

VALIDITY OF SOVIET PHYSICAL FITNESS TESTS ADMINISTERED
TO TEXAS SECONDARY SCHOOL STUDENTS

by

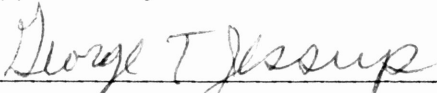
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INTRODUCTION

Physical fitness is a broad concern of the public educational system in the United States. Similarly, the Soviet Union has a major interest in developing a physically fit and healthy populace. Throughout Russia, a national physical fitness awards system, known as "Gotov k Trudu i Osborne" (Prepared for Work and Defense), is administered to upgrade the level of physical fitness of the Soviet people and to identify athletic potential (14). The history of the Soviet "PWD" has been translated and analyzed by Dr. Reet Howell at San Diego State University, who found the award system to be organized into five age groups or "stages" from ages ten to sixty (14). Each age group has requirements and performance norms* that a person must complete before receiving a gold or silver medal award (14). In the United States such a nationwide, highly structured fitness program is non-existent, rather a large variety of test batteries are available to measure fitness and these, most often, are without elaborate awards. Physical educators are continually searching for more reliable, valid tests for assessing physical fitness. Two questions this study attempted to answer are: "How do the Soviet PWD test items compare with those commonly used in the Texas Physical Fitness-Motor Ability Test?" and "What do the Soviet PWD test items validly measure and are the age group award norms reasonable?"

*See Tables 11 and 12 for examples of performance norms.

The citations on this and the following pages follow the style of the Research Quarterly.

The present study attempted to investigate a number of Soviet "PWD" Physical Fitness Tests in terms of their validity for describing the physical fitness levels of a sample population of Texas secondary school students. The evaluation of the test items is based on the performances by the subjects, their intercorrelations and chi square statistical considerations with the following items selected as "operational" criterion variables: the Astrand-Rhyming Aerobic Work Capacity Test, Vertical Jump, Two Hand Medicine Ball Put, 2 Minute Sit-ups, Flexed Arm Hang, 1.5 Mile Run-Walk, body weight and age. Interesting correlations and significant chi square relationships between other test items are discussed. Table I lists the administered tests and the components of fitness they attempt to measure. What do the Soviet tests measure and how well are these components measured?

Statement of Purpose

The purpose of this investigation was to determine the degree of relationship between selected items of the Soviet "PWD" Physical Fitness Test and those tests used as criterion variables.

The objectives of the investigation were as follows:

1. To compare selected items from the Soviet and Texas Physical Fitness Tests in terms of describing the fitness levels of a population.
2. To determine the components of physical fitness the Soviet "PWD" items attempt to measure.

3. To determine what percentage of the sample of Texas secondary school students might score within the Soviet "PWD" award norms.
4. To evaluate the validity of the selected "PWD" items using the tests common to both age groups as "operational" criterion variables.

Review of Literature

Much research involving physical fitness tests batteries has been to evaluate their effectiveness in measuring physical fitness (2, 21, 24). The validity of a test measuring a specific fitness component is usually evaluated through statistical analysis techniques, one of which is the coefficient of correlation (2, 11, 19). In this study, a test is valid for any component of fitness to which it will correlate.

This investigation has employed criterion tests to which the Soviet test items are correlated and contingently compared (Table I). How valid are the criterion tests used in this study? What are their reliabilities? The Astrand-Rhyming Aerobic Work Capacity Test was found in a number of studies to be useful, as well as valid, in predicting maximal oxygen uptake or aerobic capacity which is a measure of cardiovascular fitness (1, 9, 10, 21). Astrand-Rhyming (1) in 1954 found a predictive validity coefficient of the six-minute bicycle ergometer test to be 0.71. Teräslinna, et al (21) measured oxygen uptake and pulse rates during the submaximal test on 31 normal men engaged in sedentary occupations and found a correlation of 0.92 between the two measures after correlations for the ages of the subjects. DeVries, et al (10) in 1965 reported a predictive validity coefficient of 0.74. Davies (9) in 1968

reported a coefficient of 0.80. The 1.5 Mile Run-Walk was also used as a measure of cardiovascular endurance and aerobic capacity and is a convenient form of the 12 minute jog-walk test. The popularity of the 1.5 mile and the 12 minute tests can be traced to the work of Cooper (4, 5). Doolittle and Bigsbee (12) reported a validity r of 0.90 and a reliability r of 0.94 for the 12 minute test in 153 ninth grade males.

