weeks of training, three subjects complained of lower leg anomalities, specifically - local sharp pain along the tibial attachment of the muscles of the lower leg. One subject missed 25% of the running program because of this problem. The other two subjects, responding to hydrotherapy (whirlpool) and taping, did not miss any of the training.

Two subjects developed local pain, crepitus (grinding sensation associated with tendons), on the lateral distal third of the fibula. Since their initial symptoms were similar to those attributable to peroneal tendonitis, their maladies were treated accordingly. The X-rays which were taken to identify the existence of skeletal problems were negative. Subsequently, however, when the subjects' injuries failed to respond to the treatment, an additional X-ray was taken. A more extensive examination

of the resultant X-rays revealed that both subjects had incurred fibular stress fractures. One subject missed approximately one third of the running sessions, while the other subject missed about one sixth of the running program. The fact that both subjects continued to participate in the training between the first and second set of X-rays illustrates two important points: first, the high level of personal commitment to the program by the subjects; and secondly, the need to maintain a constant vigil regarding the injury consequences of exercise programs for women.

Two reveille subjects also developed bilateral achilles and peroneal tendonitis. After their initial symptoms, they were given cold whirlpools and were excused from the running portion of the training. Once the symptoms had subsided, these women were allowed to rejoin the training on a limited basis. In one instance, the subject regained her healthy status within a few days. In the other case, the achilles problem reappeared, resulting in additional treatment for the subject.

Given the fact that all reveille running was conducted on the indoor tartan surface, while all CBT running will occur on paved, asphalt roads the likelihhod of even greater incidences of both tendonitis and stress fractures among the women cadets is a strong possibility. Traditionally, even women athletes have not subjected themselves to the type of lower limb stress which would normally be associated with daily playing on playgrounds, outdoor basketball courts, etc. At this time in the evolution

of women's athletics, the unstructured participation by women in sport appears to be somewhat limited when compared to men's athletic habits.

Isolated cases of dyspnea (difficulty in breathing) vertigo, nausea, hyperventilation, and a vastus lateralis strain were additional medical complications arising during the reveille training. One subject frequently exhibited the symptoms of anemia during the training and was referred to the USAH, USMA. Diagnosed as having marginal anemia, she was given iron supplements and allowed to continue in the program.

An interesting note relating to the reveille-training injuries is the fact that of the eight women identified in the previous sub-section as being the top performers in the reveille training, not one experienced any injuries whatsoever except for minor muscle soreness. As a result, one by-product of admitting women with less-than-average (e.g., below 250) P.A.E. scores may be an overabundance of women cadets with medical problems.

The majority of the injuries that plagued the strength training group were muscle related. Similar to the reveille group, muscle soreness was the major initial consequence of this training. Since the subjects were unaccustomed to the stress of strength training, their muscular discomfort was expected. The subjects, however, exercised through this symptomatic period. Three women developed strains that were significant enough to warrant medical attention from USAH personnel. Subsequently, these subjects were excused from those exercises which aggravated the affected muscle group. They were given medication until they were asymptomatic.

One young women developed a rectus femoris strain. Another participant strained the para-lumbar musculature. The third subject developed a sacrospinatus strain.

Two situations arose that involved the stress placed on the knee structure when the subject performed the leg press. All subjects were instructed to avoid bending the knee past a point of ninety degrees in order to preclude excessive stress on both the quadricep retinaculum mechanism and the mensi of the knee. In spite of these instructions and project supervisor efforts to the contrary, two subjects developed stress related knee problems. One young woman developed bilateral patellar chondromalsia (irritation on the backside of the knee cap) which she claimed was aggravated by the leg press exercise. The other subject developed local pain on the inferior pole of the left patella. Her symptoms were diagnosed as "jumper's knee". She also claimed that the leg press and knee extension exercises had aggravated her knees.

Relative to CBT and women cadets, it is essential that USMA personnel and cadet cadre be alert and vigilant of the signs of medical problems. Limps, abnormal ambulation patterns, lower leg pain, and mortice awareness are signs of pending problems. Inflamation, palpation tenderness, sharp local pain, a flat foot walk with no desire to plantar or dorsi flex the foot, and in more severe cases, circulation interferance are sure symptoms of anterior tibial syndrome. The signs of lower leg tenosynovitis, crepitus, inflammation, and sharp local pain on movement, must

also be given proper attention. The dearth of information relating to the medical implications of training programs for women only serves to heighten the need for supervisor awareness.

D. MENSTRUATION

The information on the relationship between menstruation and physical activity is equivocal. In general, the data suggests that except for isolated instances, participation in physical activity should not significantly affect menstruation or vice versa. In the present study, a questionnaire was administered to the subjects in both training groups during the sixth week of training (Appendix G).

The first seven questions, dealt with the normalcy of the subjects' menstrual activity. In general, the responses to these questions indicated that the mentrual patterns of the Project 60 women were normal in all respects.

The last question concerned perceived changes in the subjects' menses as a result of the Project 60 training. As Table 25 indicates, subjects in both programs reported numerous changes. In general, the perceived changes for subjects in both types of training could be viewed as "positive" menstrual alterations (e.g., less duration, less flow, fewer cramps and discomfort, etc). Dr. George Pettit, a gynecologist assigned to the USAH, USMA, attributes the positive direction of these changes to the subjects' improved level of fitness. In Pettit's opinion, the subjects who experienced any negative changes (e.g., excessive cramping) probably would have had

these changes occur as the result of any type or form of increased physical activity.

Table 25. Menstrual Changes Occuring During the Project 60 Strength and Reveille Exercise Training

	Strength (N=20)	Reveille (N=20)
Spotting:		
Prior to menses	1	1
After menses	2	0
Heavy flowing	1	0
Excessive cramping	1	1
Excessive discomfort	0	1 (back pain)
Excessive nausea	0	0
Lessened flowing	7	2
Lessened cramping	7	2
Longer duration of menses	1	0
Shorter duration of menses	6	3
No change	6	15

E. QUESTIONNAIRE OF PROJECT 60 TRAINING SUBJECTS AND CADET SUPERVISORS

At the conclusion of the training, an opinion questionnaire was administered to subjects in both training programs and to all cadets who had been involved with either program (Appendices H and I). The

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PROJECT 60: A COMPARISON OF TWO TYPES OF PHYSICAL TRAINING PROG--ETC(U)
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Table 26. Responses of Cadets Involved With Project 60 To Post-Training Questionnaire (choices not selected by cadets are not listed)

		Strength (N=23)	Reveille (N=20)
1. For the women, how do you think your groups' part of Project 60 was?	Too Hard	---	(2)
	Too Easy	(5)	(1)
	About Right	(18)	(17)
2. Did the women make significant progress in raising their level of fitness?	Yes	(20)	(17)
	No	(3)	(1)
	No Opinion	---	(2)
3. How do you feel the subjects performed in the training overall?	Better than you expected	(16)	(10)
	About the way you expected	(5)	(8)
	Not as good as you expected	(2)	(2)

Strength Group Only

4. Could your subject have trained any harder?	Yes	(14)
	No	(9)
5. If your subject had been a female cadet, would you have pushed her any harder?	Yes	(9)
	No	(14)
6. Did your subject complain regularly of the intensity of the workout?	Yes	(7)
	No	(16)

Reveille Group Only

7. What is your recommendation regarding women running with rifles during CBT? -

*Don't do rifle exercises at all this summer, then we don't have the problem of who runs with or without rifles.	(0)
*Have them do rifle exercises with and run with their assigned company with rifles.	(9)
*Use the aforementioned option only with M16's instead of M14's.	(3)
*Have the women separate out into a women's company for the rifle exercises part of the training program, do conditioning exercises, and run without rifles.	(0)
*Have them do rifle exercises with their assigned company and run with rifles in a separate group (women only) at a much slower pace so they could complete the distance required.	(7)
*Have them do rifle exercises with thier assigned company and then run with their company but <u>without</u> the rifles.	(2)

Table 27. Responses of Subjects to Post-Training Questionnaire (choices not selected by subjects are not listed)

		Strength (N=12)	Reveille (N=13)
1. Pre-training level of physical condition:	Good	(7)	(4)
	Fair	(4)	(9)
	Poor	(1)	---
2. Post-training level of physical condition:	Excellent	(2)	(4)
	Good	(10)	(9)
3. The training (in general) was:	Too hard	---	
	About right	(12)	(12)
4. Participating on an athletic team during the training?	Yes	(12)	(6)
	No	----	(6)
5. Additional running on your own?	Yes	(1)	(4)
	No	(11)	(9)
Strength Group Only			
6. Were the supervisors effective in pushing you?	Very	(9)	
	So-so	(2)	
	Could have been better	(1)	
8. If you had been pushed harder, would you have done better?	Yes	(4)	
	No	(2)	
	Don't Know	(6)	
Reveille Group Only			
8. Mean rating of the degree of difficulty of the training (1=easiest, 5=hardest).	Running		(3.6)
	Rifle Exercises		(3.3)
	Conditioning Drill		(3.1)
	Guerilla Exercises		(2.8)
	Grass Drill		(2.2)
10. Did you experience leg problem during the training?	Yes		(11)
	No		(2)
11. Were the leg problems aggravated or caused by the wearing of boots?	Yes		(6)
	No		(7)
12. How much did you wear the boots prior to the training?	More than 20 hrs		(2)
	10 hrs		(2)
	5 hrs		(5)
	Less than 5 hrs		(1)
	Not at all		(2)

Table 28: Statements from Project 60 Subjects on the Question: "If you were to change part of the program you participated in, what part would you change and how?"

Reveille Subjects

*I wouldn't have training M, W, and F for some girls but at least every two or three days. I found with more rest I did better. Sometimes a day isn't enough time between workouts if you're really working hard. Maybe have training in the afternoon would be better for some girls.

*I feel that I could have done better had I been interested in coming to West Point. I think the girl cadets should be pushed a lot harder than we were.

*I wouldn't do those rifle exercises with an M14. The M16 was good enough. More spirit (yelling, singing, etc.).

*I feel everything was fair and challenging.

*If possible I think having it more often would help. Perhaps more stress on stretching exercises and flexibility.

*I would have the cadets who worked with us in reveille be more firm and more outspoken. I believe that alot of girls would have done better and thus been done.

*None. I thought it was all done well and was very worth while.

*I would make sure the girls were used to the rifle weight before making them run with it.

*I enjoyed the exercise group very much. I wouldn't change it. The other group I'm not sure.

Strength Subjects

*I'd like a longer rest between visits to the gym because I'd feel more rested up.

*I liked the program just as it was except one minor thing I would change. That is, making the lemonade more enjoyable by not diluting it so much.

*Better punch in the nautilus room. (It's all I can think of).

*I would change it no no way, shape, or form.

*I wouldn't change anything.

Table 29: Statements from Project 60 Subjects on the Question: "In what ways do you feel that you benefited from your participation in the program?"

Strength Subjects

*Legs feel stronger; arms a little stronger; haven't lost weight but I've firmed up.

*I feel a change in my physical abilities. I no longer feel that there are physical jobs too hard for me to handle.

*I tire less easily.

*I feel stronger in my arms and legs.

*I have noticed a considerable change in my leaping ability.

*Helped me feel better, helped increase arm strength.

*I feel better, stronger, and I can reach the rim now which is what I was aiming for. Before I was at least 4 inches away.

*Exposure to working with weight machines and to Army operations.

*My running was good and my strength too.

*I feel I'm in a lot better shape and a lot stronger.

Reveille Subjects

*I feel better physically, and I know how much my body can take.

* In opinion - of my physical capability; in physical condition; and in meeting new people.

*I'm much more firm. I feel better mentally, in a better mood, generally calm. I don't breathe heavy anymore by just climbing two flights of stairs.

*Better physical condition; gained the power to push myself; I'm much firmer.

*Better physical condition. Knowledge of how to push myself.

*I benefited physically and psychologically. I can now run further and faster without getting as tired as I did before. I also learned to push myself further than before.

Reveille Subjects (cont'd)

*Many times my mind would tell me not to stop while my legs or arms told me to rest. Most of the time, fortunately, my mind would overcome my physical pain. Because of the rigorous training, I am stronger, more agile, and quicker. I also have a longer staying power.

*I have gotten alot stronger and more fit. My running has improved.

*I increase in oxygen intake and also my muscles became toner. (sic)

*My lung capacity from running is much better. I am firmer and I feel alot more relaxed.

*Better physical condition.

*Yes. I am stronger and able to endure a little more than before.

*I feel better physically and am better shape. I also enjoyed the program.

Table 30: Statements from Cadets Involved with Project 60 Relating to the Question: "What suggestions do you have that would increase the effectiveness of a strength development program for women, that might differ from a strength development program for men?"

Cadets Involved with Strength Training

*Have some form of competition between the women. Women need more motivation and encouragement than men when it comes to weight lifting.

*I think since (girls) can't do as many different exercises as us they should add endurance exercises (30 sec or so) in between sets. This would tire them more, increase their endurance more, and make their workout more effective. These exercises could be running in place, jump rope, side straddle hop, and the situps as already done.

*Concentrate more on the upperbody exercises where the women need. Instead of wrist curls, use a hand squeezer. A number of girls complained about a reoccuring pain in the wrist from the curls. The pain was a sharp one like a muscle tear.

*Work on developing the weaker muscle groups in the women but treat them as men as far as pushing and discipline of working out.

*The girls had good lower body strength, better than many cadets. Upper body strength was very poor and they would need to concentrate heavily on upper body work in order to narrow the gap between themselves and their male counterparts.

*Separate programs and at different times. Don't take any crap off them. Keep driving and pushing them till they reach their limit. Put men in charge of overall supervision; women would be too easy.

*To put more emphasis on upper body strength where they are more lacking than on lower body strength where they seemed to be OK.

*Women, just as men, must supplement their muscle strength training program with a respiratory fitness program. If not, it takes a longer time to develop the cardiovascular endurance necessary for an effective and thorough weight training program.

*Maybe have the women work out more with dumbbells and more specific arm workouts i.e., more curls. Emphasize the need for continued stretching exercises

*Make the training as pleasant as possible.

*Design the program around increasing muscular endurance rather than muscle bulk or strength.

*None. The girls legs were strong but their arms needed extra work but I don't feel that any special workout should be given a girl for her arms because there's a limit as to what can be done in a workout. They were improving on the present program but the seated press could be added.

*Try to convince women of the toning effects of a good all-around program. Many of the girls feared getting muscle bound.

*Concentration on particularly weak muscle groups without neglect to all the other muscle groups of the body.

*More concentration of upperbody strength.

*Put extra emphasis on upper body strength.

*Make the program integrated - men and women working together.

