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REPORT NO. T3/85

RELATIONSHIP BETWEEN THE ARMY TWO MILE RUN TEST AND MAXIMAL OXYGEN UPTAKE

AD-A153 914

US ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE
Natick, Massachusetts

DECEMBER 1984

UNITED STATES ARMY
MEDICAL RESEARCH & DEVELOPMENT COMMAND

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER T3/85	2. GOVT ACCESSION NO. AD-A153 914	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Relationship Between the Army Two Mile Run Test and Maximal Oxygen Uptake		5. TYPE OF REPORT & PERIOD COVERED
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Robert P. Mello, M.S., Michelle M. Murphy, B.S. and James A. Vogel, Ph. D.		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 3E162777A879 WU: 123
11. CONTROLLING OFFICE NAME AND ADDRESS US Army Medical Research and Development Command Fort Detrick Frederick, MD 21701-5012		12. REPORT DATE 29
		13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) US Army Research Institute of Environmental Medicine Natick, MA 01760-5007		15. SECURITY CLASS. (of this report)
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

DISTRIBUTION UNLIMITED.

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Maximal O_2 uptake, Aerobic fitness, Running performance, Predicted aerobic capacity.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

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TECHNICAL REPORT

NO. T3/85

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James A.Vogel, Ph.D.

Project References: 3E162777A879

Study Reference: PH-5-81

Dec 1984

U.S. ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE

NATICK, MA 01760

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ABSTRACT

Forty-four male (aged 20-51) and seventeen female (aged 20-37) subjects of various fitness and activity levels were evaluated on a two mile run for time and on a treadmill for maximal oxygen consumption ($\dot{V}O_2$ max). The coefficient of correlation between the treadmill maximal test and the two mile run test for all subjects was -0.91. Separate regression analyses for male and female data also displayed significant correlations (r_m = -0.91, r_f = -0.89). Stepwise multiple regression analysis of such anthropometric variables as age, height, weight, and % body fat demonstrated that, individually, none of these parameters significantly improved the predictability of both the male and female equations. However, inclusion of body wieght in the male equation did improve the predictive accuracy (SEE = 3.31 to 2.69). The high degree of correlation demonstrated between $\dot{V}O_2$ max and two mile run time thus permits the estimation of either component with significant accuracy from the direct measurement of the other. This study confirms the usefulness and validity of the Army's 2 mile run for time test to indicate the level of aerobic fitness capacity when the test is properly supervised and the subjects are well-motivated.

Key Words: Maximal O_2 uptake, Aerobic fitness, Running performance, Predicted aerobic capacity

INTRODUCTION

The U.S. Army recently selected the two mile run for time as its primary predictor of aerobic fitness, i.e. capacity for prolonged, whole body mobility. The basis for this decision is the generally held belief that a timed run of one to two miles, emphasizing individual effort, correlates reasonably well with a person's aerobic fitness as determined by maximal oxygen uptake ($\dot{V}O_2$max). A review of the literature does indicate many studies (2,3,4,5,6,7,10,12,14,15,19) comparing $\dot{V}O_2$max with a variety of field performance tests. These studies most often involved a relatively short, timed run of a specific distance (2,3,7,16,17,20), or an unlimited distance run for a specifically set time, e.g. 12 min (3,5,7.10,12). We have, however, found few reports of actual comparisons of a two mile run for time with treadmill $\dot{V}O_2$ max in a heterogeneous, i.e. gender, age, and fitness level, subject population.

The purpose of this study was to examine the relationship between a two mile run for time and $\dot{V}O_2$max as measured by treadmill running (9,11,13,18) in a group of men and women of various fitness and activity levels. Important aspects such as gender, age, height, weight, % body fat, and relative fitness levels were also evaluated. From this data base, a simple regression equation was developed to predict the maximal aerobic capacity of both men and women from their biannual Army Physical Readiness Test (APRT) 2 mile run times.