Other criterion physical fitness tests used in this study included: the Vertical Jump, Two Hand Medicine Ball Put, 2 Minute Sit-ups and Flexed Arm Hang, all of which are generally considered to have face validity. In terms of reliability, or the reproducibility of individual scores, Brown (2) found a reliability r of .823 for sit-ups, an r of .920 for the Vertical Jump and a range of reliability coefficients from selected studies for both tests of .71-.99 and .61-.98, respectively. Buxton (3) obtained an r of .94 for sit-ups using a random sample of first to ninth grade students. Reliabilities of .81 and .84 for the Two Hand Medicine Ball Put (6 pounds) was reported for college girls and college boys, respectively (16). Crawford and Mason (7) found the Flexed Arm Hang reliability to be .751 on 37 eight grade boys by the test-retest method. Pull-ups and push-ups used in this study as part of the Soviet "PWD" battery are common tests with acceptable face validity and excellent-reliability. Buxton (3) reported a push-up reliability of .83 for 56 students of ages 6 through 15 and Brown (2) reported on r of .90 for 208 college students. Pull-ups (palms toward body) were reported by Brown (2) to have an r of .915 and by Phillips (19), $r = .92$ and .95 for two groups of 135 military personnel.

Methods and Procedures

The sample of this study included four groups of students enrolled in the physical education classes of a Texas high school. The grouping corresponded to the Soviet "PWD" organization of "stages": Stage II, "The Rising Sports Generation" for boys and girls 14-15 and Stage III, "Strength and Courage" for boys and girls 16-18 (14). Stage II, referred to as "Group II", involved 57 males and 58 females ranging in age from 13 through 15 years. Group III involved 40 males and 34 females ranging in age from 16 through 18 years. A few students less than 14 years of age were included in Group II because of their enrollment in the physical education classes. All the subjects were tested in six "criterion tests": Vertical Jump (VJ), Two Hand Medicine Ball Put (MB), Astrand-Rhyming Bicycle Ergometer Test (VO_2), Flexed Arm Hang (FAH), and the 1.5 Mile Run-Walk (1.5mi). Each group performed five Soviet "PWD" test items which correspond to their sex grouping and age grouping. Table I lists the specific "PWD" tests employed. In Group III, Males, the Fast Walk was omitted for two reasons: firstly, the author considered the distance (6 kilometers, or 3.32 miles) impracticable to administer during normal school schedules and, secondly, the motivation of the students for such a strenuous test was lacking. However, whenever possible, two or more students at a time performed each event to increase the level of motivation and the test validity. In addition, "performance goals" for each event was posted, the highest two goals corresponding to the Soviet Gold and

Silver Award norms for each group. The administrative part of this study was titled "The International Physical Fitness Test." All of the tests were administered over a period of five days, with special consideration to the scheduling of the tests as to not interfere with maximal performances due to fatigue. All the subjects were instructed to perform with maximal effort and informed as to how greater achievements may be performed. No practice of the test items was allowed because of time, however, two exceptions were in the Vertical Jump and Medicine Ball Put.

A Brief Description of the Tests

In the Vertical Jump, the subjects were informed that a slight staggering, or spacing, of the feet with the knees bent at approximately 115° was found to be most effective for greater jump heights (17). Each subject marked on the wall with chalk as high as possible flat-footed, then marked again at the peak of the jump; the difference in inches between marks was their score. One practice was taken, then the best score of three trials was recorded. In the Two Hand Medicine Ball Put, a 6 pound medicine ball was put (like a two-hand chest pass in basketball) by the subject sitting in a chair restrained around the chest to restrict forward leaning during the put. One practice put and three trials were taken, the best of which was recorded in feet. The Astrand-Rhyming Test consisted of a six minute submaximal workout on a bicycle ergometer (Schwinn Bicycle Ergo Metric) at a selected workload. The subject's heart rate was taken either by carotid pulse or with a stethoscope the last fifteen seconds of the six minutes. For each subject, body weight,

workload and heart rate were used in predicting a maximal oxygen uptake figure from a nomogram by Astrand and Rhyming (1).