*I do not see any differences except in the weight used. The women are much weaker in upperbody strength than lower body so may be a few more upperbody exercises could be added.

*Since they are weakest in upperbody strength, I would have them concentrate more in this area.

*A program for women could possibly put more emphasis on upperbody strength since it was here that the girls seem to fall down.

*I think that the women should follow a more "endurance type" program that would consist of many reps with little duration between sets. More beneficial to them in terms of strength endurance.

*Nothing, the girls are always screaming about being equal so keep the programs the same.

Table 31: Statements from Cadets Involved with Project 60 Relating to the Question: "What problems do you anticipate for women cadets who must initiate and continue strength development programs to increase their level of strength (throughout their four years at West Point)?"

Cadets Involved with Strength Training

*They aren't mentally motivated enough to get the important extra repetitions that are so necessary for proper strength development.

*Overshadowing by the men in the gym. Expecially at West Point where there is a high degree of male participation in the gym and on its facilities.

*They can have interest in it just like any person who starts a strength development program. They also may get some advance feedback from other cadets for working out with weights.

*The girls knew they did well in the leg exercises but did not like the arm exercises because they knew they were weakest in this area.

*The only problem I envision is the same one I face, finding the time. The 40-60 minutes workout we put the girls through was not too bad though and if they just stick with it I believe they would increase their strength. It should be augmented with a regular running program though.

*Once they get over the initial break in period (in other words, get used to working out) there should be no problems.

*Problems with the extra size incurred with added muscle mass, women still want a small physique.

*A lack of motivation to improve themselves, especially in upperbody during those periods of non-testing. Also, there may be a feeling or expectation of preferential treatment or lower standards.

*Women cadets might not feel it right to participate in strength development programs as often or as intense as men because of a fear of getting too muscular. Therefore, education along these lines might help.

*Many of them may feel they are becoming muscle bound. Many of the girls kept talking about how they were getting bigger in the bicep/tricep area or in their calves.

*They must keep up their work with more emphasis on upperbody. Their enthusiasm was great. Watch diets, my girl put weight on because she ate after her workout thus eating more. A weight program supplemented by running on off days would be ideal.

*There will be psychological barriers for them to break in that they will have to push themselves physically in this manner probably for the first time in their lives.

*Keeping an interest in strength development for four years.

*The problem of maintaining the drive to develop the strength. With a man, he may want to develop bulk and power whereas a women should strive for strength but also try to avoid the bulkiness. She may not want to develop her figure to look like a block.

*They become very discouraged at first by their lack of upperbody strength. They must realize that they can improve but are limited. Pain tolerance the first couple of weeks is a detrimental factor.

*Only one of willpower.

*Menstrual cycle seems to be a problem. Also upperbody strength is weak. They lack confidence and drive to improve upperbody strength.

*Upperbody strength - to see any real improvement in upperbody strength would require extensive long range training.

*If they are willing to work hard, they should have no problems, taking into account their physiological differences.

*Number one problem is keeping their interest in a strength program. Many girls could not wait until the end of this short program.

*Motivation - initially it is easy but they tire of it quickly, especially the thought of 4 years training.

*Probably no motivation because most girls would rather be little and agile than have big muscles (which is the common perception of weight lifters).

Table 32: Statements from Cadets Involved with Project 60 Relating to the Question: "How can the cadet cadre become better prepared to monitor women cadets during the CBT reveille exercise program?"

Cadets Involved with Reveille Training

*Should be made aware that some of the women cannot and will not be able to meet physical standards, therefore, should encourage, not ridicule or harass, to do better, just as any other new cadet would be encouraged. Both men and women should be put through the same program with the same supervision.

*Above all else, treat them as no different from any other cadet. They do not expect sympathy, so to treat them preferentially would be to degrade both their self-pride and the level of your professional leadership.

*Be in good enough shape to run at any pace for a long period of time. Talk to them. Don't watch their faces, because the expressions make things look worse than they are.

*Understand that women are physiologically different (the less obvious differences, of course). Treat them with equality but an open mind.

*Most cadets at this time are not familiar with what the capabilities of women will be. All of the information available on this subject should be provided to the cadet cadre, along with the results and observations obtained by Project 60, if possible. I realize that the information available is somewhat inconclusive and difficult to come by, but anything will help. I believe that most of the cadet cadre will underestimate the abilities of the female cadets and this could be very detrimental to both the cadre and the female new cadets.

*Drill into him the idea that he must push them just as hard as he would any male cadet. They can do a great deal if you make them do it. However, if you do not force them to do the required things everyone else must do, massive problems will occur.

*One or two cadre members should coordinate behind each company and pick up those who have fallen out on runs. Those who do fall out should go back to the PT area and do extra exercises.

*Make it clear to the cadre through classroom instruction or by some other means that the women will be particularly weak in such exercises as the pushup and other exercises that require upperbody strength. If the cadre is prepared for this problem they will be very little problem handling it.

*Don't view them as women. View them as people/new cadets who are simply not at a high physical state of conditioning. Also, don't hold this condition against them. It is a product of the mores taught by our society.

*The best preparation is previous exposure to women under physical duress. According to social norms, women are not expected to display physical stamina. I found, therefore, that the women needed extra encouragement because half of their shortcomings were purely psychological. The next best preparation to experience with women under physical duress is talking to someone who has the experience and is familiar with the common differences, which are mostly physiological.

*Show the Project 60 film to CBT cadre during the preparation phase in late June or late July. Make the report on Project 60 available to the cadre. Perhaps a lecture given by cadet supervisors of Project 60 on what to expect of the women would help.

*Cadets, from my experience, have some gross misconceptions of females, their attitudes, and their capabilities. Those of us in Project 60 were surprised at the positive attitude displayed, but their inability to complete many exercises, depressed, and dampened the spirits of many of them. Should they be required to do rifle exercises (running w/rifles included), I feel that they would suffer psychologically and this would be a great blow to an already toudry situation. Once a program is finalized, all Cadets in CBT should be familiarized with it so as to prevent spur of the moment decision-making which may prove harmful. Every cadre member should know exactly what to do in any situation which he may encounter.

*Company training officers and those leading the company exercise program are going to have to realize that the women may not be able to compete physically at the same level expected of the men. I think they should be more interested in individual progress rather than worry as to whether the girls can compete with the boys.

*If it were possible, have them participate in a similar Project 60. Something like "hands-on" training. Lectures and movies will not do the job.

*Subject them to the information obtained during Project 60 so as to better inform them of womens' capabilities.

*Positive leadership: Inspire new cadets to push themselves as much as possible; Keep special teams to do exercise program exclusively (to form esprit and familiarity with instructors and new cadets.

*Have a certain group assigned the specific task of monitoring them.

*Rather than running with the dropouts individually, each cadre member is going to have to be prepared to pick up groups. There just isn't enough personnel to monitor it sufficiently. I think it will be useful if the accomplishments, success, and results of Project 60 were made available to every cadet going to CBT. I don't mean the glorified version, but the version telling exactly what standards were set as compared to those expected of the male cadets in past CBT's.

*Allow the upperclass to know what athletic background each young lady had experienced to allow them the privilege to encourage better performance from the prior athletes and to work more with the less experienced girls.

Table 33: Statements from Cadets Involved with Project 60 Relating to the Question: "If you were to modify the physical training reveille exercise program for Cadet Basic Training for this coming summer, how would you change it?"

Cadets Involved with Reveille Training

*The main objective should be to keep the exercise program as stringent as possible for the males without totally segregating the women.

*Maybe even conduct PT for females completely by themselves. Success or failure in this training is too crucial to put uniformity of training of women and men ahead of it. A new cadet's confidence and mental stability are created in many cases, in PT of CBT. Cadets who fell out as new cadets (in PT) are still remembered and still harbor this lack of confidence today.

*Perhaps a change of pace would be beneficial once or twice in the program such as comparing sized games such as we were introduced to out at Camp Buckner during the Summer of 1974 (the Nerds vs the Tunas). Competition fostered between platoons can build up morale and esprit within the unit.

*Technically, today's soldier will not be running in combat with an M14. It makes more sense to train with M16's, since that is what is being used incombat. It would also solve some of the problems with women's upperbody strength. I realize however that it would be a great waste of time and effort to procure M16's when the M14's are readily available. Would it be possible to use a reasonably small number of M16's on a rotation basis?

*Increase the number of repetitions for each exercise. Certainly when some new cadets starting dropping out the formation would not look as good, but there are many new cadets, in good shape, who are simply not challenged with the current PT. Also the others would probably work harder to keep up.

*I would allow more time for the program so that more emphasis could be placed on the proper execution of the exercises.

*I do not think I would change it. However, I do believe that the women should at least be given a fair chance to do exactly what the cadets do. After a week or so, maybe there can be a separate PT group formed composed of weak women and men. In this separate group those new cadets that need special help in a specific area can get it.

*Keep it the same.

*The program has to be made easier but it wouldn't be in the right spirit to change it only for the female cadets. I would have all of the reveille runs made in tennis shoes and the rifle runs made with the M16's by both the female and male new cadets.

*Throw in more strength-building exercises and more running.

*Modify the program so that the same goals are achieved without running with rifles. The other alternative is to insure a higher level of physical fitness prior to entrance.

*I would consider determining just which women can adequately compete with the men in their exercises and exercise the two together. Those who prove unable to compete (to include any men in the same category) may be sectioned off into a remedial program designed to strengthen them and improve endurance.

*I don't feel PT should be modified for women. It's been said nothing is to change for them, but has. There were no modifications made for the men who had problems with PT, but were given extra training. The same should be done for the women.

*I would not change it, except maybe to increase the distance on running.

*The use of boots is not really needed therefore have PT without boot throughout CBT.

*No running with boots (Tore up too many feet).

*I worked with the program last summer and believe it is fine. I oppose modifying it for the women, however, course (OPE boxing and wrestling) modifications is justified, but not PT.

*I think it should stay the same. Standards should not be lowered (i.e., no rifles or M16's, etc.) to accommodate women.

*I think that for the first time the company will have to be separated into a fast group and a slow group, regardless of sex. I don't feel that the argument towards using a M16 is sound because by the same reasoning why do cadets have to run a two mile?

*I have a concentrated effort to develop self confidence and upperbody strength in the girls.

questionnaire was designed to solicit opinions regarding how the program was conducted and what was accomplished. Hopefully, this information will be used for decision making purposes in the development of future studies involving young women. The results of these questionnaires are presented in Tables 26 and 27 The responses of the subjects to the two questions which asked for a brief statement are presented in Tables 28 and 29 The responses of the cadets to the two open-ended questions which were directed to them are included in Tables 30-33.

V. Summary

A substantial amount of information relating to the physical capabilities and limitations of young women was provided by Project 60. Two basic interpretations of this data can be made: (1) the young women in Project 60 were, in many instances, far more physically proficient than a review of the literature on the physical abilities of women would have led USMA personnel to believe; and (2) on a number of tasks, even above-average women physical performers performed at a level below that achieved by the average male cadet. As a result, it is apparent that in order to maintain the one-track cadet experience with the minimum essential adjustments, a concerted effort must be made to identify and attract high-level women physical performers to become women cadets. For over 174 years, the best young men in the United States - both intellectually and physically - have become a part of the "long grey line". The same type of young woman must also be recruited to attend USMA.

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APPENDIX A: Physiological Differences Between Men and Women*

A review of the literature suggests that men have traditionally demonstrated greater levels of physical prowess than women. Although a wide variety of reasons (e.g., societal, motivational, environmental) have been advanced to explain this actuality, much of the basis for this performance dissimilarity is due to the physiological differences between men and women. With the initial admission of women to the Corps of Cadets less than a year away, it is essential that these differences be identified and evaluated for their implication on two critical areas of concern: the physical potential of women and the "biophysical" limitations women encounter in physical activity. The interpretation which these matters receive will, in turn, determine the United States Military Academy's approach to such critical matters as how the PAE will be structured for women, how the core 4^{o} physical education curriculum will be modified to account for "biophysical" differences, how the physical ability testing program will be administered, and whether or not women will be restricted from participating in some sports and military training in the interest of safety and common sense.

In the interest of lending clarity and order to a discussion of the physiological differences between men and women, four comparative areas are examined: anthropometrics, body composition, cardiorespiratory factors, and menstruation. All data, unless otherwise noted, represents the "mean value" for the group under discussion. In addition, while a substantial amount of information could be provided which purports to look at the "biophysical" similarities between men and women, only differences between the two sexes are discussed in this paper.

1. Anthropometric and Body Composition Factors

Table I presents a summary of adult male and female anthropometric and body composition comparisons. The implications of the existing differences on physical performance are significant. The female possesses only about half the amount of lean muscle mass (LMM) than does the male. As a result of this greater quantity of LMM and coupled with their greater size and level of strength, men perform far better than women in activities which require explosive power; e.g., sprinting, basketball throw, medicine ball put, and jumping events. Even when size is held constant, however, females are only 80% as strong as males.

*Unpublished USMA paper, 1 August 1975.

Researchers attribute this condition to hormonal changes which occur in males at puberty. On the other hand, numerous studies on women's strength have indicated that in this country, women appear to reach their peak performance at about the age of $12\frac{1}{2}$ or one year before menstruation begins. One study found that even when females had similar strength training programs, males improved 50% whereas the females only improved 24%.

The elbow joint is a physiological characteristic on which men and women differ. While a few researchers have taken exception to the conclusion that these differences in the elbow joint can affect athletic performance, many investigators have stated otherwise. These individuals found that when the female elbow joint is hyperextended and the arms are extended in a supinated position, the elbows are much closer to each other than in males, and the female arms form an "X" whereas the male arms form parallel lines extending from the shoulders. These researchers speculate that this angular displacement of the female forearm to the upper arm results in poorer performances in the throwing activities such as discus and javelin events, and is a handicap in sports requiring maximum leverage, such as tennis and gymnastics.

Another physiological difference is the angle of the femur with the pelvis. A woman's pelvis is $\frac{1}{2}$" wider and is rounder than the man's. From the slightly wider pelvis, the femurs extend at a greater angle. Some researchers speculate that the X-shaped leg tendencies, the joint distensions, and the softer joints and ligaments in the pelvic girdle of women are disadvantageous in running and jumping events.

In terms of body composition, women have less bone mass, less muscle component, but more fat than men. This combination of more fat and less muscle per unit volume has a negative effect upon physical performances requiring strength, speed, and power. In addition, women accumulate fat on the waist, arms, and thighs, whereas men accumulate fat primarily on the back, chest, and abdomen. This differential distribution effects movement efficiency. Since women have a relatively longer trunk and shorter legs, their weight is distributed lower than it is in the males. The pelvis and thighs of women contain a greater amount of weight. Thus, the female center of gravity is .6% lower than that of the males. The greater weight in the thigh in proportion to the muscle mass provides the female lower limbs with more inertia and more resistance to rotary movement than the lower limbs of men. As a result, on a proportional muscular force basis, the speed of movement in females is slower.