METHODS

A group of sixty-one volunteer test subjects consisting of 44 males and 17 females, ranging in age from 22 to 51, participated in this study. All subjects were asked to perform two basic tests within fifteen days of each other: a timed 2-mile run on a measured, level, asphalt surface, and a treadmill determination of VO_2max (11,13) using the Douglas bag technique (1,13,19). The treadmill test was patterned on the methods described by Taylor et al (19) and Mitchell et al (13), and involved the use of interrupted runs at a constant speed with progressively increasing grades in order to achieve a plateau in oxygen consumption. The test began with a 3.5 mph familiarization walk at 0% grade for approximately 3 minutes. During this time, the Koegel breathing valve and noseclip were presented to the subject and the Douglas bag system was flushed. The test then proceeded with an initial warmup run of 5 or 6 mph at 0% grade for 6 minutes, immediately followed by a 5 to 10 minute rest period. Upon evaluation of the initial warmup load the speed of the treadmill remained constant but the intensity was progressively increased by raising the grade of the treadmill (2.0 - 2.5%) with each successive bout. Two to four additional runs were then performed, each 3 to 4 minutes long and interrupted by rest periods. During the last minute of each session, the subject breathed through a low resistance Koegel value while two 30 second Douglas bags of expired air were collected. At maximal intensity, three 20 second bag collections were taken during the last minute. A plateau, or decrease, in oxygen uptake with increasing exercise intensity was considered indicative of achieving $\dot{V}O_2max$. A plateau was defined as an increase of less than 2.0 ml/kg/min with an increase of 2.5% grade through two successive intensities.

Gas volumes were measured by a Collins 120 liter chain-compensated spirometer. Aliquots of expired air were analyzed for oxygen and carbon dioxide fractions with an Applied Electrochemistry fuel cell (MDL S-3A) and a Beckman LB-2 infrared carbon dioxide analyzer, respectively. Both gas analyzers were calibrated using primary certified gas standards (Matheson Gas Company, Gloucester, MA) which were checked for accuracy against our own Scholandered cylinders and daily outside air analyses. Heart rate was monitored using a modified V_5 electrocardiographic recording. Additional measurements made on each subject included height, weight, and skinfold thicknesses. Percent body fat (%BF) was estimated from four skinfold sites (bicep, tricep, subscapular and suprailiac) using the age and gender related equations of Durnin and Womersley (8). Each subject also completed an activity questionnaire listing the type, frequency and duration of any regular physical exercise.

The two mile run test was performed outdoors on a level, paved surface and was conducted as part of the regular biannual Army Physical Readiness Test (APRT). The subjects ran in shorts and running shoes. Each subject was asked to exert a maximal effort in covering the distance in the shortest possible time which was recorded to the nearest second by digital stopwatches. Civilian subjects ran the same APRT course in smaller groups of three to six persons, also within fifteen days of completing a maximal treadmill running test.

DESIGN

For the purposes of this study, two groups of volunteers comprised the subject pool. One group consisted of 45 military personnel (37 males and 8 females) who participated in the APRT. The other group was composed of 16 civilian laboratory staff (7 males and 9 females), the majority of whom were active recreational joggers. All military personnel had a directed medical history and a complete review of their medical records. A physical examination, if necessary, was performed. In the case of civilian subject, a directed medical history was taken and a physical examination was given. All subjects above the age of 40, sedentary volunteers between the ages of 35-40, and any individual under the age of 35 previously selected for additional evaluation based on the medical screening, underwent a resting, 12-lead, electrocardiogram, and a cardiac exercise stress test. This test utilized a walking (3.3mph) multi-graded, protocol terminating at the point of maximal exertion or symptomatic onset. Throughout the test and recovery phase, the subject's heartrate and blood pressure were continously monitored and displayed by means of a computer-assisted 12-lead EKG (Marquette Case System).

The military subjects performed a maximal treadmill running test (11,13) within fifteen days of their APRT. The civilians performed a 2-mile run for time (APRT course) within fifteen days of their maximal treadmill running test. Both groups performed the treadmill test and the 2-mile run in PT clothes and running shoes. All subjects were urged to provide a maximal effort in performing both tests to the best of their individual abilities. The two groups of subjects were combined for statistical analyses.

In order to determine the effects of gender on $\dot{V}O_2$max and two mile run time,a t-test comparing male and female regression coefficients was completed on all performance data (19). The existence of separate gender regression lines was confirmed. Simple male and female regression equations ($\dot{V}O_2max$ vs 2-mile time) were developed and t-tests and confidence limits determined on the two separate slopes. The final prediction equations were then developed through stepwise, multiple regression analysis to determine if the estimation of $\dot{V}O_2max$ from 2-mile run time might be improved through the incorporation of such anthropometric variables as age, %BF, Ht, Wt.

RESULTS

Tables 1 and 2 present the physical characteristics and performance results, by gender, for all subjects (n=61). Table 1 lists the means and standard deviations for all major variables while Table 2 depicts the relationship of gender and age to $\dot{V}O_2max$ and 2-mile run time.