In the 2 Minute Sit-ups, the subjects started flat on their backs, knees bent with feet flat on the floor held by a partner and their hands interlaced behind the head. One sit-up consisted of bending up until the elbows are on the outside of the knees and back down. The number performed correctly in two minutes was their score. Scoring in the Flexed Arm Hang involved a performance (recorded in seconds) starting in a chinning position (overhand grip) on a crossbar, holding this position as long as possible and ending when the chin passes below the bar. The 1.5 Mile Run-Walk involved covering the distance around a track as quickly as possible; scores are reported here in minutes. In the Soviet "PWD" tests, the dash scores are the best of two trials performed on the track; the pull-ups (for boys) and push-ups (for girls) scores are the maximum number performed without rest. An underhand grip was used in the pull-ups. Floor push-ups (unmodified) were used in effort to duplicate indicated Soviet procedures (14). Both the Tennis Ball Throw and the Weighted Ball ("Grenade") Throw for distance were scored from the best of three throws, using any form of throwing from a six foot restraining area. The weighted ball consisted of a tennis ball filled with lead shot up to the appropriate weight: 500 grams (1.1 lbs.) for girls and 700 grams (1.54 lbs.) for boys. All of the cross country run-walks were performed in an open field course and were to be covered as quickly by the subjects. The Fast Walk events involved briskly walking around a track for the

TABLE 1. TESTS ITEMS ADMINISTERED

Group II (14-15 yrs.)

<u>Soviet Test Item</u>	<u>Abbreviation</u>	<u>Component of Physical Fitness</u>
1. 60 Meter Dash	60m	1. Speed & Power
2. a. Push-ups (for girls)	Psh-up	2. Muscular Strength & Endurance
b. Pull-ups (for boys)	Pl-up	
3. Tennis Ball Throw	TBT	3. Arm Strength (?) & Body Coordination
4. Cross Country Running	X-C	4. Cardiovascular Endurance & Aerobic Capacity (?)
300 meters (for girls)	300m	
500 meters (for boys)	500m	
5. Fast Walk	FW	5. Muscular Endurance, Body Coordination & Skill
1 kilometer (for girls)	1 km	
2 kilometers (for boys)	2 km	

Group III (16-18 yrs.)

1. 100 Meter Dash	100m	1. Speed & Power
2. a. Push-ups (for girls)	Psh-up	2. Muscular Strength & Endurance
b. Pull-ups (for boys)	Pl-up	
3. Weighted Ball (Grenade) Throw	WBT	3. Arm Strength & Body Coordination
4. Cross Country Running	X-C	4. Cardiovascular Endurance & Aerobic Capacity
500 meters (for girls)	500 m	
1000 meters (for boys)	1000m	
5. Fast Walk	FW	5. Muscular Endurance, Body Coordination & Skill
3 kilometers (for girls)	3km	

Tests Common to Both Groups II & III

1. Astrand Rhythmic Bicycle Ergometer Test	VO ₂	1. Cardiovascular Endurance & Aerobic Capacity
2. Vertical Jump	VJ	2. Power
3. Medicine Ball Put	MB	3. Arm & Shoulder Power
4. 2-Minute Sit-Ups	SU	4. Abdominal Muscle Endurance
5. Flexed Arm Hang	FAH	5. Arm & Shoulder Muscular Endurance
6. 1.5 Mile Run/Walk	1.5 mi	6. Cardiovascular Endurance & Aerobic Capacity

appropriate distance. Both the fast walk and cross-country times are reported here in minutes.

An intercorrelation analysis was performed on all the data of each group. A contingency table analysis using Chi Square was employed to locate significant relationships between the test performances.

Results and Discussion

Tables 2 through 5 are descriptive summaries of all the data collected for each group. Intercorrelations among the variables are found in Tables 6 through 9. Significant chi square calculations from the contingency table analysis are reported in Table 10. Tables 11 and 12 summarize the performances by the subjects in relation to their corresponding Soviet "PWD" award norms. It appears from the data in Tables 2 and 3 that the older males tend to outscore the younger males in the same tests. This is usually expected (8, 13). However, the younger males averaged more sit-ups and slightly faster times for the 1.5 mile. A similar trend appears among the females as shown in Table 4 and 5. The older females outscored the younger ones in the VJ and MB, but the latter averaged better in the push-ups, sit-ups and flexed arm hang. It is possible that this trend reflects a general decrease in physical fitness as they grow older and probably less active; however, this could be from differences in motivation alone. Motivation may have very well played a role in the performances in the 1.5 mile seeing that the older females, on the average, had a higher maximal oxygen uptake, yet a slower time in the 1.5 mile than those of the younger females (Tables 4 and 5).