TABLE I

Summary of Adult Male and Female Anthropometric and Body Composition Comparisons Relevant to Physical Performance

Physique Characteristic	Male	Favors	Female	Favors	Source
Height*	Taller	greater lung volume, speed, power	Shorter	quick rotary	Lowe, 1968
Weight*	20-25% heavier	throwing power	Lighter		
Muscle mass of total body weight (%)	51.5% (greater)	power, speed, strength	Less (39.9%)		Shaffer, 1973
Body fat of total body weight (%)			Greater (23.7-31.0%)	buoyancy	Garn, 1957 Parizkova, 1973
Bone mass	Larger bones, more massive		Smaller, less massive		Bradbury and Edwards, 1949
Center of Gravity	.6% higher	rotary movement	.6% lower	balance	Cotton, 1933
Pelvis	shallower, narrower, heavier	running speed	½" wider, rounder	lateral sway in running, injury production	Adrian, 1972 Zaharieva, 1961
Bi-iliac diameter (hips)	narrower	power production	Wider	stability, child birth	Simmons, 1944
Bi-acromium diameter (shoulders)	wider	weight support production	Narrower	flexibility	Simmons, 1944

*According to the US Public Health Service, the average 18 year old male is 70.2" tall and weighs 144.8 lbs. The average 18 year old female is 64.4" tall and weighs 126.2 lbs. (Source 1975 World Almanac, p. 956).

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TABLE I (cont'd)

Physique Characteristic	Male	Favors	Female	Favors	Source
Chest Girth	Greater	Thoracic cavity ventilation capacity	smaller		
Trunk length	Relatively shorter		relatively longer	lower center of gravity	
Leg length	Relatively longer	Acceleration, speed, power, greater kicking velocity	relatively shorter	agility	
Elbow joint	Arms parallel from shoulders	leverage in throwing, supporting weight	Arms form an "X" from shoulder		Mateef, 1958

2. Cardiorespiratory Factors

Physical activity involving large muscle groups requires that the body undergo certain physiological changes. The body must provide the energy for muscular contraction either aerobically, as in the distance events when oxygen is provided in amounts as needed, or anaerobically, as in sprinting, when short periods of gross muscle contraction are made in excess of available oxygen.

The physiological mechanisms that influence both aerobic and anaerobic work, and consequently greatly effect sports performance, have been extensively investigated. The studies in this area have primarily focused on the efficiency of the oxygen absorption system, efficiency of the oxygen transport system, and the ability of the body to tolerate accumulated fatigue products. Because the circulatory and the respiratory systems are the cardinal limiting factors in these matters, it is necessary to examine the potential effect of cardiorespiratory differences between men and women on physical performance.

Table II presents a comparative summary of adult male and female cardiorespiratory factors. Several significant differences exist, most of which place woman at a disadvantage if she is to be compared to a man in endurance activities. Collectively summarized, the differences that are important in terms of physical performance are cardiovascular characteristics, aerobic capacity, blood characteristics, and heat tolerance. The implication of these differences are twofold: (1) men have a greater potential for endurance that cannot be matched by women; and (2) at submaximal work levels, women have to work much harder to accomplish the same amount of work.

There are several cardiovascular differences which can be attributed to gender. Physically, the male heart and lungs are larger than those of the female. Not only are they larger, but the relative weight of a man's heart and lungs to his total body weight is greater. The larger male heart and lungs produce higher stroke volumes (the amount of blood forced from the heart for each beat) and vital capacities (maximum volume of air that can be expelled from the lungs following a maximum inspiration) than those of women. In addition, the resting heart rate of men is approximately 5 to 8 beats/min slower than that of women, both at rest and at all levels of exercise. Another cardiovascular difference concerns the oxygen content in arterial blood. Due to higher hemoglobin values, men have more oxygen in their arterial blood than do women. Accordingly, the variations of oxygen content of arterial blood that occur during exercise are met by compensatory changes in cardiac output. Since

TABLE II
Comparison of Female and Male Cardiorespiratory Factors

Component	Subjects	Unit of Measure	Female	Male	Difference (%)	Source
Heart volume		ml	640	880	27.0	Astrand & Rodahl, 1970
Red blood cells		No/cubic ml	4,500,000	5,000,000	8.0	Ellis, 1929
Hemoglobin	average	gm/100 cc	13.9	15.8	13.2	Astrand, 1956
	average			greater	14.3	Holmgren, 1967
				greater	10.9	vonDobeln, 1956
	average, college		13.9	14.8	10.0	Cotes et al., 1969
Oxygen content of blood		ml O_2/100ml	16.7	19.2	13.0	Astrand & Rodahl, 1970
Hemoglobin (total body)				greater	30.0	Astrand, 1956
		gm	510	776	34.0	Cotes et al., 1969
Vital capacity	College age			greater	30.0	Metheny, 1942
	adults	l	3.66	5.66	35.0	Cotes et al., 1969
	Well-trained	l	4.25	5.70	25.0	Astrand & Rodahl, 1970
Cardiac output		Q necessary to carry 1 l/min at maximum work	7	6	14.0	Astrand & Rodahl, 1970

TABLE II (cont'd)

Component	Subjects	Unit of Measure	Female	Male	Difference (%)	Source
Heart rate in max tests		beats/min	185.6			Raven et al., 1972
			186.9			Sinning & Adrian, 1968
			187			Astrand, I., 1960
			189			Darwick, 1964
			198			Metheny, 1942
			193	190	2.0	Cotes et al., 1969
			189			Astrand et al., 1964
			194	186	4.0	Astrand et al., 1964
VO_2max		ml/kg-min	36.0	51.0	30.0	Astrand, 1956
	College swimmers		40.0	51.0	22.0	Metheny, 1942
			51.65	61.86	22.0	Mijashita, 1970
			36.4	55.6	35.0	Matsui, 1970
			39.2	48.5	19.0	Cotes et al., 1969
Diffusing Capacity of	Average	ml $min^{-1}Torr^{-1}$	37.0	47.6	22.0	Cotes et al., 1969
Alveolar Membrane	Average	ml	55.2	63.0	13.0	Cotes et al., 1969

maximal cardiac output is limited somewhat by the size of the heart, the female cannot (comparatively) compensate for the lower content of oxygen in the arterial blood. As a result, the masimum oxygen that can be consumed is lower in women than in men.

The second cardiorespiratory factor affected by these differences is aerobic capacity. This factor is important because it is an indication of the ability of an individual to continue delivering the required amount of oxygen demanded by the working muscles under varying work loads. Aerobic capacity is generally expressed as oxygen uptake, (VO_2), which is defined as the volume of oxygen that can be extracted from the inspired air. Maximum oxygen uptake (VO_2 max) is the maximum amount of oxygen that can be extracted while performing strenuous work and is expressed as liters per minute. Once an individual reaches his VO_2 maximum, the work may be continued until the building of waste products forces a cessation of the work. Numerous researchers have found that on a VO_2 max test (a measure generally considered to be the best single criterion of cardiovascular endurance), men clearly are superior to women.

The third cardiorespiratory factor affected by differences between men and women concerns blood characteristics. Men have a higher percentage of red blood cells, the oxygen-carrying component in the body. Men also have 30% greater amount of total body hemoglobin, due to their greater body size. The lower average hemoglobin content of arterial blood in women has frequently been advanced by researchers as a principal explanation for the lower aerobic capacity of women. During heavy exercise women have to increase cardiac output in order to compensate for lower arterial oxygen hemoglobin. During vigorous physical exertion, women have to increase their heart rate since stroke volume and performance are limited by total blood volume. Accordingly, for a given submaximal work load, women are always operating at a level closer to their maximum than men, and will reach exhaustion sooner.

The fourth cardiorespiratory factor to be examined is heat tolerance. Since heat is a limiting factor in physical performance, both men and women must develop methods of coping with increases in temperature. There are two types of heat. Metabolic heat consists of higher internal body temperatures which are generated by the individual's physical activity. Ambient heat is the environmental temperature, and interacts with humidity to produce thermal stresses on the body. Researchers have found that women have a higher body temperature at rest than men, fewer sweat glands, lower sweat production, and a propensity to start sweating at higher temperatures than do men. A woman's greater amount of adipose tissue serves as insulation and inhibits heat dissipation. These

differences have an important implication for physical performance. Women have less tolerance to heat than men. As a result, women are more subject to heat stress than men. Under heat conditions and at low levels of work, a woman's heart rate is 10 to 12 beats/min faster than that of a man's. At high levels of work, a woman's heart rate is 20-30 beats/min faster. Accordingly, under higher levels of heat condition, a woman has to work relatively harder than a man to achieve similar work loads.

3. Menstruation Factors

Answers to questions relating to the effect of the menstrual cycle on physical performance remain largely a matter of educated speculation. Such questions are very difficult to answer experimentally, due to the extreme variability of subjects' menstrual phases. Much of the existing information on the subject has been provided by physicians. The reliability of instruments commonly used to obtain such data (self-report inventories or questionnaire) has never been validated. In addition, experimental bias and the Hawthorne effect (subject knows she is a participant in a study, thereby affecting her perceptions and her performance) may have influenced such data. Table III illustrated the equivocal nature of the results of several studies of the effect of menstruation on athletic performance. The literature is somewhat more clear with regard to whether or not women should be restricted from physical participation during menstruation. The majority of recent investigations on this question expressed the opinion that sports activity has little effect on menstruation and that no restriction should be placed on the physical activity of average women at any phase of their cycle. At the present time, little is known about the influency of "psychological effects" on physical activity during the menstrual cycle.

In summation, the data presented in this paper conclusively illustrates that numerous physiological differences exist between men and women. These differences result in significantly different performance capacities between men and women. Because of this performance dissimilarity, it is prudent to conclude that certain modifications in the United States Military Academy's physical entrance exam and the physical education and military training programs may be warranted. On the other hand, if as some researchers claim women have not begun to reach their athletic and physiological potential, current physiological understandings of them may be only descriptions of the "emerging" women performer.

TABLE III
Sports Performance of Female Athletes During Menstruation

Better Performance During Menses (%)	Similar Performance During Menses (%)	Worse Performance During Menses (%)	Source
	36.9	17.0	Zaharieva, 1965
13.0-15.0	42.0-48.0	30.7	Erdelyi, 1962
15.0	46.5	38.5	Duntzer & Hellandall, 1929
	42.0	48.0	Antoine, 1941
13.0	48.2	30.0	Kiss, et al., 1957

As a result, an effort should be undertaken to periodically reevaluate the research concerning the physiological differences between men and women.

DR. JAMES A. PETERSON
Director, Upperclass Instruction
Office of Physical Education

GLOSSARY OF TERMS

Alveolar Membrane - Very thin layer of connecting tissue between the air in the alveoli and the blood in the pulmonary capillary. Alveoli are the "air cells" of the lungs. Each lung contains millions of these air sacs. With each intake of breath, the alveoli expand, and during expiration air is forced out of the alveoli through the membrane to the capillaries.

Anthropometric - Pertaining to human attributes

Biophysical - Pertaining to the inner-functioning of the human body

Femur - The bone in the leg which extends from the pelvis to the knee; sometimes referred to as the "thighbone".

Hemoglobin - The protein coloring matter of the red blood corpuscles, serving to convey oxygen to the tissues; in combination with oxygen in arterial blood, it is referred to as oxyhemoglobin.

Vital Capacity - A measure of a person's overall ability to inspire and expire air; it is determined by 2 factors: (1) the strength of the respiratory muscles, and (2) the resistance of the Thoracic Cage and lungs to expansion and contraction.

*AR 70-25

ARMY REGULATION
No. 70-25

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *31 July 1974*

RESEARCH AND DEVELOPMENT

USE OF VOLUNTEERS AS SUBJECTS OF RESEARCH

Effective 15 September 1974

This revision transfers the final approval authority from the Chief of Research and Development to The Surgeon General for all research using volunteers, except research involving nuclear and chemical warfare agents and identifies the requirement for use of active duty military personnel as volunteers and instructs major commanders to provide assistance in their recruitment. Local limited supplementation of this regulation is permitted, but is not required. If supplements are issued, Army Staff agencies and major Army commands will furnish one copy of each to HQDA (DASG-RDZ), Washington, DC 20310. Other commands will furnish one copy each to the next higher headquarters.

	Paragraph
Purpose	1
Definition	2
Exemptions	3
Basic principles	4
Additional safeguards	5
Approval to conduct experiment	6
Civilian employees	7
Recruitment of active duty military volunteers	8
Appendix, Legal implications	

1. Purpose. These regulations prescribe policies and procedures governing the use of volunteers as subjects in Department of the Army research wherein human beings are deliberately exposed to unusual or potentially hazardous conditions. These regulations are applicable worldwide, wherever volunteers are used as subjects in Department of the Army research.

2. Definition. For the purpose of these regulations, unusual and potentially hazardous conditions are those which may be reasonably expected to involve the risk, beyond the normal call of duty, of privation, discomfort, distress, pain, damage to health, bodily harm, physical injury, or death.

3. Exemptions. The following categories of activities and investigative programs are exempt from the provisions of these regulations:

a. Research and nonresearch programs, tasks, and tests which may involve inherent occupational hazards to health or exposure of personnel to potentially hazardous situations encountered as part of training or other normal duties, e.g., flight training, jump training, marksmanship training, ranger training, fire drills, gas drills, and handling of explosives.

b. That portion of human factors research which involves normal training or other military duties as part of an experiment, wherein disclosure of experimental conditions to participating personnel would reveal the artificial nature of such conditions and defeat the purpose of the investigation.

c. Ethical medical and clinical investigations involving the basic disease process or new treatment procedures conducted by the Army Medical Service for the benefit of patients.

4. Basic principles. Certain basic principles must be observed to satisfy moral, ethical, and legal concepts. These are—

a. Voluntary consent is absolutely essential.

(1) The volunteer will have legal capacity to give consent, and must give consent freely without being subjected to any force or duress. He must have sufficient understanding of the implications of his participation to enable him to make an informed decision, so far as such knowledge does not compromise the experiment. He will be told as much of the nature, duration, and purpose of the experiment, the method and means by which it is to be conducted, and the inconveniences and hazards to be expected, as will not invalidate the results. He will be fully informed of the effects upon his health or person which may possibly come from his participation in the experiment.

(2) The consent of the volunteer will be in writing. A document setting forth substantially the above requirements will be signed by the volunteer in the presence of at least one witness

*This regulation supersedes AR 70-25, 26 March 1962.