These two tables (1 and 2) summarize the principal parameters used in the development of the regression equations presented in this study. When compared to previously reported values for individuals of a similar age, body composition, and aerobic fitness, it is evident that these subjects possessed average levels of aerobic capacity.

Separate examination of the male and female data on the relationship between $\dot{V}O_2max$ and 2-mile run time resulted in correlation coefficients of -0.91 and -0.89, respectively (Figure 1). Regression analysis of the entire sample (male plus female) resulted in a correlation coefficient of -0.91. The slopes of the regression lines between genders were also found to be significantly different ($p < .001$). Comparision of males and females by independent t-test for the variables $\dot{V}O_2max$ and 2-mile run time resulted in significantly different values for both ($\dot{V}O_2max$: $t = 3.986$, $p<.001$; 2-mile run time: $t= 3.953$, $p<.001$). For this reason separate prediction equations of $\dot{V}O_2max$ based on 2 mile-run times were developed for each gender. For easy reference, Annex A presents the equivalent $\dot{V}O_2max$ values for 2 mile run times in increments of 0.1 minutes.

Figures 2 and 3 describe the relationship between actual and predicted $\dot{V}O_2max$ (by 2 mile run time) for male and female subjects, respectively. The relationship for both was highly significant ($p<.001$).

Figures 4 and 5 present the relationship between $\dot{V}O_2max$ as determined on the treadmill and running speed as measured during the performance of the

TABLE 1 Physical Characteristics and Performance Results by Gender ($\bar{x} \pm SD$)

Variable	Male (n=44)	Female (n=17)
Age(yrs)	31.3 ± 6.9	28.3 ± 4.0
Height(cm)	177.2 ± 6.3	165.3 ± 5.9
Weight(kg)	77.9 ± 9.2	60.9 ± 7.7
Body Fat (%)	18.3 ± 4.5	26.5 ± 4.1
Lean Body Mass (kg)	63.9 ± 6.3	44.5 ± 4.9
$\dot{V}O_2max$ (ml/kg/min)	50.4 ± 7.7	42.0 ± 6.0
2-Mile Time(min:sec)	14:44 ± 2:06	17:26 ± 3:01

TABLE 2. Relationship of Gender and Age to $\dot{V}O_2$ max, and 2-Mile Run Time

Age	Gender	n	$\dot{V}O_2max$	2-Mile Time
20-24	Male	9	54.1 ± 5.5	13:53 ± 1:32
	Female	4	43.4 ± 4.6	16:52 ± 2:28
25-29	Male	10	49.9 ± 4.8	14:49 ± 1.23
	Female	7	42.1 ± 6.5	17:15 ± 3:00
30-34	Male	14*	51.6 ±10.6	14:33 ± 3:04
	Female	4	42.1 ± 7.1	17:55 ± 3:22
35-39	Male	5	46.7 ± 7.3	15:42 ± 1:30
	Female	2	39.0 ± 8.8	18:14 ± 6:01
Over 40	Male	6	46.0 ± 5.1	15:25 ± 1:06

*Four Marathon Runners in this group.

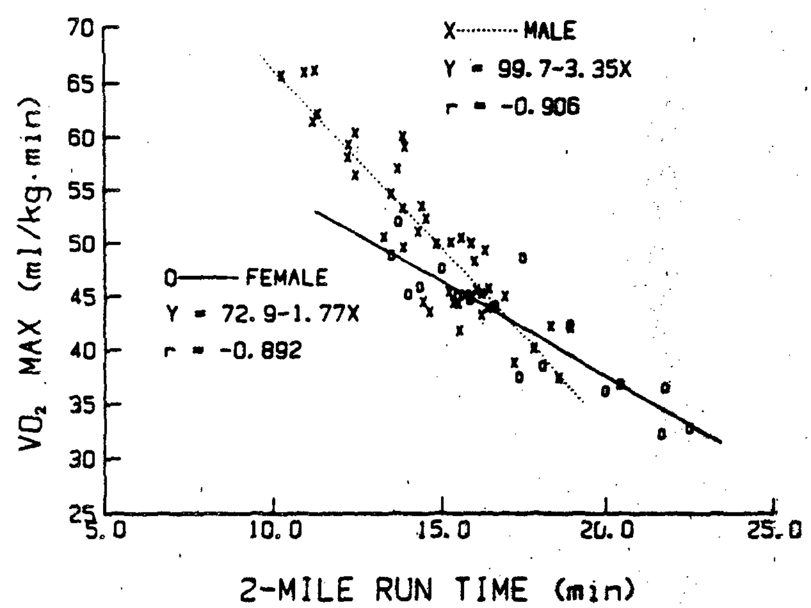

Figure 1. Relationship of $\dot{V}O_2$max to 2-Mile Run Time (males and females.