Intercorrelations among the test variables for the younger, Group II Males (Table 6) are typically low because the variation of measured components of fitness among most of the tests. As might be expected, though, the Soviet 500 meter cross-country performances correlated reasonably to those in the 1.5 mile (N = 37) with an r of 0.74.

TABLE 2. DESCRIPTIVE SUMMARY OF DATA FOR GROUP II MALES

Group II Males	N	Mean	S.D.	Range
Weight (lbs.)	54	129.8	19.8	99 - 179
Age (yrs.)	56	14.4	0.5	13 - 15
Vertical Jump (in.)	56	17.5	2.8	10.0 - 24.0
Medicine Ball Put (ft.)	40	15.7	2.0	12.0 - 20.0
Maximal $\dot{V}O_2$ (ml/kg.min)	46	38.3	12.4	12.4 - 66.7
2 Minute Sit-Ups (#)	53	65.5	12.4	42.0 - 91.0
Flexed Arm Hang (sec.)	52	22.3	13.8	0.0 - 56.0
60 Meter Dash (sec.)	46	9.0	0.6	8.0 - 11.4
Pull-Ups (#)	53	6.2	3.7	0.0 - 14.0
Tennis Ball Throw (ft.)	55	140.2	25.9	82.0 - 186.0
500 Meter X-Country (min)	46	1.78	0.19	1.50- 2.53
1.5 Mile Run-Walk (min)	44	13.04	2.06	9.47- 17.63
Fast Walk, 2km (min)	42	14.90	1.70	12.40- 18.95

TABLE 3. DESCRIPTIVE SUMMARY OF DATA FOR GROUP III MALES

Group III Males	N	Mean	S.D.	Range
Weight (lbs.)	40	141.75	17.6	104 - 195
Age (yrs.)	39	16.4	0.7	16 - 19
Vertical Jump (in.)	37	19.4	3.4	9.0 - 27.0
Medicine Ball Put (ft.)	38	17.9	2.7	14.0 - 27.0
Maximal VO_2 (ml/kg.min)	24	38.9	9.0	26.0 - 63.2
2 Minute Sit-Ups (#)	31	59.0	12.8	36.0 - 90.0
Flexed Arm Hang (sec.)	21	29.8	15.0	10.0 - 54.0
100 Meter Dash (sec.)	30	14.0	1.9	4.7 - 16.3
Pull-Ups (#)	37	9.4	4.0	1.0 - 18.0
Weighted Ball Throw (ft.)	35	108.9	18.8	74.0 - 150.0
1000 Meter X-Country (min)	31	4.49	0.57	3.68- 5.67
1.5 Mile Run-Walk (min)	32	13.05	2.38	9.90- 17.90

TABLE 4. DESCRIPTIVE SUMMARY OF DATA FOR GROUP II FEMALES

Group II Females	N	Mean	S.D.	Range
Weight (lbs.)	50	113.5	13.8	85 -151
Age (yrs.)	52	14.5	0.5	13 - 15
Vertical Jump (in.)	50	12.8	2.4	7.0 - 18.0
Medicine Ball Put (ft.)	50	11.6	1.5	7.0 - 14.0
Maximal $\dot{V}O_2$ (ml/kg.min)	47	22.8	9.6	7.5 - 55.0
2 Minute Sit-Ups (#)	41	47.5	11.2	22.0 - 81.0
Flexed Arm Hang (sec.)	48	10.6	8.2	0.0 - 30.0
60 Meter Dash (sec.)	39	10.4	1.7	8.7 - 20.0
Push-Ups (#)	50	11.0	7.0	0.0 - 30.0
Tennis Ball Throw (ft.)	49	71.1	19.8	36.0 -127.0
300 Meter X-Country (min)	36	1.14	0.19	0.92- 2.00
1.5 Mile Run-Walk (min)	31	17.84	2.94	13.13- 24.27
Fast Walk, 1km (min)	45	8.42	1.05	6.33- 10.25