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not involved in the research study who will attest to such signature in writing.

(3) The responsibility for ascertaining the quality of the consent rests upon each person who initiates, directs, or conducts the experiment. It is a personal responsibility which may not be delegated.

b. The number of volunteers used will be kept at a minimum consistent with *c* below.

c. The experiment must be such as to contribute significantly to approved research and have reasonable prospects of yielding militarily important results essential to an Army research program which are not obtainable by other methods or means of study.

d. The experiment will be conducted so as to avoid all unnecessary physical and mental suffering and injury.

e. No experiment will be conducted if there is any reason inherent to the nature of the experiment to believe that death or disabling injury will occur.

f. The degree of risk to be taken will never exceed that determined to be required by the urgency or importance of the Army program for which the experiment is necessary.

g. Proper preparations will be made and adequate facilities provided to protect the volunteer against all foreseeable possibilities of injury, disability, or death.

h. The experiment will be conducted only by scientifically qualified persons. The highest degree of skill and care will be required during all stages of the experiment of persons who conduct or engage in the experiment.

i. The volunteer will be informed that at any time during the course of the experiment he will have the right to revoke his consent and withdraw from the experiment, without prejudice to himself.

j. Volunteers will have no physical or mental diseases which will make the proposed experiment more hazardous for them than for normal healthy persons. This determination will be made by the project leader with, if necessary, competent medical advice.

k. The scientist in charge will be prepared to terminate the experiment at any stage if he has probable cause to believe, in the exercise of the good faith, superior skill, and careful judgment required of him, that continuation is likely to result in injury, disability, or death to the volunteer.

l. Prisoners of war will not be used under any circumstances.

5. Additional safeguards. As added protection for volunteers, the following safeguards will be provided:

a. A physician approved by The Surgeon General will be responsible for the medical care of volunteers. The physician may or may not be the project leader but will have authority to terminate the experiment at any time that he believes death, injury, or bodily harm is likely to result.

b. All apparatus and instruments necessary to deal with likely emergency situations will be available.

c. Required medical treatment and hospitalization will be provided for all casualties.

d. The physician in charge will have consultants available to him on short notice throughout the experiment who are competent to advise or assist with complications which can be anticipated.

6. Approval to conduct experiment. It is the responsibility of the head of each major command and other agency to submit to The Surgeon General a written proposal for studies which come within the purview of this directive. The proposal will include for each study the name of the person to be in charge, name of the proposed attending physician, and the detailed plan of the experiment. The Surgeon General has final approval authority for all research using volunteers except research with nuclear or chemical warfare agents. Proposals for research with nuclear or chemical warfare agents will be forwarded by The Surgeon General with recommendations on medical aspects to the Secretary of the Army for approval.

7. Civilian employees. When civilian employees of the Department of the Army volunteer under this program, the following instructions will be observed:

a. Any duty as a volunteer performed during the employee's regularly scheduled tour of duty will be considered as constructive duty for which straight time rates are payable. Time spent in connection with an experiment outside the employee's regularly scheduled tour will be considered as voluntary overtime for which no payment may be made nor compensatory time granted. The employee will be so informed before acceptance of his volunteer services.

b. Claims submitted to the Bureau of Employees' Compensation, U.S. Department of Labor, because of disability or death resulting from an employee's voluntary participation in experiments, will include a citation to title 10,

APPENDIX

LEGAL IMPLICATIONS

The following opinions of The Judge Advocate General furnish specific guidance for all participants in research using volunteers:

1. Authority. The Secretary of the Army is authorized to conduct research and development programs including the procurement of services that are needed for these programs (10 U.S.C. 4503). The Secretary has the authority to "assign detail and prescr the duties" of both members of the Army and civilian personnel (10 U.S.C. 3012(e)).

2. Military personnel and Department of the Army civilian employees. Compensation for the disability of death of a civilian employee resulting from personal injury or disease proximately caused by his employment is payable under the Federal Employees Compensation Act (39 Stat. 742 et seq.), as amended (5 U.S.C. 751 et seq.), regardless of whether his employment was of a hazardous nature. The amount and type of disability compensation or other benefits payable by reason of the death or disability of a member of the Army resulting from injury or disease incident to service depends upon the individual status of each member, and is covered by various provisions of law. It may be stated generally that under present laws no additional rights against the Government will result from the death or disability of military and civilian personnel participating in experiments by reason of the hazardous nature of the operations.

3. Private citizens. It is the policy of the United States to prohibit the acceptance of voluntary services particularly when they may provide a basis for a future claim against the Government. (R.S. 3679, as amended; 31 U.S.C. 665(b)).

4. Use of appropriated funds for the purchase of insurance. As the payment of insurance premiums on the life of an officer or employee of the United States is a form of compensation which is not currently authorized, payment of those premiums is prohibited (R.S. 1765; *Commissioner of Internal Revenue* v. *Bonwit*, 87 F 2d 764 (2d Cir. 1937); *Canaday* v. *Guitteau*, 86 F 2d 303 (6th Cir. 1936); 24 Comp Gen. 648 (1945)).

5. Contractor's employees. There appears to be no legal objection to the use of employees of contractors in research and development experiments. It is the responsibility of the contracting officer to determine whether the terms of the contract are sufficiently broad to permit the participation of these employees. Generally, benefits to which private employees may become entitled by reason of death or disability resulting from their employment are payable under State law except persons covered by the survivors insurance provisions of the Social Security Act (49 Stat. 623, as amended (42 U.S.C. 402)). Reimbursement of the employer for additional costs by reason of this liability of his employees will depend upon the terms of each contract. These employees are not disqualified from prosecuting claims against the Government under the Federal Torts Claims Act (28 U.S.C. 2671 et seq., see AR 25-70). In cost reimbursement type research contracts with commercial organizations the cost of maintaining group accident and life insurance may be reimbursed to the contractor (subject to certain exceptions) under ASPR 15-205.16 provided that the approval of the head of the Procuring Activity is obtained (APP 10-551).

6. Irregular or fee-basis employees. Intermittent services of such employees are authorized. (For experts and consultants see Sec. 15, Act of 2 Aug 1946 (60 Stat. 810; 5 U.S.C. 55a); Sec. 501, DoD Appropriation Act, 1961 (74 Stat. 349); note APP 30-204.1, CPR A7; Sec. 710 Defense Production Act of 1960 (64 Stat. 819; 50 U.S.C. App 2160); and for architects, engineers, and other technical and professional personnel on a fee basis, see 10 U.S.C. 4540.). Whether these employees can be detailed or assigned to the proposed experiments will depend upon the statutory authority for employment and the provisions of their employment agreement in each case. The Federal Employees Compensation Act, *supra*, in all probability applies with respect to these irregular and fee-basis employees for any injury or disease resulting from their employment, although a final determination in such cases will have to be made by the Bureau of Employees Compensation, Department of Labor. Subject to such restrictions and limitations as may appear in the statutory authority under which he is employed, it would appear that the Government may legally bear the expense of premiums upon the life of an irregular or fee-basis employee whose rate of compensation is not fixed by law or regulations. In this regard, it may be advisable for the Government to provide an

United States Code, section 4503 as the Department of the Army authority for the use of such volunteer services.

c. All questions concerning hours of duty, pay, leave, compensation claims, or application of other civilian personnel regulations to volunteer employees will be presented through channels to the Deputy Chief of Staff for Personnel, ATTN: Office of Civilian Personnel.

8. Recruitment of active duty military volunteers. Some research will require active duty military personnel as volunteers because of the nature of the investigations. Recruiting is best accomplished by research personnel responsible for conduct of the research. Major commanders will provide assistance to recruiting teams. At all times recruiting will be conducted in a morally, ethically, and legally acceptable manner.

additional allowance to the employee for financing such private insurance arrangements as he may wish to make rather than to undertake direct negotiations with insurance carriers for the desired coverage.

7. Conclusion. Subject to the above conditions, Armed Forces personnel and/or civilians on duty at installations engaged in research in subject fields will be permitted to actively participate in all phases of the program.

The proponent agency of this regulation is the Office of The Surgeon General. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) to HQDA (DASG–RDZ), WASH DC 20310.

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

DISTRIBUTION:
Active Army, ARNG, USAG: To be distributed in accordance with DA Form 12–9A requirements for AR, Research and Development—D (Qty Rqr Block No. 112)

APPENDIX C: Project 60 Briefing Packet

A COMPARISON OF TWO TYPES OF PHYSICAL TRAINING PROGRAMS ON THE PERFORMANCE OF 16-18 YEAR OLD WOMEN

by

Dr. James A. Peterson and staff from USMA

CPT Dennis M. Kowal, MSC and staff from USARIEM

I. Introduction

Every year the United States Military Academy (USMA) selects approximately 1400 individuals for admission. Beginning with Academic Year (AY) 1976-77, the entering class will include women cadets. A review of the pertinent literature indicates that there are substantive physiological differences between men and women. One of the paramount differences is the minimal level of upper body strength of women. Accordingly, major questions remain to be resolved regarding how to accomplish these differences. Initially, it has been decided to substitute the flexed-arm hang for pullups in the physical aptitude examination (PAE) (part of the screening criteria for applicants to USMA). The PAE consists of four events: pullups, standing long jump, modified basketball throw, and the 300 yard shuttle run. Eventually, however, it appears desirable that women cadets who possess less than adequate levels of physical ability be required to participate in a developmental program

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designed to provide them with the requisite physical ability for cadet training.

The lack of research on the consequences of differing types of training programs for women leaves many unanswered questions relating to what type of training program is best suited, and what results can be obtained. This study will attempt to provide answers to those questions.

This study will be conducted by personnel from the Office of Physical Education (OPE), USMA, in cooperation with personnel from the Exercise Physiology Division, United States Army Research Institute of Environmental Medicine (USARIEM). The OPE staff will supervise the actual training and conduct the performance testing. USARIEM staff will conduct the physiological and behavioral assessment testing.

II. Experimental Design

If you agree, you will be one of sixty women high school students, 16-18 years of age, who have been asked to participate in this nine week study. You will have a physical examination administered to you and will receive, along with your parents, a briefing given in accordance with Army Regulation (AR) 70-25. You will be informed of the nature, purpose, and extent of the study and will be asked to sign various informed consent, privacy, and agreement statements. You will then be

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randomly assigned to one of three groups after the pretest measures have been accomplished. These groups are:

A. An experimental group which will participate in a strength training program. This program will consist of 3 workout sessions per week using a prescribed strength development schedule.

1. Prescribed Program:

a. Repetitions, sets, workload. One set of 8-12 repetitions of each exercise will be performed. The workload of each exercise should be maximal so that the subject will reach what she considers to be the point of momentary muscular failure (unable to execute another properly performed repetition).

b. Time interval. The time interval between exercises should be adequate so that the subject is capable of exerting a maximum effort on each succeeding exercise. If the time interval does not allow adequate recovery, the exercise will become a test of cardiorespiratory fitness and not strength. The primary objective of the program is to observe the effects of a strength training program; therefore, the time interval between exercises will be established by the capacity of the subjects.

c. Frequency of workout. The frequency of workout will be three sessions per week while alternating days.

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d. Order of exercise. The order of exercise has been established based on the most efficient and effective training principles. The most basic of these principles is: The muscle groups should be exercised from the largest to the smallest and; to alternate pressing and pulling movements when exercising the torso and the arms (this allows adequate recovery of opposing muscle groups).

e. Exercises to be performed. The program is designed to develop overall strength. The exercises to be performed (in the following order) are as follows:

Exercise	Equipment	Muscle Groups
Hip & back	Nautilus	Buttocks, lower back
Leg press	Universal	Buttocks, legs
Leg extension	Nautilus	Quadriceps
Leg curl	Nautilus	Hamstrings
Heel raise	Universal	Gastorcnemius
Bench press	Universal	Pectorals, deltoids, triceps
Lat pulldown	Nautilus	Latissimus dorsi, biceps
Triceps extension	Universal	Triceps
Biceps curl	Universal	Biceps
Wrist curl	Free weights	Forearm flexors

2. Exercise description:

a. Hip and Back: The subject is in the supine position with the back of the legs resting on a pad. She then extends downward from the hip until the legs are completely extended and parallel to the floor.

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b. Leg Press: The subject is sitting in a seat in a bent leg position with the feet resting on foot pedals. The subject then extends the legs fully, pauses, and recovers to the starting position.

c. Leg Extension: The subject sits on the extension machine with the front part of the ankle behind a pad on the machine. She extends her legs upward until they reach the locked position. She then pauses, and slowly recovers to the starting position.

d. Leg Curl: The subject lies face down on the machine with the back of the heel hooked under a pad. She raises the weight up and pauses when the leg is perpendicular to the floor. She then pauses and slowly recovers to the starting position.

e. Heel Raise: The subject will start the exercise standing with the toes elevated. She will elevate the heels, similar to standing on the toes, pause and slowly recover to the starting position.

f. Bench Press: The subject lies on her back on the machine, with hands placed on a horizontal bar. She then extends her arms vertically against the weight until locked. She pauses at the height of her extension and then slowly recovers to the starting position.

g. Lat Pulldown: The subject sits down on a bench and grasps a bar above her head. She then pulls the bar down behind her neck, pauses, and slowly recovers to the starting position.

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h. Tricep Extension: The subject will grasp (palms facing down) the curl bar (paragraph g above) and pulls it down in such a manner so that the elbows are locked in the down position at the side. She will then extend from the elbow, pause, and recover to the starting position.

i. Bicep Curl: The subject will grasp the curl bar (palms facing up) and lift the bar to the chest, pause, and recover to the starting position.

j. Wrist Curl: The subject will sit with the top of her wrist resting on her thigh. She will then lift a barbell to the up position, pause, and then recover to the starting position.

k. Bent Leg Stiup: The subject will lie on her back, knees bent, and the feet flat on the floor. An assistant will hold the subject's feet. The subject will then rise to the vertical position and lower her body back to the floor as many times as possible in one minute.

3. Risks involved:

Danger: None--subject acts as own monitor of physical well-being.

Injury: Unlikely; however, muscle pulls, tears, strains, cramping, or sprains are possible. Extremely remote possibility of an injury resulting from the dropping of a free standing weight on an extremity.

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Discomfort: Muscle soreness. The degree of soreness will vary with the individual depending upon her present level of physical condition. The individual who has been very active will not experience the same degree of discomfort as will the more dormant individual. The soreness will be the greatest during the first week of training, gradually diminishing during the second week. The subjects should not experience any additional soreness during the remainder of the study.

B. An experimental group (reveille exercise program) which will engage in a program of calesthenics and exercises comparable to that which is given to the cadets (1975 New Cadet Training period) during the first two months of new cadet basic training. This program will be conducted on a 4 day a week basis.