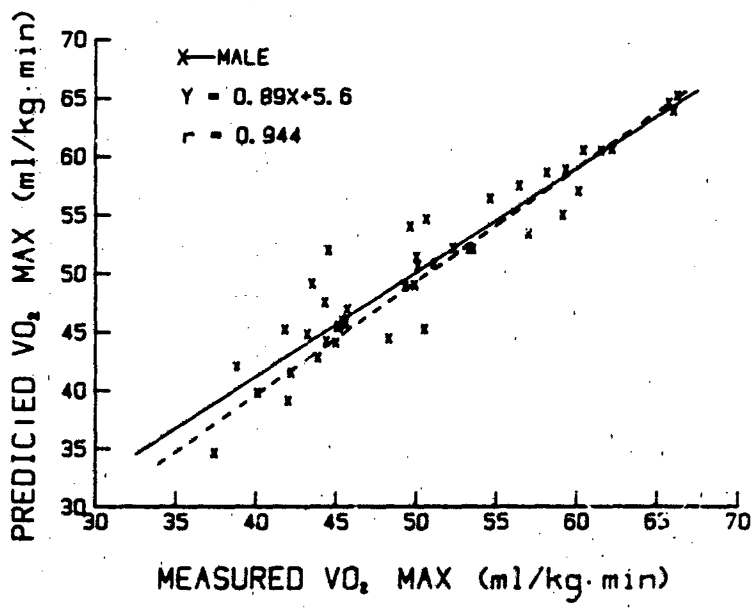

Figure 2. Relationship between actual and predicted VO_2max in males. Dashed line indicates line of identity.

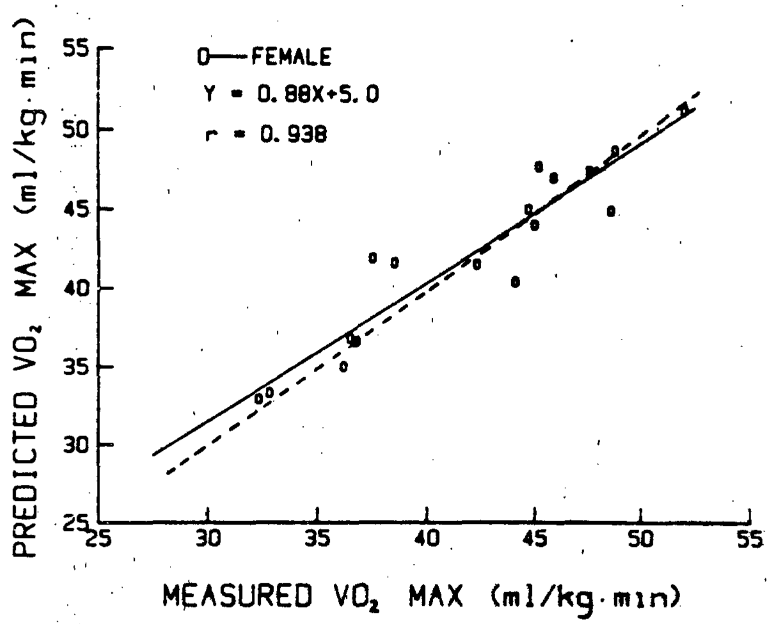

Figure 3. Relationship between actual and predicted $\dot{V}O_2$max in females. Dashed line indicates line of identity.