TABLE 5. DESCRIPTIVE SUMMARY OF DATA FOR GROUP III FEMALES

<u>Group III Females</u>	<u>N</u>	<u>Mean</u>	<u>S.D.</u>	<u>Range</u>
Weight (lbs.)	33	117.6	15.1	77 - 150
Age (yrs.)	33	16.3	0.5	16 - 18
Vertical Jump (in.)	30	13.2	2.4	8.0 - 17.0
Medicine Ball Put (ft.)	31	12.0	2.6	7.0 - 22.0
Maximal $\dot{V}O_2$ (ml/kg.min)	27	28.7	8.9	14.9 - 44.3
2 Minute Sit-Ups (#)	20	41.6	15.2	0.0 - 70.0
Flexed Arm Hang (sec.)	15	10.5	7.1	0.0 - 26.0
100 Meter Dash (sec.)	22	16.7	1.4	14.0 - 19.9
Push-Ups (#)	29	10.4	9.6	0.0 - 30.0
Weighted Ball Throw (ft.)	32	63.4	15.9	37.0 - 99.0
500 Meter X-Country (min)	23	2.39	0.35	1.82- 3.02
1.5 Mile Run-Walk (min)	23	18.24	2.82	12.06- 24.02
Fast Walk, 3km (min)	9	27.11	3.03	20.17- 30.10

TABLE 6. INTERCORRELATION OF DATA FROM GROUP II MALES

	VJ	MB	VO ₂	SU	FAH	60m	P1-Up	TBT	500m	1.5mi	WT	Age	FW2km
VJ	1.00	0.35	0.38	0.43	0.46	-0.56	0.53	0.38	-0.37	-0.28	-0.07	-0.06	-0.26
MB		1.00	0.02	0.00	0.02	-0.27	0.08	0.15	-0.12	-0.04	0.78*	0.14	-0.10
VO ₂			1.00	0.16	0.51	-0.38	0.51	0.35	-0.53	-0.60	-0.27	-0.14	-0.47
SU				1.00	0.41	-0.27	0.37	0.19	-0.23	-0.24	-0.30	-0.21	-0.37
FAH					1.00	-0.41	0.63	0.24	-0.55	-0.55	-0.35	-0.13	-0.47
60m						1.00	-0.60	-0.30	0.71*	0.44	0.12	-0.20	0.27
P1-Up							1.00	0.28	-0.60	-0.54	-0.32	0.19	-0.27
TBT								1.00	-0.43	-0.51	0.04	0.02	-0.17
500m									1.00	0.74*	-0.11	-0.09	0.62
1.5mi										1.00	0.08	0.15	0.42
WT											1.00	0.08	0.27
Age												1.00	0.17
FW2km													1.00

*Pertinent Correlations

TABLE 7. INTERCORRELATION OF DATA FROM GROUP III MALES

	VJ	MB	VO ₂	SU	FAH	100m	P1-Up	WBT	1000mX-C	1.5mi	WT	Age	FW3km
VJ	1.00	0.40	-0.14	-0.17	0.20	0.03	0.12	0.47	-0.34	-0.25	0.16	0.09	0.54
MB		1.00	-0.10	0.32	-0.27	-0.08	0.29	0.35	-0.11	-0.07	0.48	0.14	0.35
VO ₂			1.00	0.00	-0.70*	0.27	-0.17	0.04	-0.10	0.19	0.09	-0.08	-0.25
SU				1.00	-0.10	0.12	0.22	0.03	-0.20	-0.39	0.21	-0.13	0.02
FAH					1.00	-0.25	0.43	-0.17	0.08	-0.37	-0.29	-0.26	0.00
100m						1.00	0.11	-0.02	0.01	0.16	-0.17	-0.04	0.25
P1-Up							1.00	0.05	0.09	-0.09	-0.19	0.07	0.20
WBT								1.00	-0.41	-0.06	0.35	0.24	0.26
1000mX-C									1.00	0.58	-0.30	-0.02	-0.07
1.5mi										1.00	-0.05	0.13	-0.32
Wt											1.00	0.02	-0.01
Age												1.00	-0.40
FW3km													1.00

*Pertinent Correlations

TABLE 8. INTERCORRELATION OF DATA FROM GROUP II FEMALES

	VJ	MB	VO ₂	SU	FAH	60m	Psh-Up	TBT	300mX-C	1.5mi	Wt	Age	Fw1km
VJ	1.00	0.27	0.29	0.16	0.09	-0.14	0.18	0.28	-0.61	-0.29	-0.11	-0.27	-0.17
MB		1.00	0.36	0.15	0.03	-0.34	0.08	0.35	-0.33	-0.03	0.28	-0.10	-0.12
VO ₂			1.00	0.12	0.12	-0.25	0.01	0.16	-0.36	-0.20	-0.14	-0.05	-0.15
SU				1.00	0.33	-0.48	0.29	-0.05	-0.28	-0.40	-0.04	0.36	-0.31
FAH					1.00	-0.31	0.11	0.18	-0.02	-0.43	-0.35	-0.07	-0.37
60m						1.00	-0.07	-0.19	0.54	0.28	0.41	-0.33	0.09
Psh-Up							1.00	-0.03	-0.13	-0.37	-0.05	-0.07	0.08
TBT								1.00	-0.33	-0.35	-0.08	-0.25	-0.28
300mX-C									1.00	0.58	-0.07	0.16	0.27
1.5mi										1.00	0.30	0.12	0.39
Wt											1.00	-0.12	-0.04
Age												1.00	0.04
Fw1km													1.00