1. Prescribed Program: The program will include participation in conditioning drills, rifle exercises, grass drills, guerilla exercises, and mass formation running. Cadets, trained and monitored by OPE personnel, will supervise each training session.

2. Training Schedule:

Week #	Day #	Exercises	Running
1	1	Cond 45 min 6 reps	None

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Week #	Day #	Exercises	Running
1	2	Cond 30 min 8 reps	15 min 6/2 (run 6 min, walk 2 min) 8:30 pace minute mile)
1	3	Cond 30 min 10 reps	15 min 6/2 8:30 pace
1	4	None	30 min 8/2 8:30 pace
2	1	Cond 30 min 10 reps	15 min 8/2 8:30 pace
2	2	Cond 30 min 12 reps*	15 min 8/2 8:30 pace
2	3	Grass 15 min	15 min 8/2 8:30 pace
2	4	None	30 min 9/1 8:30 pace
3	1	Cond 30 min 12 reps*	15 min 9/2 8:15 pace
3	2	Cond 30 min 14 reps*	15 min 9/2 8:15 pace
3	3	Cond 30 min 14 reps*	15 min 9/2 8:15 pace
3	4	None	30 min 10/1 8:30 pace
4	1	Cond 30 min 16 reps*	15 min 15/0 8:30 pace

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Week #	Day #	Exercises	Running
4	2	Grass 15 min	15 min 15/0 8:30 pace
4	3	Cond 30 min	15 min 15/0 8:30 pace
4	4	None	30 min 15/1 8:15 pace
5**	1	Rifle 45 min 8 reps	None
5	2	Rifle 30 min 8 reps	15 min 15/0 8:15 pace
5	3	Rifle 30 min 10 reps	15 min 15/0 8:00 pace
5	4	None	30 min 30/0 8:15 pace
6	1	Rifle 30 min 10 reps	15 min 15/0 8:00 pace
6	2	Guerillo 30 min	15 min 15/0 8:00 pace
6	3	Rifle 30 min 14 reps	15 min 15/0 8:00 pace
6	4	None	30 min 15/0 8:00 pace
7	1	Rifle 30 min 14 reps	15 min 15/0 8:00 pace
7	2	Rifle 30 min 14 reps	15 min 15/0 8:00 pace

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Week #	Day #	Exercises	Running
7	3	Guerilla	15 min 15/0 8:00 pace
7	4	None	30 min 30/0 8:00 pace

*Eight count pushup & four count pushup will not exceed 10 repetitions

**During weeks 5-7, all subjects will wear combat boots during training.

NOTE: Rifle to be used in rifle drills will be the M-14, weight approximately 9.0 pounds.

3. Risks Involved: The risks involved in the reveille exercise program are no greater than those which would be associated with a conditioning program for women athletes at the high school level. Since the participant herself is the best judge of her physical reactions to exercise, she will be able to monitor her performance and terminate it whenever the discomfort becomes excessive.

Danger: None

Injury: Those attendant to running, such as muscle pulls, strains, sprains, or cramps. Likewise the possibility, however remote, does exist that an injury of unspecified nature could occur from dropping the rifle on an extremity (rifle weight 9.0 pounds).

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Discomfort: Muscle soreness, tightness in the chest due to rapid breathing, headaches due to a buildup of carbon-dioxide and other physical discomforts which could reasonably be expected to occur from a vigorous exercise and running program. Discomfort will be greatest during the onset of the program and will diminish toward the middle/end of the training program.

C. A control group will maintain their normal physical activity schedule and will not participate in an experimental training program, other than the pre and post testing events.

III. Test Measures and Procedures

A. Anthropometrical Evaluation (Body Measurements)

This test will consist of measuring body weight in shorts, blouse, and stocking feet; height in stocking feet and selected measures of skin fold thickness to estimate lean body mass, percent body fat, and limb and trunk circumferences. The skin fold measurements will be taken with calipers (similar to large pair of tweezers). The fold itself will be approximately one or two inches of skin which has been grasped by the thumb and forefinger of the researcher so that it includes two layers of skin and the fat under the skin, but excludes any muscle tissue. The researcher will then place the caliper beneath the thumb and forefinger,

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CONDITIONING DRILL

HIGH JUMPER (4)



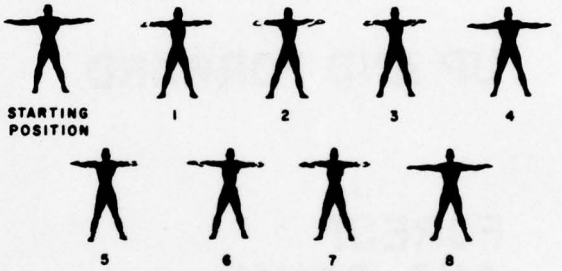
PUSH-UPS (4)



TRUNK TWISTER (4)



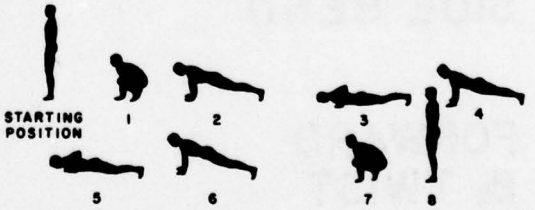
TURN & BOUNCE (8)



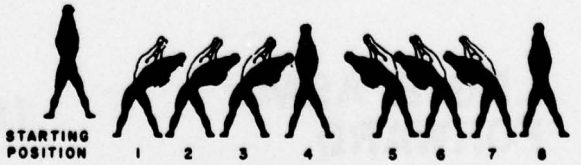
SQUAT THRUST (4)



8 COUNT PUSH-UP (8)



SIDE BENDER (8)



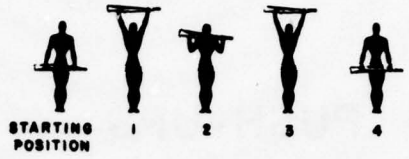
BOTTOMS UP (4)



Acknowledged _____

RIFLE DRILL ONE

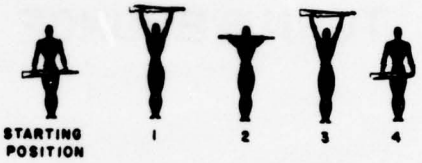
FORE UP, BEHIND BACK 4



SIDE LUNGE & BEND (8)



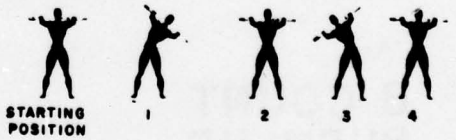
UP AND FORWARD (4)



FOREUP AND SQUAT (4)



ARMS FORWARD SIDE BEND (4)



FORWARD & TWIST (8)



LEG & ARM FORWARD (8)



STRADDLE JUMP (4)



 Acknowledged_____

FOUR BASIC POSITIONS

GRASS DRILL 1



GO FRONT BACK STOP



CHANGING FROM FRONT TO BACK



CHANGING FROM BACK TO FRONT



ASSUMING FRONT AND BACK POSITIONS

EXERCISES

A. BOUNCING BALL



B. BICYCLE



C. SIT UPS



D. MOUNTAIN CLIMBER



E. ROLL LEFT



 Acknowledged_____

GUERRILLA TABLE 1



A. DOUBLE TIME



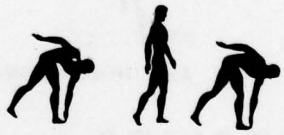
B. ALL FOURS



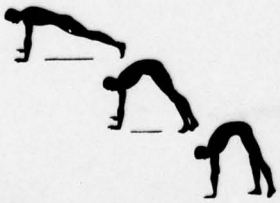
C. CRAB WALK



D. BROAD JUMP



E. TOE TOUCH WALK



F. BOTTOMS UP WALK



G. STRADDLE RUN

Acknowledged_____

Blank

grasping the fold, and take the necessary measurements. These measurements are then used in a formula to determine lean body mass. The areas of the body which will be measured are:

1. Abdominal - taken at the side of, and level with, the navel

2. Chest - taken at the side, under the arm, in line with the bottom of the breast bone

3. Arm - taken with the arm flexed at 90° and at the back of the arm at a point midway between the tip of the shoulder and the tip of the elbow

4. Subscapular Reading - taken at the lower tip of the shoulder blade, parallel to the spine

5. Thigh - taken at the front of the thigh at a point midway between the knee and the hip

Risk Involved: None

B. Cardiorespiratory Endurance (Maximal Work Capacity)

This test will consist of running on a treadmill which is similar to the equipment used in health clubs. You will be asked to do a six-minute warm-up run followed by a rest period. After the rest period, you will do two of four additional runs on the treadmill. Each of these runs will be three to four minutes in duration; however, each run will become increasingly more difficult as the treadmill's angle is increased.

Acknowledged_____

This is the same as requiring you to run up a hill and increasing the steepness of the hill. During your runs small paper recording devices (electrodes) will be placed on your chest with tape. These are the same as the electrodes used by doctors in hospitals to record patients' heart rates and are harmless. During the last minute of each run you will be asked to breathe into a rubber mouthpiece (similar to the mouthpiece in SCUBA equipment). As you breathe into the mouthpiece, the air you breathe out will be collected through a system of tubes into special bags to determine the content of the air you breathe out. By observing your heart rate and collecting samples of your breath, we can determine the maximum amount of work you can do on a treadmill.

Danger: Cardiac arrest: 1:150,000 - for all healthy young adults - USARIEM has conducted this experiment on over 1,000 young adults without a single incident. Medical personnel will monitor heart rate during the administration of the test and will terminate at the first indication of an abnormality.

Injury: That which would be attendant to falling off the treadmill (assistants will be used to minimize the likelihood); sprains, contusions, bruises, potential broken limbs. Likelihood extremely remote. Muscle pulls, tears, sprains, strains, again a remote possibility.

Acknowledged_____

C. Strength Evaluation

The variables which will be recorded in the strength testing are peak strength, endurance, work done, and the rate at which the work is done. The muscle strength of the arms, upper and lower legs, the hand, chest, and the hips and back will be measured. You will be asked to push or pull on special handles or pedals (similar to those found in health clubs). While you are exerting force against these measuring devices, recording electrodes, similar to those described in the treadmill test, will be attached with tape to your skin. These electrodes will record the strength of your muscle contractions, and are completely harmless.

Risks Involved:

Danger: None

Injury: Muscle pulls, strains, sprains, cramps are a remote possibility.

Discomfort: Localized muscle soreness of varying intensity.

D. Behavioral Assessment

You will be asked to complete psychological inventories. These inventories will be filed in your testing folder and will be used when analyzing group composition, attitudes, opinions, etc. They will not be

Acknowledged_____

used to identify or single out any particular individual. These inventories are:

1. Profile of Mood States (PMOS). This inventory yields independent measures of tension, depression, anger, vigor, fatigue and confusion.

2. Spielberger Inventory (STAX). This inventory yields measures of state (situational) and trait (enduring) self-perception.

3. Eysenck Personality Inventory (EPI). This inventory yields measures along the continuum of introversion/extroversion and emotionality/stability.

4. Endurance and Achievement Subscales (EPPS). This inventory measures motive to endure and persevere on a given task.

5. Attitude Questionnaire (PEAS). This inventory measures physical estimation (of self) and attraction (to physical exercise/activity) variables.

6. Personal Data Inventory. This inventory includes questions about participation in high school athletic programs, personal traits and habits, and a history of activity.

E. Flexibility Assessment. The following measures of flexibility will be obtained:

Acknowledged_____

1. Shoulder Flexion. (shoulder elevation)

This test consists of the subject lying on the floor in the prone position with arms extended straight in front of the subject, approximately shoulder width apart. The subject is asked to grasp a ruler in both hands and then to raise it upwards as far as possible without lifting the chin from the floor or bending the elbows or wrist. The vertical distance the ruler is raised will then be measured.

2. Trunk Extension.

This test consists of the subject lying on the floor in the prone position with an assistant securing her feet and hips. The subject is then asked to raise her trunk (head to waist) as far backward as possible. The vertical distance from the floor to the base of the neck will then be measured.

3. Trunk Flexion. (modified sit and reach)

This test consists of the subject sitting on the floor with her legs extended, heels approximately five inches apart, and perpendicular to a measuring line. The subject is then instructed to bob (bounce at the waist) three times and then lean and reach forward with both hands as far across the measuring line as possible. The distance the subject reaches across the line is then measured.

Risks Involved:

Acknowledged_____

Danger: None

Injury: Extremely remote, however, possibility for muscle pulls, strains, sprains or cramps does exist.

Discomfort: Remote, however, muscle soreness could result. Soreness would be temporary in nature.

F. Functional Evaluation

1. The PAE test for women consists of four parts:

(a) throwing a basketball for distance, from a kneeling position.

(b) standing long jump

(c) shuttle run between two lines 25 yards apart, for a total distance of 300 yards.

(d) the flexed arm hang, which consists of hanging from a bar with both hands, chin over the bar, similar to the "up" position of a pullup, for as long as possible before the chin falls below the bar.

Risks Involved:

Danger: None, subject acts as own monitor of physical well-being.

Injury: Although unlikely, muscle pulls, strains, sprains or cramps could result from taking the test.

Acknowledged_____

Discomfort: Muscle soreness, shortness of breath from running or muscle fatigue may result. Fatigue and soreness will be temporary in nature.

2. The 1.5 mile run will be conducted on a timed basis with the subject running a pre-arranged route.

Risks Involved:

Danger: None, subject acts as own monitor of physical well-being.

Injury: Unlikely, however, muscle pulls, strains, sprains, cramps, stone bruises and other injuries normally associated with running are conceivable.

Discomfort: Muscle soreness, fatigue, shortness of breath, headache, or other short term effects from running.

3. Block Shuttle Run: The block shuttle run consists of running for time between two marked lines, approximately 6 yards apart. The subject will run from the starting line to the opposite line and pick up a small wooden block and return it to the starting line, placing it down so that it touches the line. She will continue until all six blocks are touching the starting line. She will then sprint across the finish line.

Risks Involved:

Acknowledged_____

Danger: None, subject acts as own monitor of physical well-being.

Injury: Unlikely, however, muscle pulls, strains, sprains, or cramps could occur.

Discomfort: Muscle soreness, fatigue, shortness of breath, headache, or other short term effects from running.

4. Vertical Jump:

This test consists of the subject leaping vertically as high as possible, from the standing position, and touching a marked board. Prior to the subject actually making the vertical jump, she is asked to stand in front of the marked board and extend her arms overhead as far as possible while remaining flat footed. After executing the test three times, the vertical distance measured standing is subtracted from the vertical distance jumped. The resulting measure indicates the degree of explosive strength in the subject's legs.