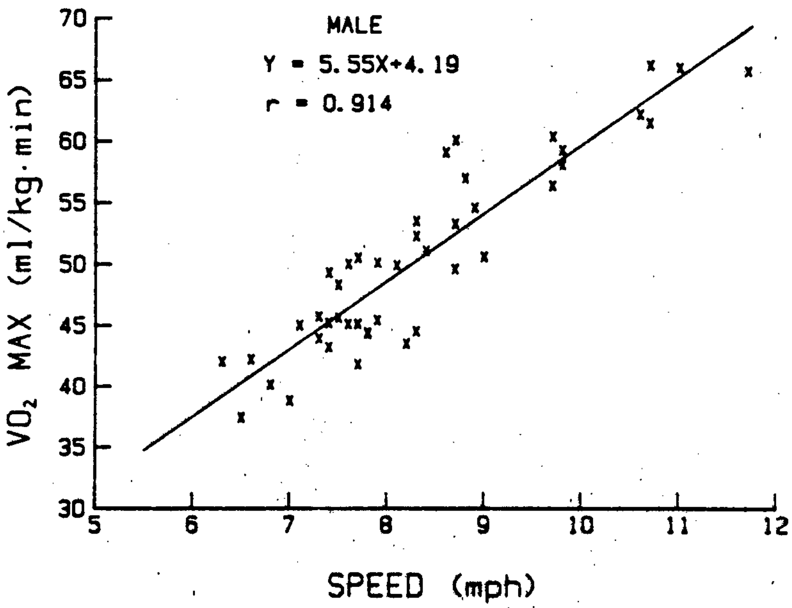

Figure 4. Relationship between VO_2max and running speed in males.

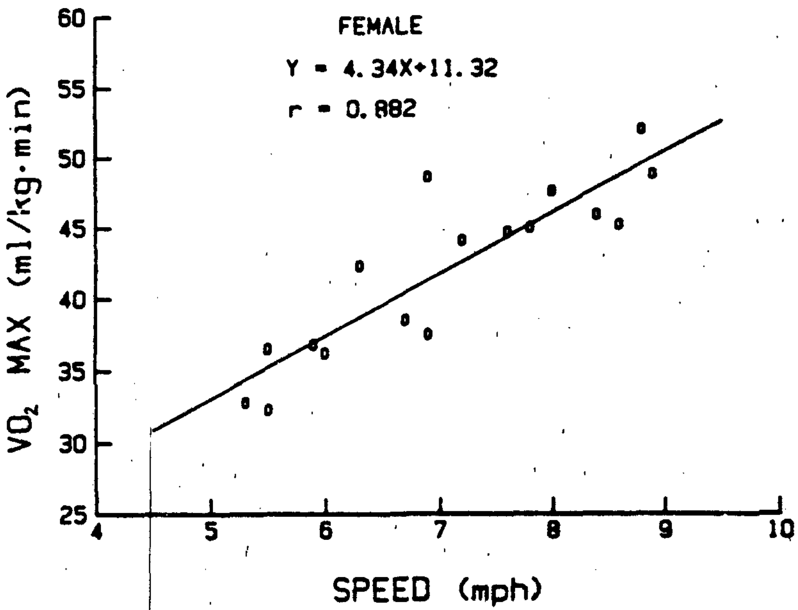

Figure 5. Relationship between VO_2max and running speed in Females.

2-mile run in both male and female subjects, respectively. Significant r values of 0.91 for the males and 0.88 for the females were found between these two variables.

Tables 3 and 4 present a correlation matrix of the individual variables tested to improve the predictive power of the original equations through a stepwise multiple regression procedure. The highest correlation in both tables was by the relationship of $\dot{V}O_2$max and 2-mile run time. Other significant relationships ($p<.05$) occurred in the male matrix between $\dot{V}O_2$max and body weight, % body fat and Ht/Wt ratio. These same anthropometric measures were also significantly correlated with 2 mile-run time. These relationships, however, did not hold true for the female matrix.

Both the original male and female regression equations and the multiple regression equation for males are presented in Table 5. The first two equations describe the simple linear regression of $\dot{V}O_2$max and 2-mile run time (r_m =-0.91, r_f = -0.89). The third equation, developed through a stepwise multiple regression of the variables in Table 3, resulted in a more accurate expression by including body weight (r = -0.941) to predict $\dot{V}O_2$max, thus resulting in an improvement in the accuracy of the estimate (S.E.E. from 3.31 to 2.69 ml/kg).

Table 6 presents male data comparing $\dot{V}O_2$max as predicted from equations 1 and 3 of Table 5 to $\dot{V}O_2$max determined directly on the treadmill for individuals who possessed the highest and lowest values for various anthropometric measures, aerobic power, and performance times. It can be seen that in 7 of the 11 categories $\dot{V}O_2$max as predicted using equation 3 was closer to the directly measured value of $\dot{V}O_2$max than that using equation 1.