*Pertinent Correlations

TABLE 9. INTERCORRELATION OF DATA FROM GROUP III FEMALES

	VJ	MB	VO ₂	SU	FAH	100m	Psh-Up	WBT	500mX-C	1.5mi	Wt	Age	FW3km
VJ	1.00	0.48	0.16	0.08	0.63	-0.63	0.22	0.51	-0.27	-0.28	0.22	0.34	-0.67
MB		1.00	-0.00	-0.12	0.32	-0.04	0.04	0.36	-0.32	-0.29	0.44	0.11	-0.40
VO ₂			1.00	0.38	-0.47	0.01	0.05	0.19	-0.16	0.29	0.14	0.15	0.11
SU				1.00	0.02	-0.07	0.56	0.03	-0.23	0.23	-0.03	0.22	0.00
FAH					1.00	-0.36	0.28	0.13	-0.26	-0.56	-0.47	-0.40	0.00
100m						1.00	-0.22	-0.30	0.70*	0.48	0.11	-0.07	0.19
Psh-Up							1.00	-0.28	-0.33	-0.07	0.45	0.21	0.05
WBT								1.00	-0.35	-0.20	0.47	0.32	-0.58
500mX-C									1.00	0.72*	0.08	-0.28	0.71*
1.5mi										1.00	-0.02	0.31	-0.02
Wt											1.00	0.36	-0.61
Age												1.00	-0.72*
FW3km													1.00

*Pertinent Correlations

TABLE 10. CHI SQUARE SIGNIFICANT RELATIONSHIPS

Related Items	Group	N	df	Chi Square	Probability Level
VJ & 60m	II M	45	25	70.42	.001
MB & Body Wt.	II M	39	25	62.31	.001
VO ₂ & 60m	II M	39	1	6.31	.02
VO ₂ & 500mX-C	II M	38	1	5.15	.05
VO ₂ & 1.5mi	II M	34	25	40.69	.05
VO ₂ & 2kmFW	II M	35	1	6.99	.01
TBT & 60m	II M	45	25	42.44	.02
1.5mi & 500mX-C	II M	35	1	8.99	.01
MB & Body Wt.	III M	37	25	52.11	.01
60m & Body Wt.	II F	33	25	39.45	.05

A similar high correlation for these two was also found among the older females in Table 9; $r = 0.72$ ($N = 14$). In both groups, the 500m X-C correlated well to the dashes: the 60m for 39 Group II males showed an r of 0.71 and the 100m for 14 Group III females showed an r of 0.70. From Table 10, significant relationships ($P \leq .05$) appears between the 500m X-C and the 1.5 mile and between the former and predicted maximal $\dot{V}O_2$ for the younger males. Distribution in the contingency table analysis indicates that the Group II males ran slower on the 500m X-C also ran significantly slower in the 1.5 mile and those who had a higher max $\dot{V}O_2$ ran the 500m X-C significantly faster. Significant chi square relationships were not found in the performances by the older females probably because of the small N that completed each test. From these results, the Soviet 500m X-C appears to be an acceptable test for cardiovascular fitness for the males 14-15 years of age. However, its correlation with max $\dot{V}O_2$ is -0.53 while the correlation between the 1.5 mile and max $\dot{V}O_2$ is -0.60 for this group (Table 6). Metz and Alexander (19) found an r of -0.27 between max $\dot{V}O_2$ and a similar distance (600 yd.) among a sample of 30 boys 14-15 years old. Vocak and Wilmore (23) reported an r of -0.50 between the same two variables, but using younger males. Similar negative correlations have been found between slightly longer distances and max $\dot{V}O_2$ in other studies: Katch and Henry (16) reported $r = -0.55$ between max $\dot{V}O_2$ and a 2 mile run-walk; Wiley and Shaver (22) reported an r of -0.47 for the same variables, both studies using 35 college males. In this study, the 1.5 mile and the Soviet 500m X-C correlated reasonably to each other ($r = 0.74$), showed similar poor correlations to max $\dot{V}O_2$, yet both showed significant chi

square relationships to max $\dot{V}O_2$. It appears that both have similar validity for assessment of aerobic capacity in the males 14-15 years of age.