Risks Involved:

Danger: None

Injury: Remote likelihood of muscle pulls, strains, sprains, cramping or stone bruises are also a remote possibility.

Discomfort: Muscle soreness of a limited degree, which should diminish rapidly.

Acknowledged_____

Volunteer Agreement

I/we _____ having full capacity to consent, do hereby consent for my/our daughter, _____, to participate in an investigational study entitled: A Comparison of the Effects of Two Types of Physical Training Programs on the Performance of 16-18 Year Old Women under the direction of Dr. James A. Peterson and staff from the U.S. Military Academy and CPT Dennis M. Kowal, Medical Service Corps and staff from the United States Army Research Institute of Environmental Medicine.

(Parent's names)

(Name of Participant)

The implications of her participation; the nature, duration and purpose; the methods and means by which it is to be conducted; and the inconveniences and hazards which may reasonably be expected have been explained to me/us by _____ and are set forth as attachments to this Agreement, each page of which I/we have initialed. I/we have been given an opportunity to ask questions concerning this investigational study, and any such questions have been answered to my/our full and complete satisfaction.

I/we understand that our/my daughter will be given entry and exit physical examinations by U.S. Army medical personnel at no expense to us and that under the provisions of paragraph 4-62 of Army Regulation 40-3, she will be entitled to medical care at government expense for any injury which occurs as a direct result of her participation in this program. I/we likewise understand that our/my daughter may be requested to undergo certain further medical examinations, if in the opinion of the attending physician, such examinations are necessary for her health or well being.

I/we understand and agree to the transportation of my/our daughter to and from a pre-determined pickup site and the research site, West Point, New York, by means of U.S. Army vehicles.

I/we understand that photographs, both still and motion, will be taken of my/our daughter and that these photographs may be used at a later date in a published form. I/we further understand that these photographs will only be taken as a direct result of this investigational study and that at no time will my daughter be specifically identified by name.

I/we understand the voluntary nature of my/our daughter's participation in this study and that I/we/she will not be entitled to any payment for her participation in this study or use of the results thereof.

I/we understand that I/we/she may at any time during the course of the investigational study revoke my/our/her consent, and withdraw the above named participant from the study without prejudice.

Signature	Relationship	Date
Signature	Relationship	Date
Signature	Participant	Date

I was present during the explanation referred to above, as well as the parent's/guardian's and participant's opportunity for questions, and hereby witness their signatures.

Witnesses' Signature	Date

GENERAL RELEASE

(Participation without remuneration)

The United States Government has requested me to grant, release, and discharge to it certain rights (hereinafter more fully set forth) arising from my participation in a particular production (be it a motion picture film, telecast, television recording, or filmstrip) to be made by or produced for the United States Government.

This grant, release, and discharge of said rights to the United States Government is made freely and without expectation of recompense of any kind, in full cognizance of the risks inherent in the operational techniques employed in the production, including, but not limited to, the focusing of lights upon me; and in contemplation of the reliance by the United States Government upon the rights herein granted and release.

I hereby grant and release to the United States Government the following rights:

To use my photograph, likeness, acts, poses, plays, and appearances made in connection with this research project; to reproduce, duplicate, publish, exhibit, use or transmit the same or any parts thereof, by any means, and in any manner consistant with this study; and to use the same perpetually.

This grant, release, and discharge shall inure to the benefit of the United States Government, and its officers, agents, servants, and employees when acting in their official capacities; and to persons, firms, or corporations contracting with Government, and their heirs, executors, administrators, successors, or assigns; and to any other persons lawfully reproducing, distributing, exhibiting, or otherwise using the said production or any portion thereof.

Date: _____ 19___

Production identification: A Comparison of Two Types of Physical Training Programs on the Performance of 16-18 Year Old Women

Witness:

_____
(Signature)

_____
(Typed Name)

_____
(Signature) (Parent/Guardian)

_____
(Typed Name)

_____
(Signature) (Parent/Guardian)

_____
(Typed Name)

_____
(Signature) (Participant)

_____
(Typed Name)

Authorization for Medical Treatment

I/We, the undersigned, am/are the parent(s) of _____

_____ age _____, who is participating as a volunteer subject in a Department of the Army research project.

I/We hereby authorize and give my/our consent to the United States Army Hospital, West Point to conduct a physical examination of my/our daughter prior to and at the conclusion of the research project and to provide medical care as necessary for treatment of injury or disease which is the proximate result of her participation in the project.

_____

Signature (parent or guardian) Date

_____

Signature (parent or guardian) Date

_____

Signature (participant) Date

_____

Signature (witness) Date

DEPARTMENT OF THE ARMY
UNITED STATES MILITARY ACADEMY
WEST POINT, NEW YORK 10996

MACC-P

SUBJECT: Letter of Instruction for Privacy Act Statement

TO: Test Candidate, Project 60, A Comparison of Two Types of Physical Training Programs on the Performance of 16-18 Year Old Women

We would like to take this opportunity to inform you of a new act passed by Congress called the "Privacy Act". The Act contains certain safeguards against possible invasions of your personal privacy. Among other responsibilities, all federal agencies, including the Army, are required to inform individuals from whom information is collected of the purposes for which the information is gathered, how it will be used and their rights, benefits, and obligations with respect to supplying such data. Since many forms will be used in facilitating and documenting your progress during the course of this study, this Privacy Act Statement form has been designed as an all-purpose statement to inform you of the Act and our reasons for requesting the information as well as to reduce the size of the record.

One copy of the form will be provided to you for your reference upon your request and a signed copy will be placed in your record. Your signature on the form signifies only that you acknowledge receipt of this notification as required by law. Information from your record will be made available only for the purposes of this study, medical treatment, and other official purposes as outlined in the statement itself, or upon your specific authorization for release.

FOR THE DIRECTOR OF PHYSICAL EDUCATION:

RONALD E. BOEHME
MAJ, MPC
Admin Officer

Buy and hold U. S. Savings Bonds

DATA REQUIRED BY THE PRIVACY ACT OF 1974
(5 U.S.C. 552a)

TITLE OF FORM	PRESCRIBING DIRECTIVE
Use of Volunteers as Subjects of Research	AR 70-25

1. AUTHORITY
Section 4503 and Section 3012, title 10 US Code; R.S. 3679, as amended; and Section 665 (b), title 31 US Code

2. PRINCIPAL PURPOSE(S) The purpose for requesting and maintaining personal training and testing information is to assist research personnel in developing records to facilitate and document your physical condition in order to provide a basis of comparison between beginning and concluding levels of physical fitness. The SSN is necessary to identify the person and records.

3. ROUTINE USES This information may be used to plan and coordinate health care. It may be used to provide medical treatment; conduct further research; compile statistical data; teach; determine suitability of persons for service; provide basis for determining physical capabilities; highlight physiological differences; identify potential problem areas; evaluate testing and training procedures; verify accuracy of existing physical performance measuring devices; provide a basis for change in physical performance testing publications; compile psychological, interest, and attitude profiles of the test groupings; form a basis for course or curriculum changes; aid in instructor training, development, and evaluation; aid in the expansion of the body of knowledge through publication in books, journals, magazines, and other related literature; provide graphic demonstration of testing and research techniques through the use of still and motion photography; aid in public relations and recruitment through the use of lectures, audiovisual presentations, indoctrinations, orientations, and briefings; aid in injury prevention, care, and treatment; adjudicate claims and determine benefits; evaluate care rendered; provide physical qualifications of test candidates and future cadets; and report medical conditions required by law to federal, state, and local agencies.

I understand that the foregoing one time privacy act statement will apply to all requests for personal information made by research personnel or for medical treatment purposes. I further understand that a copy of this form which I have signed will be placed in my records as evidence of this notification. I have received a copy of this statement which I can retain, and I understand that I can receive additional copies of this statement upon request.

Signature	Relationship	Date
Signature	Relationship	Date
Signature	Participant	Date

4. MANDATORY OR VOLUNTARY DISCLOSURE AND EFFECT ON INDIVIDUAL NOT PROVIDING INFORMATION

In the case of non-approval, the test candidate will not be allowed to participate in the comparison study.

FORM - Privacy Act Statement - 26 Sep 75
DA Form 4368-R, 1 May 75 *(One-Time)*

DATA REQUIRED BY THE PRIVACY ACT OF 1974
(5 U.S.C. 552a)

TITLE OF FORM	PRESCRIBING DIRECTIVE
HEALTH CARE RECORDS	AR 40-403

1. AUTHORITY
Sections 133, 1071-87, 3012, 5031 and 8012, Title 10, U.S. Code and Executive Order 9397.

2. PRINCIPAL PURPOSE(S) The purpose for requesting personal information is to assist medical personnel in developing records to facilitate and document your health condition in order to provide you health care treatment and to provide a complete account of such care rendered, including diagnosis, treatment, and end result. The SSN is necessary to identify the person and records.

3. ROUTINE USES This information may be used to plan and coordinate health care. It may be used to provide medical treatment; conduct research; teach; compile statistical data; determine suitability of persons for service or assignments; implement preventive health and communicative disease control programs; adjudicate claims and determine benefits; evaluate care rendered; determine professional certification and hospital accreditation; conduct authorized investigations; provide physical qualifications of patients to other federal, state and local agencies upon request in the pursuit of their official duties; and report medical conditions required by law to federal, state and local agencies. It may be used for other lawful purposes including law enforcement and litigation.

I understand that the foregoing one time privacy act statement will apply to all requests for personal information made by medical treatment personnel or for medical treatment purposes. I further understand that a copy of this form which I have signed will be placed in my health records as evidence of this notification. I have received a copy of this statement which I can retain, and I understand that I can receive additional copies of this statement from any medical treatment facility upon request.

Signature of parent and date signed (or authorized sponsor or guardian of patient)

Signature and date of participant

4. MANDATORY OR VOLUNTARY DISCLOSURE AND EFFECT ON INDIVIDUAL NOT PROVIDING INFORMATION

In the case of active duty military personnel, disclosure of requested information is mandatory. In the case of all other personnel/beneficiaries, disclosure of requested information is voluntary. If the information is not furnished, optimum medical care may not be possible.

DD FORM 2005-R · Privacy Act Statement - 28 Sep 75

APPENDIX D: Project 60 Reveille Exercise Group Supervisor Notes

Day #1, Monday, 26 January

The girls learned the exercises very easily; no repetition was needed during the teaching phase for them to learn the exercises. This was due in part to an excellent job by the cadets leading the exercises (Mr. Wood and Mr. Quinnones), a relaxed atmosphere, strong motivation by the girls, and the fact that they had access to the exercise charts before they had to learn them.

All girls were able to do the exercises correctly except the push-up and 8 count push-up. Only 3 or 4 out of the 20 could do all 6 repetitions of these 2 exercises correctly.

Day #2, Wednesday, 28 January

Went to the 2 step method of leading the exercises with no difficulties encountered.

Same comment reference pushups.

Twenty girls began the run. The run went very well. The girls who stayed together for the entire run held the formation very well. Ten girls completed the entire run without falling back. Five fell back during the first $4\frac{1}{2}$ laps. Five more (total 10) fell back on second $4\frac{1}{2}$ laps. All girls except one completed all laps. Barbara Zachery sprained her ankle on the 6th or 7th lap and stopped.

Day #3, Thursday, 29 January

Barbara Zachery absent due to sprained ankle.

Margaret Garrigan absent - sick but will make up run.

Exercise performance continues to go well - same comments regarding pushups.

Fourteen girls began run. Three fell back during first $4\frac{1}{2}$ laps - all caught up to begin second $4\frac{1}{2}$ laps. Four fell back but completed the run.

Day #4, Saturday, 31 January

Barbara Zachery fell out on 3rd lap with sprained ankle.

Seventeen began run. Four fell back during first $5\frac{1}{2}$ laps - 3 completed entire distance at slower pace. Patty Raimondo completed $4\frac{1}{2}$ laps (was in menstruation). All began second $5\frac{1}{2}$ laps together. One fell back on 1st lap. Total of five fell back; Patty Raimondo completed only $4\frac{1}{2}$ laps. Brenda Zachery fell out permanently at 7 laps with possible shin splints on

both legs. During third $5\frac{1}{2}$ laps, Phyllis Berghnoff fell out sick (threw up) on 2nd lap; she stopped at this point. Patty Raimondo did not complete this portion of the run either.

A total of 6 girls completed the entire run together without falling back. Two of them after the run raced two of the cadets for a half lap around the track.

Day #5, Monday, 2 February

Exercises went well - same comment regarding pushups. Barbara Zachery fell out (ankle) after 2 laps. Sixteen began run. Eight fell back (including Barbara Zachery) during first $5\frac{1}{2}$ laps. Eight completed the entire run in formation during the second $3\frac{1}{2}$ laps.

Day #6, Tuesday, 3 February

Exercises OK - same comment regarding pushups. Nineteen began run. Three fell back at $2\frac{1}{2}$ laps, two more fell back at 4 laps, Margaret Garrigan stopped due to dizziness at 4 laps, 13 finished together during first $5\frac{1}{2}$ laps. During the second $3\frac{1}{2}$ laps, 15 started, 2 fell back at $\frac{1}{2}$ lap, 2 more fell back at 3 laps, Barbara Zachery left (she had an appointment she was late for).

Day #7, Thursday, 5 February

AP photographer present.

Grass Drills - All did well except bouncing ball (poorly executed). Janet Ruskaweitz did not run because of track meet tonight. Sixteen began run. During first $5\frac{1}{2}$ laps, no one fell back. During second $3\frac{1}{2}$ laps, one fell back; rest finished run together.

Day #8, Saturday, 7 February

Twenty began run. During first $6\frac{1}{2}$ laps, 3 fell out on lap 4, 3 more on lap 5 (Barbara Zachery due to dizziness, menstruation), 13 finished together. During second $6\frac{1}{2}$ laps, 14 began together, 2 fell out on 1st lap, 1 more on 2nd lap, 3 more on 3rd lap, 1 more on 4th lap; 7 finished in formation. During third $6\frac{1}{2}$ laps, Carry Smith stopped and took off shoes due to blisters and ran in socks (completed run). Brenda Zachery fell out due to cramps (menstruation). Six completed total run together in formation. Patty Raimondo only ran 14 laps. Seventeen completed total distance.

Day #9, Monday, 9 February

Cadets were not very enthusiastic; girls performed accordingly. Same comment regarding pushups. Nineteen began run. During first $6\frac{1}{2}$ laps, Barbara Zachery fell out (blisters on toes), Margaret Garrigan fell out (dizziness), Pam Nipper fell back but kept running, Marty Sporbert fell back. During second 3 laps, 8 completed entire run together, Ruskiweitz fell back.