DISCUSSION

For the purposes of this study, data analysis and predictive equation development proceeded along gender lines. Analysis of male and female data (Figure 1) demonstrated distinctly different regression lines. As such, individual regression equations were developed for each gender taking into consideration those variables which were significantly different for each gender and exerted any influence on the observed relationship ($\dot{V}O_2$max vs 2-mile time). Johnson et al (12), had previously documented the need for a

TABLE 3. Correlation Matrix for Males

VARIABLE	1	2	3	4	5	6	7	8
1. $\dot{V}O_2$max(ml/kg.min)	1.00	-.91	-.23	-.68	-.28	-.69	-.70	-.40
2. 2-Mile Run(min)		1.00	.18	.51	.21	.60	.53	.23
3. Age(yrs)			1.00	.19	.29	.43	.11	-.01
4. Weight(kg)				1.00	.60	.62	.96	.84
5. Height(cm)					1.00	.20	.35	.63
6. % Body Fat						1.00	.65	.15
7. Wt/Ht(kg/m)							1.00	.77
8. LBM(kg)								1.00

TABLE 4. Correlation Matrix for Females

VARIABLE	1	2	3	4	5	6	7	8
1. $\dot{V}O_2$max(ml/kg.min)	1.00	-.89	-.16	-.24	-.24	-.22	-.21	-.20
2. 2-Mile Run(min)		1.00	.10	.23	-.02	.35	.28	.11
3. Age(yrs)			1.00	-.06	-.33	.24	.04	-.17
4. Weight(kg)				1.00	.53	.47	.96	.89
5. Height(cm)					1.00	-.22	.28	.74
6. % Body Fat						1.00	.60	.03
7. Wt/Ht(kg/m)							1.00	.77
8. LBM(kg)								1.00

TABLE 5. Equations for the Prediction of $\dot{V}O_2$max from 2-Mile Run Time

<u>Equation 1: Male Run Time Only</u>

Pred.$\dot{V}O_2$max = 99.7 - 3.35 x

x = 2 Mile Run Time(min)

r = -0.906

r^2 = 0.821

SEE = 3.31

<u>Equation 2: Female Run Time Only</u>

Pred.$\dot{V}O_2$max = 72.9 - 1.77 x

x = 2 Mile Run Time(min)

r_2 = -0.892

r = 0.796

SEE = 2.78

<u>Equation 3: Male Run Time + Weight</u>

Pred.$\dot{V}O_2$max = 110.9 - 2.79x_1 - 0.25x_2

x_1 = 2 Mile Run Time(min)

X_2 = Wt(kg)

r_2 = -0.941

r = 0.885

SEE = 2.69

TABLE 6. Equation Comparison ($\dot{V}O_2max$ = ml/kg/min)

INDIVIDUAL	DIRECT $\dot{V}O_2max$	PREDICTED $\dot{V}O_2max$ Equation 1	PREDICTED $\dot{V}O_2max$ Equation 3	BEST PREDICTIVE EQUATION
Highest $\dot{V}O_2max$	66.1	63.2	63.4	-
Lowest $\dot{V}O_2max$	37.4	37.8	34.5	1
Fastest 2-mile(10:15)	65.7	65.4	64.1	1
Slowest 2-mile(18:56)	42.0	36.4	38.9	3
Heaviest Weight	37.4	37.8	34.5	1
Lightest Weight	56.0	62.1	65.0	3
Highest % BF	38.8	42.3	41.7	3
Lowest % BF	58.1	58.9	58.4	3
Highest LBM	44.4	48.5	44.4	3
High $\dot{V}O_2max$/Slow Run Time	60.1	53.5	56.2	3
Low $\dot{V}O_2max$/Fast Run Time	41.8	47.8	45.0	3

prediction model which recognized the separate performance characteristics of both men and women. A dual approach such as this would also serve the purposes of the U.S. Army since current APRT scores are based on two entirely different sets of standards for males and females.

Data from this study describe the relationship that exists between a laboratory determination of maximal oxygen uptake and a field event of sufficient duration to allow energy production to occur through aerobic rather than anaerobic pathways. This is in agreement with other studies (2,3,5,10,14,15) which reported similar results. The majority of subjects participating in this study (75%) were part of the permanently assigned military personnel of USARIEM. As such, they were required to participate in the biannual APRT which included pushups, situps, and a timed 2-mile run. The relationship between aerobic fitness and 2-mile run time from this study demonstrates that $\dot{V}O_2max$ levels and running ability for males were better than those of their female counterparts (Table 2). This occurred in spite of the fact that more than half of the females tested (9 of 17) were active joggers who ran two or more miles, three or more times weekly. Table 2 also illustrated an age-related phenomenon common to both men and women, i.e., decreasing $\dot{V}O_2max$ values with correspondingly higher 2 mile run times.