Performances on the Soviet 60m and the VJ showed a significant chi square for the Group II males (Table 10). There appears to be a significant relationship between jumping and running ability; in other words, those subjects that could jump higher also ran faster. This may indicate that the 60m is a reasonable test for power and speed, however, the correlation of -0.56 between VJ and 60m in Table 6 does not seem to reflect this. Others (6, 24) have found similar negative correlations between VJ and short dashes. The 60m was also found to be significantly related to three other variables at this age (Table 10): max $\dot{V}O_2$, Tennis Ball Throw (TBT) and body weight (Group II females). Those males who had a higher max $\dot{V}O_2$, as well as those who threw the tennis ball farther, ran significantly faster. The Group II females that weighed between 107 and 118 lbs. (36.4%) seemed to be consistently quicker in the 60 meter dash. Girls outside this weight category tended to be significantly slower. Apparently, the younger males who are in better cardiovascular condition run the 60 meters faster, however this may be in some way, related to their general body development at this age. Better muscular development during growth might account for the better performances in 60m among those males categorized by better aerobic capacities and TBT scores. This may also indicate that the TBT has some validity in measuring quickness, however, body development probably plays the major role in the correlations.

Similarly, the younger females with the "optional" body weight and who ran faster may represent a greater percentage of musculature development than those outside this weight category.

The Soviet 2 kilometer Fast Walk for 35 Group III males was found to be significantly related to their max $\dot{V}O_2$ (Table 10). Those with greater aerobic capacities tended to perform the fast walk significantly faster. A negative correlation ($r = -0.47$) was found between these two tests for this group (Table 6), however an r of 0.71 ($N = 6$) was found between the 3 km Fast Walk and the 500m X-C for the older females (Table 9). Could the Soviet fast walk be acceptable tests for assessing cardiovascular fitness? The results show some relationship between max $\dot{V}O_2$ and the 2 km Fast Walk for the younger males, however, the fair correlation among the older females between the 3 km FW and the 500m X-C may be mere coincidental because of the small N of 6 used for the correlation calculation. In administering the fast walk tests, it was obviously an event for which the subjects had little knowledge of race walking skill nor had motivation for its proper performance, hence, the results of the FW tests have little, if any, meaning in assessing physical fitness. In the Soviet Union, this event is indeed practiced (14). Those younger males who were in better cardiovascular fitness were probably more motivated to excel in an endurance event than those with lower cardiovascular fitness.

Two other high correlations that appeared were between body weight and MB with an r of 0.78 for 39 Group II males (Table 6) and between max $\dot{V}O_2$ and FAH with an r of -0.70 for 12 Group III males (Table 7).

Interestingly, Table 10 reports that a significant chi square was found for both the male groups between MB and body weight. These results may point to a development trend that those males with stronger arms and shoulders usually weight more.

Tables 11 and 12 summarize the performances of the subjects with respect to the Soviet "PWD" award norms. Group II males excelled in every test except the 2 km FW which appears to require race walking skill. A high percentage of the older males (Group III) scored well in the 100m Dash, pull-ups and the WBT but showed a lack of cardiovascular endurance in failing to achieve the norm for the Soviet 1000m X-C. Both male groups had a relatively large percentage achieve the Soviet Gold Award norm in pull-ups (39.0% of Group II, 33.3% of Group III). Similarly, scoring was high among both groups in the dashes and throwing events. The percentages of the females achieving Soviet award norms indicate a similar trend of better performances in speed and power-type events (dashes and throws) than in the cardiovascular events. None of the females, as well as the males, achieved Soviet norms in their respective fast walk tests, only a low percentage achieved the cross country norms, yet much higher percentages were found in the dashes and push-ups. The trends in the achievement percentages may indicate that the emphasis on physical fitness appeals to upper body fitness, rather than cardiovascular fitness, among young people in the United States. However, administration of the tests and the testing conditions differ from those in the Soviet Union, hence, the conclusions concerning the performances in this study cannot be definitive.