Day #10, Tuesday, 10 February

CBS News here to film for Walter Kronkite news show. Pushups same comment; many are doing them better and more of them but only 2-3 can do all repetitions. Twenty began run. During first $6\frac{1}{2}$ laps, Pam Nipper fell back on 3rd lap, Patty Raimondo fell out on 4th lap (possible shin splints), one more fell out with blisters on 5th lap, 2 more fell back on 5th lap, 13 finished together. During second 3 laps, 12 completed all laps together.

Day #11, Thursday, 12 February

SI reporter here. Patty Raimondo, lower leg stress problems. Began to use "sound off" - worked well. Same comment on pushups. Eighteen began run. Nine completed first $6\frac{1}{2}$ laps together. During second 3 laps, 13 began together and 11 completed together.

Day #12, Saturday, 14 February

Sixteen began run. During first 7 laps, Barbara Zachery tripped on sister and skinned knee and left big toe. Margaret Garrigan was sick and stopped run on 1st lap. On total run 6 girls fell back but finished the distance.

Day #13, Tuesday, 17 February

Excellent. On pushups all but 3 or 4 could do all 10 repetitions. Only 3 or 4 could do 10 repetitions of the 8 count pushup correctly. Seventeen began run. Garrigan, Raimondo, and Zachery did not run - only did exercises. Nancy Combs wrist was sore (an old injury from volleyball). Eight finished the run in formation. The rest fell back but completed the $10\frac{1}{2}$ laps.

Day #14, Wednesday, 18 February

Grass Drill. Nancy Combs' wrist hurt to badly to do the Mountain Climber, Bottoms Up. Garrigan did not run - possible anemia. Pam

Nipper did not run - tendonitis both ankles. Seven completed 10½ laps in formation. Rest completed all laps. Sixteen began run.

Day #15, Thursday, 19 February

Pam Nipper did not run - tedonitis still bothering her. Garrigan began to fall back after 2 laps. Nine completed 8 laps in formation. Carry Smith had her ankle taped but completed total distance. Seventeen began run.

Day #16, Saturday, 21 February

Patty Raimondo - present but did not run. Ran outside today - went well, girls really enjoyed it. Fifteen girls in formation - first mile, 4 fell back. Diana Biscardi completed run on inside track because the cold air hurt her sore throat. After first three minutes three were behind main group. Seven girls completed 30 minute run together - the rest completed entire distance.

Day #17, Monday, 23 February

First day of rifle exercises - wore boots for first time, no run today. Extend to the left - had difficulty holding rifle at arms length - few could do it correctly. First 3-4 exercises - no big problems - this is the 3 step method - and after the first couple of exercises they began to have difficulty holding the rifle out in front of them with arms straight in the rifle forward position. Smaller girls had the most difficulty. One girl had to leave during the exercise for an appointment. Leg and arm forward, many had trouble standing on one leg with the rifle forward.

Day #18, Wednesday, 25 February

Cornwall girls not here. Bus did not show up. Cari Smith had problems holding the rifle up on many exercises. Extend to the left - same problem holding rifle up. Fore up and squat should be ½ squat - many not going down far enough. Running-16 began. First major set back of the program. Not one girl could maintain the pace after the first ½ lap. After 8 laps the girls were strung out all the way around the Track. They were regrouped and ran the final 2 laps fairly well together at a 1:45 per lap pace - much slower than the 1:23 pace scheduled to run. A factor here was their lack of grip strength - it was difficult for them just to hang on to the rifles.

Day #19, Thursday, 26 February

Pam Nipper will not run for one week from tonight. Dr. Petit, hospital orders. Ankle.

Rifle exercises: The last three exercises gave 4 or 5 of the weaker, smaller girls a great deal of difficulty; i.e., they could not complete all 10 repetitions with their arms straight (where required) or could not stay with the cadence of the group.

Run (without rifles): 18 began run. Seven fell back on 2nd lap. On 3rd lap Margaret Garrigan fell out with hyper ventilation. She began running again after she recovered. On 4th lap one fell out with a blister. Five girls completed entire run without falling back. About 8 girls had blisters to be treated. Patty Raimondo commented that the boots were better for her to run in because they seemed to give her legs more support. J. Ruskiewicz fell out several times with side ache.

Day #20, Saturday, 28 February

Eighteen present for run. Ran outside (very windy). Six girls completed entire run without fall out. Brenda Zachery - MEX. Barbara Zachery - blackout at 3/4 mile mark. Was revived with no complications. Pace too fast to begin with - then correct pace established - many girls fell back during first part of run. All girls completed the $3\frac{1}{2}$ miles except Barbara Zachery.

Day #21, Monday, 1 March

Diana Biscardi ran in tennis shoes instead of boots because of blisters. Pam Nipper still MEX from running (ankle). Rifle exercises went well - during the last 3-4 exercises most of the girls had difficulty doing the exercises correctly for all repetitions; i.e., keeping their arms straight (where required) and maintaining the cadence. Run: 17 began. Brenda Zachery fell out with shin pain again. On 5th lap Patty Raimondo (ankles sore from boots - took them off and continued run). On 8th lap, 5 still in group. On 9th lap, 3 still in group. On the 6th and 7th laps Patty Raimondo and Margaret Garrigan fell out again. Only 2 girls completed entire run together. Ten completed total distance required.

Day #22, Tuesday, 2 March

Guerilla Exercises: Pam Nipper had problems with her ankles and had to stop. She has been MEX from running because of ankles anyway. The girls tired quickly but tried hard all the way. Eighteen began run. Five minutes between Guerilla exercises and run was required for treatment

of blisters. Patty Raimondo did not run (legs were hurting badly). Margaret Garrigan fell out after 10 feet with a cramp of the quadriceps area. On lap 1 three girls fell back; on lap 2 seven girls fell back; on lap 3 nine completed together; on lap 5 eight completed together; on lap 6 seven completed together. Seven girls completed entire run together.

Day #23, Thursday, 4 March

Used M-16 rifles today! Ran in tennis shoes (no more boots). All girls completed 12 repetitions of all exercises - even the smallest and weakest could maintain the cadence and keep their arms straight (where required). Run: Nineteen began run with M-16 rifles. On lap 1 all were in group; on lap 2 eight remained in group (7 fell back); on lap 3 slowed to 1:25 pace with only 5 in group; on lap 4 there were four in group; on lap 5 slowed to 1:30 pace with 4 in group; on lap 6-11$\frac{1}{4}$ five completed run together. About 4 girls did not carry the rifles the entire distance but completed the distance with the group that fell back.

General Comments: At this point in the program we have established that the girls cannot run with rifles and maintain the pace used during the summer reveille exercise program. In fact it is extremely difficult for the most athletic among them to carry the rifles (either M-16 or M-14) at any pace for distances in excess of approximately 3/4-1 mile.

Day #24, Saturday, 6 March

Fifteen began run.

Lap	
1-2	All together
3	Pam Nipper fell back
4	Margaret Garrigan fell out
5	13 still in group
6	11 still in group
7-9	10 still in group
10	8 still in group
11-12	7 still in group
13-16	slowed pace to 1:25 per lap, 7 in group

Four completed entire run together: Clare Kirby, Bev Chapman, Donna Hart, Janet Ball. The following girls did not run today: Barbara Zachery, ankle tendonitis; Janes Ruskiewicz, bad cold; Brenda Zachery, lower respiratory problems.

Day #25, Monday, 8 March

Rifle exercises with M-14's (Mrs. Berry observed training). Diane Biscardi had extreme difficulties completing all repetitions as required. Several others had difficulty toward the last few exercises.

Run: Ninteen began run. Eight girls completed the run in formation. Janet Ball, Bev Chapman, S. Cooper, C. Kirby, C. Smith, D. Hart, D. Biscardi, L. Tosolini, and Brenda Zachery fell out with leg problems. Pam Nipper ran very well, her best ever. Patty Raimondo still experienced leg problems. Margaret Garrigan completed run with much difficulty.

Day #26, Tuesday, 9 March

Guerilla Exercises: went well - cadets did a great job of leading exercises.

Run: 18 began Slowed pace to 8:30 - reason: keep more girls in the group - and we also did 4 repetitions of rifle exercises for photographers.

Lap	
1-3	All together
4	Margaret Garrigan fell out
5	Pam Nipper fell back
6-11	11 in group. Total of 10 finished entire run.

Day #28, Friday, 12 March - LAST DAY!

Run only today. Fifteen began. Ran at 8:30 pace to keep more girls in the group. Nancy Combs present but not running - has flu. Barbara and Brenda Zachery absent - both have flu. Barbara also has stress fracture of her fibula. Janet Ball is running with a taped sprained ankle.

Lap	
1-2	OK
3	13 in group
4	12 in group
5-6	11 in group
7-9	10 in group
10-11	9 in group
12-14	7 in group
15-22½	6 in group

Six completed entire run in group without falling back.

APPENDIX E: Psychological Inventories*

Name _____ Unit _____

Date _____ Service Number _____

ATTITUDE QUESTIONNAIRE

Directions. The statements below reflect certain attitudes and interests of persons. Read each statement and decide whether it is true or false as applied to you. Indicate your answer by placing an X through the T (TRUE) or F (FALSE). In some cases you may have difficulty deciding which response is best, but please make some decision and answer every item. Please do not make an attempt to be consistent in your answers during the test, but respond to each item individually. Even if an item asks about things you haven't experienced, answer it as best you can on the basis of what you have heard, seen, or read.

T F 1. I would rather see a play than a movie.

T F 2. I prefer exercising to reading.

T F 3. I generally prefer talking with friends to playing a family table game such as monopoly.

T F 4. I would much rather play softball than go for a ride in a car.

T F 5. Most of my friends work harder than I do.

T F 6. My body is strong and muscular compared to other men my age.

T F 7. I would be interested in learning to play a musical instrument.

T F 8. Most sports require too much time and energy to be worthwhile.

T F 9. I would have made a good accountant.

T F 10. I am in better physical condition than most men my age.

T F 11. The mechanical properties of motors interest me a great deal.

*Because of copyright requirements, two of the psychological inventories used in Project 60 are not included in Appendix E. The self-evaluation questionnaire (STAI Form X-1) is available from the Consulting Psychologists Press, Palo Alto, California. The Eysenck Inventory is available from the Educational and Industrial Testing Service, San Diego, California.

T F 12. On a Sunday afternoon, I would prefer to go to a movie rather than to go on a picnic.

T F 13. I am quite limber and agile compared to others my age.

T F 14. I often stick up for my own point of view even when no one agrees with me.

T F 15. I enjoy people who talk a great deal.

T F 16. I prefer team sports to individual sports because of the experience of playing with different people.

T F 17. I like to be in sports that don't require a great amount of running.

T F 18. I know that my health improves when I exercise.

T F 19. I just don't have the coordination necessary to look like a graceful skier.

T F 20. I prefer woodworking to tinkering with a motor.

T F 21. One of my favorite interests is listening to music.

T F 22. I would enjoy participating in activities such as cross-country skiing, and channel swimming.

T F 23. Music, art, or intellectual pursuits are more refreshing to me than physical activity.

T F 24. I would rather visit an amusement park than watch a tennis match.

T F 25. I like the social opportunities afforded by physical activity programs.

T F 26. I am better coordinated than most people I know.

T F 27. I would enjoy difficult mountain climbing.

T F 28. I love to go to jazz or rock concerts.

T F 29. I don't think that I'd enjoy participating in a judo program.

T F 30. I enjoy the feeling of physical well-being one gets after a day's tramp in the woods.

T F 31. I would rather watch a good movie than a hockey match.

T F 32. I would like to belong to some type of exercise group.

T F 33. I am a good deal stronger than most of my friends.

T F 34. I would rather play poker than softball.

T F 35. Compared to other people I am somewhat clumsy.

T F 36. I enjoy hard physical work.

T F 37. I like to engage in recreational exercise rather than in organized, competitive athletics.

T F 38. I am stronger than a good many of my friends.

T F 39. Most people I know think I have very good physical skills.

T F 40. My friends seem to be more physically active than I do.

T F 41. I would rather walk than run through an open meadow or field.

T F 42. Sports provide me with a welcome escape from the pressures of present-day life.

T F 43. I like the rough and tumble of athletic competition.

T F 44. I prefer to watch an exciting basketball game to playing it myself.

T F 45. I rather enjoy the physical risk involved when I play football.

T F 46. I would enjoy participating in a vigorous weight-lifting program.

T F 47. Long distance running would seem to be an enjoyable activity.

T F 48. I doubt that I could ever get into good physical condition.

T F 49. My legs have as much spring as those of champion high jumpers.

T F 50. I don't enjoy doing things that get me sweaty and dirty.

T F 51. I prefer not to participate in physical activities that involve risk of injury.

T F 52. I would enjoy belonging to a whitewater canoe club.

T F 53. When tensions are high, I prefer to lie down and rest rather than to absorb myself in physical activity.

T F 54. If I wanted to, I could become an excellent tennis player.

T F 55. I enjoy performing gymnastic stunts because of the coordinated movements involved.

T F 56. It makes no difference to me how strong or fit I am.

T F 57. I would like to meet more people engaging in various types of physical activities.

T F 58. After a day at work, I prefer to take it easy instead of participating in vigorous sport activities.

T F 59. It is difficult for me to catch a thrown ball.

T F 60. With a fair amount of practice I could maintain a high bowling average.

T F 61. I enjoy the discipline of long and strenuous physical training.

T F 62. I can run faster than most of my friends.

T F 63. Watching an athletic contest provides a welcome relief from the cares of life.

T F 64. With practice I could become a very good golfer.

T F 65. I have more important things to do than to spend time on developing and maintaining physical fitness.

T F 66. I would rather run in a track meet than play badminton.

T F 67. I could do better at long distance hiking than the average man of my age.

T F 68. I exhibit a fair amount of leadership in a sports situation.

T F 69. I lack confidence in performing physical activities.

T F 70. Even with practice I doubt that I could learn to do a handstand well.

T F 71. Playing tennis appeals to me more than does golfing.

T F 72. I can run longer distances than most men of my age.

T F 73. I'm a natural athlete.

T F 74. The thought of getting sweaty and dirty often keeps me from exercising.

T F 75. I love to run.

T F 76. Getting into good physical shape takes too much effort to be really worth it.

T F 77. I have a strong throwing arm for baseball or softball.

T F 78. Karate competition must be fun.

T F 79. It would very difficult for me to learn to do a back dive.

T F 80. I would prefer to listen to a concert than to watch a gymnastics match.

T F 81. I am well-equipped to excel at physical activities.

T F 82. Being strong and highly fit is not really that important to me.

T F 83. Absorbing myself in a good sport activity provides an escape from the routine of a work day.