Analysis of data from this study describes the relationship that exists between $\dot{V}O_2max$ and 2-mile run time. Nearly 82% of the total variance of the 2-mile run times was accounted for by VO_2max. Cooper (5), Getchell (10), and Ribisl (15) also reported correlations of this magnitude, but in subject populations which were much more homogeneous in nature. Table 5 presents the prediction equations for both genders, based primarily on the strength of the relationship between $\dot{V}O_2max$ and 2-mile run time (r_m = -0.906, SEE = 3.31: r_f = -0.892, SEE = 2.78). For the sake of simplicity, it would be possible to use only the first two equations for the prediction of $\dot{V}O_2max$ and still have a very good relationship (Table 6). The standard error of the estimate for both equations is approximately 3.0 ml O_2/kg/min, thus permitting a reasonably accurate estimate of aerobic capacity. Equivalent $\dot{V}O_2max$ values and 2 mile run times are found in Annex A.

However, the addition of other variables such as height, weight and % body fat, to the original equation did improve the error of the estimate. In the male expression (Equation 1), the addition of Wt alone improved the shared variance from 82 to 89%. Conversely, for the female expression (Equation 2), the addition of the Ht variable improved the amount of the shared variance from 80 to 86%. However, for purposes of developing a simple prediction equation, an effort was made to discover one common variable for both men and women which when added to the basic equation using 2-mile time would significantly improve the predictability of both equations. It was found that body weight was the single most significant variable (after 2-mile run time) which accounted for most of the remaining variance. Body weight (BW) was then incorporated into the regression equations for both sexes. Addition of body weight to equation 1 did improve the standard error of the estimate from 3.31 ml/kg/min to 2.69 ml/kg/min. However, inclusion of body weight in equation 2 resulted in no measurable difference to the S.E.E. of this expression. It is the authors' opinion that the smaller sample size (N=17 females) used to derive equation 2 may have adversely affected any improvement body weight might have produced to the S.E.E. of this expression. Equation 3 is included in Table 5 because of its improved predictive accuracy, and because the majority of personnel presently serving in the U.S. Army are male.

Table 6 evaluates the two main predictive models, i.e., equation 1 and 3, with actual subject data spanning the widest range of anthropometric, physiological, and performance characteristics observed in the study. The predictive improvement of the regression expression with the inclusion of body weight is clearly seen from this table. In seven of elevan instances, the estimation of $\dot{V}O_2max$ was improved by the use of body weight. This improvement occurred equally over the entire range of values, including instances where the estimated $\dot{V}O_2max$ figure was both above and below the actual treadmill $\dot{V}O_2max$ determination.

CONCLUSIONS

Based on the data collected in the present study, the following conclusions were drawn:

1) Significant correlations (r_m = -0.91, r_f = -0.89) were found between 2-mile run time and maximal aerobic capacity for males and females, respectively.

2) Separate prediction equations should be developed for each gender due to the nature of the respective performance results.

3) Inclusion of anthropometric variables (Wt, Wt/Ht, %BF) improved the predictive power of the original regression relationship in males but not females.

4) The Army's 2 mile run for time test validly estimates the level of aerobic fitness capacity as represented by $\dot{V}O_2max$ when the run test is properly supervised and the subjects are well-motivated. Conversion tables are presented (Annex A).

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ACKNOWLEDGMENT

The authors wish to express their appreciation to Major Bruce H. Jones, Dr. John F. Patton, III and Specialist Five Frank R. Frederick of the Exercise Physiology Division of USARIEM. Major Jones' dedication as test subject medical consultant, Dr. Patton's critique of the manuscript and Specialist Frederick's contribution in the collection and organization of the data were invaluable to the successful completion of this study.