TABLE 11. SUMMARY OF RESULTS OF SOVIET AWARD QUALIFYING PERFORMANCES
GROUP II AND III MALES

Event	Sample Size	Mean M±S.D.	Soviet Award Norms		No. Qualified Soviet Awards		% of N Achieving Soviet Award Norms	
			Silver	Gold	Silver	Gold	Silver	Gold
60m Dash (seconds)	46	9. 0+ 0.63	9.2	8.4	37	6	80.4	13.0
Pull-ups (number)	53	6. 2+ 3. 7	6	8	28	21	52.8	39.0
Tennis Ball Throw (feet)	50	140. 2+25. 9	127	153	34	15	68.0	30.0
GROUP II Males 14-15 yrs.								
X-Country 500m (min)	46	1.78+ 0.19	1.75	1.50	24	1	52.2	2.2
Fast Walk 2Km (min)	42	14.90+ 1.70	10.00	9.00	0	0	0	0
100m Dash (seconds)	30	14. 0+ 1. 9	14.2	13.5	17	6	56.7	20.0
Pull-ups (number)	37	9. 4+ 4. 0	8	12	24	12	66.7	33.3
GROUP III Males 16-18 yrs.								
Weighted Ball Throw (feet)	35	10. 9+18. 8	115	131	10	5	29.4	14.7
X-Country 1000m (min)	31	4.49+ 0.57	3.50	3.33	0	0	0	0

TABLE 12. SUMMARY OF RESULTS OF SOVIET AWARD QUALIFYING PERFORMANCES
GROUP II AND III FEMALES

Event	Sample Size	Mean M±S.D.	Soviet Award Norms		No. Qualified Soviet Awards		% of N Achieving Soviet Award Norms	
			Silver	Gold	Silver	Gold	Silver	Gold
GROUP II Females 14-15 yrs.	60m Dash (seconds)	10. 4± 1. 7	10.0	9.4	17	8	43.6	20.5
	Push-ups (number)	11. 0± 7. 0	8	10	31	27	60.8	52.9
	Tennis Ball Throw (feet)	71. 1±19. 8	83	100	12	3	24.5	6.1
GROUP III Females 16-18 yrs.	X-Country 300m (min)	1. 14± 0. 19	1.00	0.92	6	1	17.1	2.9
	Fast Walk 1Km (min)	8. 42± 1. 0	5.33	5.00	0	0	0	0
	100m Dash (seconds)	16. 7± 1. 4	16.2	15.4	7	5	31.8	22.7
GROUP III Females 16-18 yrs.	Push-ups (number)	10. 4± 9. 6	10	12	14	13	48.3	44.8
	Weighted Ball Throw (feet)	63. 4±15. 9	69	82	11	4	34.4	12.5
	X-Country 500m (min)	2. 39± 0. 35	2.00	1.83	3	1	13.0	4.3
Fast Walk 3Km (min)	27. 11± 3. 03	20.00	18.00	0	0	0	0	

Understandably, the apparent low correlations between the Soviet events and the criterion tests (Tables 6-9) may indicate that the former tests measured different components of fitness than those measured by the latter. The Soviet WBT, for instance, correlated well with no other test nor showed any significant chi square relationships, thus, it may be measuring a unique throwing fitness. Individual variance, or inconsistent subject response to the tests may have affected a decrease in the correlations. Additional significant relationships most likely would have appeared in the contingency table analysis had the groups been larger in number.

Conclusions

The Soviet "PWD" Physical Fitness Tests used in this study are administratively more difficult and appear more skill-related than the Vertical Jump, 2 Minute Sit-ups, Flexed Arm Hang and the 1.5 Mile Run-Walk, all from the Texas Physical Fitness-Motor Fitness Test. The Soviet 60 Meter Dash and 500 Meter Cross-Country Run appear to be valid tests for discriminating between the more physically fit and the less physically fit among the younger high school males. There seems to be a valid relationship between those of higher fitness levels and those that scored well on the Soviet 60m and 500m X-C. The other Soviet "PWD" test items cannot be said to be invalid but have shown no significant relationship to the components of physical fitness used in this study, that is, cardiovascular endurance, aerobic capacity, power, abdominal muscle endurance, arm and shoulder power and muscle endurance. Overall the Soviet "PWD" award norms may be relatively low as seen by the large percentage of norm achievers in this study using a sample absent of athletes, and therefore, biased toward the non-athletic population. The norms may be deliberately low to increase the motivation of the Soviet population for improving their general fitness levels. Large achievement percentages in certain events requiring power and arm-shoulder strength over small percentages in endurance events may point to the effects of an emphasis on upperbody fitness rather than cardiovascular fitness among the youth of the United States.

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