T F 84. Even with practice I doubt that I could ever learn to do a cartwheel well.

T F 85. Exercise relieves me of emotional strain.

T F 86. I would play sports more often if I didn't get so tired.

T F 87. I could probably get into good physical condition faster than most men my age.

T F 88. I often doubt my physical abilities.

T F 89. I would rather play touch football than go to an amusement park.

T F 90. Participation in physical activity improves me as a social person.

T F 91. I'm not very good at most physical skills.

T F 92. I enjoy the exhilarated feeling one gets after doing calisthenics.

T F 93. I'm not able to meet many worthwhile people through participation in sports.

T F 94. Poor timing handicaps me in certain physical activities.

T F 95. I am a natural leader in sports activities.

T F 96. I would rather play active sports like soccer and basketball than participate in activities like badminton and softball.

T F 97. I believe it is important that a person belongs to a group that participates in sport activities together.

T F 98. I would rather watch either a baseball or basketball game than visit a museuum or art gallery.

T F 99. Target archery appeals to me more as an activity than does tennis.

T F 100. I believe one of the greatest values of physical activity is the thrill of competition.

Name _____ Unit _____

Date _____ Service Number _____

Directions: We are interested in learning about your physical activity patterns. Please answer the following questions as accurately as possible. Place a circle around the appropriate letter or number for each question.

1. Which of these exercises were you doing on a regular basis prior to your entry into service?

a. None
b. Walk for exercise
c. Ride a bicycle
d. Swim
e. Do calisthenics
f. Jogging (running)
g. Lift weights
h. Taekwondo, karate, or judo
i. Competitive sports (List _____)
j. Other (List _____)

2. How many days per week did you exercise prior to your entry into service?

a. None
b. One
c. Two
d. Three
e. Four
f. Five
g. Six
h. Seven

3. How much time did you spend on exercise each day prior to your entry into service?

a. None
b. Less than 15 minutes
c. 15 to 30 minutes
d. 30 to 45 minutes
e. 45 to 60 minutes
f. 60 to 75 minutes
g. 75 to 90 minutes
h. 90 minutes or more

4. When you exercised select the odd or even number which best described the intensity (how hard) of your workouts.

6		14	
7	Very, very light	15	Hard
8		16	
9	Very light	17	Very hard
10		18	
11	Fairly light	19	Very, very hard
12		20	
13	Somewhat hard		

5. Did you participate in one or more school sports?

a. Yes
b. No

6. If you are a former athlete list the sports you participated in along with the number of varsity letters you earned.

a. High School Sports	(Letters)	b. College Sports	(Letters)
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

7. Did you take physical education or gym classes in,

YES NO Grade School
YES NO Junior High School
YES NO High School
YES NO College

8. Indicate the MAJOR or MAIN reason why you exercised prior to your entry into service (SELECT ONE ANSWER).

a. I do not exercise
b. It makes me feel good
c. I am trying to lose weight
d. It is good for your health
e. I am required to exercise
f. My doctor told me to exercise
g. Other (Explain _____)

9. Prior to your entry into service did you participate in a competitive sport?

a. Yes (List _____)
b. No

10. Have you ever had a physical injury as a result of participating in sports or an exercise program?

a. Yes (Explain _____)
b. No

11. Did your father participate in school sports?

a. Yes
b. No

12. Did you have any older brothers who competed in school parts?

a. Yes
b. No

13. Did your close friends in high school take part in sports?

a. Yes
b. No

Name _____ SSN _____

Date _____

PERSONAL PREFERENCE QUESTIONNAIRE

Read each statement carefully and select, in all cases the statement in each pair that you believe to be most characteristic of yourself; indicate your answer by crossing out the A or B to the left of the statement. Work as quickly as possible.

1. A. I like to be able to say that I have done a difficult job well.
   B. I like to work hard at any job I undertake.

2. A. If I have to take a trip, I like to have things planned in advance.
   B. I like to keep working at a puzzle or problem until it is solved.

3. A. I like to solve puzzles and problems that other people have difficulty with.
   B. I like to follow instructions and to do what is expected of me.

4. A. I sometimes like to do things just to see what effect it will have on others.
   B. I like to stick at a job or problem even when it may seem as if I am not getting anywhere with it.

5. A. I like to be able to do things better than other people can.
   B. I like to tell amusing stories and jokes at parties.

6. A. I like to accomplish tasks that others recognize as requiring skill and effort.
   B. I like to come and go as I want to.

7. A. I like to do things that other people regard as unconventional.
   B. I like to put in long hours of work without being distracted.

8. A. I like to be successful in things undertaken.
   B. I like to form new friendships.

9. A. I like to analyze the feelings and motives of others.
   B. I like to avoid being interrupted while at my work.

10. A. I like to solve puzzles and problems that other people have difficulty with.
    B. I like to judge people by why they do something - not by what they actually do.

11. A. I like to do my very best in whatever I undertake.
    B. I like to help other people who are less fortunate than I am.

12. A. My written work that I do I like to have precise, neat, and well organized.
    B. I would like to be a recognized authority in some job, profession, or field of specialization.

13. A. I like to be able to come and go as I want to.
    B. I like to say that I have done a difficult job well.

PERSONAL PREFERENCE QUESTIONNAIRE (CONT "D)

14. A. I like to work hard at any job I undertake.
    B. I would like to accomplish something of great significance.

15. A. If I do something that is wrong, I feel that I should be punished for it.
    B. I like to stick at a job or problem even when it may seem as if I am not getting anywhere with it.

16. A. I like to stay up late working in order to get a job done.
    B. I like to praise someone I admire.

17. A. I like to be loyal to my friends.
    B. I like to do my very best in whatever I undertake.

18. A. I like to finish any job or task I begin.
    B. I like to keep my things neat and orderly on my desk or workspace.

19. A. I like to complete a single job or task at a time before taking on others.
    B. I like to feel free to do what I want to do.

20. A. I like to help other people who are less fortunate than I am.
    B. I like to finish any job or task that I begin.

21. A. I like to finish any job or task that I begin.
    B. I like to be able to persuade and influence others to do what I want.

22. A. When I have some assignment to do, I like to start in and keep working on it until it is completed.
    B. I like to help other people who are less fortunate than I am.

23. A. I like to help my friends when they are in trouble.
    B. I like to do my very best in whatever I undertake.

24. A. I like to be attractive to persons of the opposite sex.
    B. I like to be successful in things undertaken.

APPENDIX F: A Work-out Sheet for One Strength Group Subject

Day	Exercise									
	Duo-Poly Hip & Back	Leg Press	Leg Extension	Leg Curl	Heel Raise	Bench Press	Lat Pulldown	Triceps Extension	Biceps Curl	Wrist Curl
1	40/12	160/16	60/10	50/10	60/10	50/13	50/11	20/8	17/15	25/13
2	60/13	200/12	60/11	50/10	60/12	55/15	55/12	20/8	22/10	30/10
3	70/11	205/10	65/12	55/9	70/9	65/10	60/8	20/10	22/11	30/10
4	70/16	205/11	70/12	55/10	70/12	55/10	60/10	20/10	22/11	30/15
5	80/9	205/12	75/10	55/10	75/10	65/8	60/12	20/10	25/8	35/12
6	80/10	210/10	75/12	55/13	75/15	65/10	60/11	20/11	25/9	35/13
7	80/10	210/11	80/12	60/11	80/13	65/8	60/11	20/11	25/10	40/10
8	80/7	210/17	85/14	60/G	90/10	65/7	60/11	20/12	25/11	40/12
9	80/12	220*/14	85/15	62.5/10	92.5/12	65/8	62.5/6	20/12	25/14	40/17
10	80/13	225/11	87.5/12	62.5/12	92.5/13	65/10	62.5/8	22.5/8	24.5/8	45/15

APPENDIX F: (Cont.)

Day	Exercise									
	Duo-Poly Hip & Back	Leg Press	Leg Extension	Leg Curl	Heel Raise	Bench Press	Lat Pulldown	Triceps Extension	Biceps Curl	Wrist Curl
11	85/11	225/13	90/12	65/9	100/11	65/10	62.5/10	22.5/8	27.5/8	50/11
12	85/13+	230/13	92½/8+	65/11	105/12+	65/12+	65/8+	22.5/9+	27½/10+	55/7+
13	90/10	235/10	92½/10	67½/8	110/11	70/10	65/8	22.5/9	27.5/10	50/11
14	90/11	235/11	92½/11	67½/9	110/13	70/10	60/9	22.5/10	27.5/11	50/12
15	90/13	235/17	92½/11	67½/9	120/12	70/10	60/11	22.5/10	27.5/11	50/12
16	95/12	240/10	92½/12	67½/9	125/12	70/10	62.5/10	22.5/11	27.5/12	55/10
17	100/12	240/14	95/9	67½/10	130/14	70/12	62.5/12	25/12	30/10	55/10
18	102½/12	245/10	95/10	67½/10	135/12	75/8	65/11	25/17	30/9	55/9
19	102½/13	245/15	95/12	67½/10	140/13	72½/11	65/15	25/13	30/11	55/9
20	105/10	260/12	97½/11	70/9	140/13	75/9	70/13	27½/12	30/11	55/9

APPENDIX G: Project 60 MENSTRUATION QUESTIONNAIRE

NAME:_____

The following answers will be kept strictly confidential.

1. Would you consider your monthly menstruation to be regular?

   YES NO

2. Do you normally experience excessive cramping during menses?

   YES NO

3. Do you normally experience nausea during menses?

   YES NO

4. How would you rate your flow during menses?

   a. Light b. Average c. Heavy

5. Do you require any form of medication during menses?

   YES NO

   If yes, what?

6. What is the average duration of your menses? (actual flow)

   a. 1-3 days b. 3-7 days c. less d. more

7. Do you normally lessen your participation in physical activity during menstruation?

   YES NO

8. Have you noticed any of the following changes in your menses while you have been participating in Project 60?

   a. Spotting prior to or after menses
   b. Heavy flowing
   c. Excessive cramping and discomfort
   d. Excessive nausea
   e. Lessened flowing, cramping, etc.
   f. change in duration of menses - longer or shorter
   g. others, please indicate

APPENDIX H: Project 60 Training Participant's Questionnaire

Name_____ Group: Reveille Exercise_____
Strength Training_____
Control_____

1. In your opinion, what was the level of your physical condition prior to your training?

Excellent_____ Good_____ Fair_____ Poor_____

After training?

Excellent_____ Good_____ Fair_____ Poor_____

2. The training (in general) was:

Too Hard_____ Too Easy_____ About Right_____

3. What activities did you participate in during the training which might have affected the results you achieved? Please list! (e.g., basketball, volleyball, riding club, etc.)

4. During the training, did you do any running on your own (other than being on an athletic team)? YES_____ NO_____

STRENGTH TRAINING GROUP ONLY

5. How effective do you feel the cadet supervisors were pushing you to do your best?

Very_____ So-So_____ Could have been better____

6. Which type of equipment did you feel was most effective for you?

Nautilus_____ Universal_____ Free Weights_____

7. If you had been pushed harder, do you feel it might have made a difference in your results? YES_____ NO_____ DON'T KNOW_____

APPENDIX H: (cont'd)

REVEILLE EXERCISE GROUP ONLY

8. What is your opinion of the degree of difficulty of the aspects of training? Please rate (1-5) with 1 the easiest and 5 the most difficult!

_____ Conditioning Exercises
_____ Rifle Exercises
_____ Guerilla Exercises
_____ Grass Drill
_____ Running

9. What lower leg problems did you experience during the training?

_____ Tendonitis
_____ Sprain
_____ Blisters
_____ Shin Splints

10. Were your lower leg problems aggravated_____ or caused_____ (check one) by the wearing of boots?

11. How much did you wear the boots prior to the training?

_____ More than 20 hours
_____ More than 10 hours
_____ More than 5 hours
_____ Less than 5 hours
_____ Not at all

12. Given your training, how many hours do you feel the boots should be worn (at a minimum) to properly break them in?

_____ # hours

13. Why did you volunteer to take part in this program? (check 1 or more)

_____ Challenge
_____ Conditioning
_____ Curiosity
_____ "Womanhood"

14. Do you feel that you benefitted from your participation in the program?
YES_____ NO_____ In what way? (brief statement)

APPENDIX H: (cont'd)

15. If you were to change part of the program you participated in, what part would you change and how? (brief statement)

APPENDIX I : Project 60 Cadet Supervisor Questionnaire

Name_____ Company_____

Group: (check one) Strength_____ Reveille_____

Q 1-4 should be answered by everyone.
Q 5-11 should be answered by those cadets involved with the strength training.
Q 12-14 should be answered by those cadets involved with the reveille exercise group.

1. Do you feel that the Project 60 training (your group) participated in was: too hard_____ too easy_____ about right_____ for the girls?

2. In your opinion did the women make significant progress in raising their level of physical fitness as a result of the training?

YES____ NO____ NO OPINION_____

3. How do you feel the girls performed in the training overall?

_____ better than you expected
_____ about the way you expected
_____ not as good as you expected

4. Do you think that the majority of the cadet supervisors approached their responsibilities with a commendable degree of motivation and individual enthusiasm? YES_____ NO_____

5. How could have the overall effectiveness of the strength training program been improved?

6. What suggestions do you have that would increase the effectiveness of a strength development program for women, that might differ from a strength development program for men.

7. Taking into consideration the overall situation of the Project 60 subjects, could your subject have trained any harder? YES_____ NO____

8. If your subject had been a female cadet, would you have pushed her through her workouts any harder? YES_____ NO_____

APPENDIX I : (cont'd)

9. Did your subject complain regularly of the intensity of the exercise (was it too difficult)? YES_____ NO_____

10. Did the OPE supervisors contribute to the efficiency of the program?

11. What problems do you anticipate for women cadets who must initiate and continue strength development programs to increase their level of strength (throughout their four years at West Point)?

12. What is your recommendation with regard to running with rifles for women during CBT?

_____ Have them to rifle exercises with their assigned company and run with rifles in a separate group (women only) at a much slower pace so they could complete the distance required.

_____ Have them do rifle exercises with their assigned company and then run with their company but without the rifles.

_____ Don't do rifle exercises at all this summer, then we don't have the problem of who runs with or without rifles.

_____ Have them do rifle exercises with and run with their assigned company with rifles.

_____ Use the aforementioned option only with M-16's instead of M-14's.

_____ Have the women separate out into a women's company for the rifle-exercises-part of the training program, do conditioning exercises, and run without rifles.

13. If you were to modify the physical training reveille exercise program for Cadet Basic Training for this coming summer, how would you change it?

14. How can the cadet cadre become better prepared to monitor women cadets during the CBT reveille exercise program?