ANNEX A

Two mile run time to $\dot{V}O_2max$ Conversion Tables

2-mile run time*	$\dot{V}O_2max$#		2 mile run time*	$\dot{V}O_2max$#		2 mile run time	$\dot{V}O_2max$#	
	male	female		male	female		male	female
10.0	66.20	55.20	15.0	49.45	46.35	20.0	32.70	37.50
10.1	65.86	55.02	15.1	49.11	46.17	20.1	32.36	37.32
10.2	65.53	54.85	15.2	48.78	46.00	20.2	32.03	37.15
10.3	65.1	54.67	15.3	48.44	45.82	20.3	31.69	36.97
10.4	64.86	54.49	15.4	48.11	45.64	20.4	31.36	36.79
10.5	64.52	54.31	15.5	47.77	45.46	20.5	31.02	36.61
10.6	64.19	54.14	15.6	47.44	45.29	20.6	30.69	36.44
10.7	63.85	53.96	15.7	47.10	45.11	20.7	30.35	36.26
10.8	63.52	53.78	15.8	46.77	44.93	20.8	30.02	36.08
10.9	63.18	53.61	15.9	46.43	44.76	20.9	29.68	35.91
11.0	62.85	53.43	16.0	46.10	44.58	21.0	29.35	35.73
11.1	62.51	53.25	16.1	45.76	44.40	21.1	29.01	35.55
11.2	62.18	53.08	16.2	45.43	44.23	21.2	28.68	35.38
11.3	61.84	52.90	16.3	45.09	44.05	21.3	28.34	35.20
11.4	61.51	52.72	16.4	44.76	43.87	21.4	28.01	35.02
11.5	61.17	52.54	16.5	44.42	43.69	21.5	27.67	34.84
11.6	60.84	52.37	16.6	44.09	43.52	21.6	27.34	34.67
11.7	60.50	52.19	16.7	43.75	43.34	21.7	27.00	34.49
11.8	60.17	52.01	16.8	43.42	43.16	21.8	26.67	34.31
11.9	59.83	51.84	16.9	43.08	42.99	21.9	26.33	34.14
12.0	59.50	51.66	17.0	42.75	42.81	22.0	26.00	33.96
12.1	59.16	51.48	17.1	42.41	42.63	22.1	25.66	33.78
12.2	58.83	51.31	17.2	42.08	42.46	22.2	25.33	33.61
12.3	58.49	51.13	17.3	41.74	42.28	22.3	24.99	33.43
12.4	58.16	50.95	17.4	41.41	42.10	22.4	24.66	33.25
12.5	57.82	50.77	17.5	41.07	41.92	22.5	24.32	33.07
12.6	57.49	50.60	17.6	40.74	41.75	22.6	23.99	32.90
12.7	57.15	50.42	17.7	40.40	41.57	22.7	23.65	32.72
12.8	56.82	50.24	17.8	40.07	41.39	22.8	23.32	32.54
12.9	56.48	50.07	17.9	39.73	41.22	22.9	22.98	32.37
13.0	56.15	49.89	18.0	39.40	41.04	23.0	22.65	32.19
13.1	55.81	49.71	18.1	39.06	40.86	23.1	22.31	32.01
13.2	55.48	49.54	18.2	38.73	40.69	23.2	21.98	31.84
13.3	55.14	49.36	18.3	38.39	40.51	23.3	21.64	31.66
13.4	54.81	49.18	18.4	38.06	40.33	23.4	21.31	31.48
13.5	54.47	49.00	18.5	37.72	40.15	23.5	20.97	31.30
13.6	54.14	48.83	18.6	37.39	39.98	23.6	20.64	31.13
13.7	53.80	48.65	18.7	37.05	39.80	23.7	20.30	30.95
13.8	53.47	48.47	18.8	36.72	39.62	23.8	19.97	30.77
13.9	53.13	48.30	18.9	36.38	39.45	23.9	19.63	30.60
14.0	52.80	48.12	19.0	36.05	39.27	24.0	19.30	30.42
14.1	52.46	47.94	19.1	35.71	39.09	24.1	18.96	30.24
14.2	52.13	47.77	19.2	35.38	38.92	24.2	18.63	30.07
14.3	51.79	47.59	19.3	35.04	38.74	24.3	18.29	29.89
14.4	51.46	47.41	19.4	34.71	38.56	24.4	17.96	29.71
14.5	51.12	47.23	19.5	34.37	38.38	24.5	17.62	29.53
14.6	50.79	47.06	19.6	34.04	38.21	24.6	17.29	29.36
14.7	50.45	46.88	19.7	33.70	38.03	24.7	16.95	29.18
14.8	50.12	46.70	19.8	33.37	37.85	24.8	16.62	29.00
14.9	49.78	46.53	19.9	33.03	37.68	24.9	16.28	28.83
						25.0	15.95	28.65

* **Minutes** # **ml/Kg/min**

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