

Evaluation of Physical Fitness and Body Composition Indices in Iranian Military Officer Trainees

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Received: September 02, 2013; Revised: September 10, 2013; Accepted: September 17, 2013

Background: Physical activities during military services must not only provide appropriate body fitness and health but also should reduce the physical and psychological problems.

Objectives: This study aimed to evaluate physical fitness and body composition measures of male military officer trainees and compare them with those with APFT and WHO standards.

Materials and Methods: In this research, 150 junior and senior officer trainees (75 in each group) were randomly selected and their body composition as well as cardiovascular fitness and muscular endurance were compared. Their mean age was 18.5 ± 0.5 and 23.1 ± 0.31 years; they had mean weight of 65.0 ± 7.05 and 67.4 ± 8.13 kg, and mean height of 174.4 ± 5.38 and 174.1 ± 5.68 , respectively.

Results: There was a significant difference in the physical fitness indices (cardiovascular and muscular endurance) between junior and senior officer trainees ($P < 0.05$), and the senior officers had a higher rank. Both groups obtained the highest ranks based on APFT standard. There was no significant difference between the two groups in terms of BMI and BF% based on WHO and Western Army Standard ($P > 0.05$) and both were in normal range.

Conclusions: Military officer trainees have a good physical fitness and body composition which is possibly due to the appropriate physical activities during their training courses.

Keywords: Physical Fitness; Body Composition; Military Personnel

1. Background

Material readiness is one of the major challenges for every country because an unprepared army cannot protect any territory. Obviously, human elements are the major determinants of the military preparation. Then, physical fitness and body composition assessments are the common concerns of all armed forces since the ancient times. However, along with science and technology development, there has been substantial evolution in those training in a way that nowadays, simple, rapid, inexpensive, and exact military skills in armed forces are targeted. For a military officer, physical fitness includes capacity for continuous and skillful movements and ability for the recovery after a vigorous effort. This increases the required features for complete fulfilling of duties, inspires obtaining combat skills, and improves self-confidence in confrontation with any given situation (1).

Living and working in non-conventional places such as high mountains, deserts, forests, rivers and vigorous and long-term physical activities are constant parts of mili-

tary jobs. Too much action and unfavorable weather can produce stresses, stimulating catabolic processes and physical strength by decreasing the immunity functions, increased disease incidence, malnutrition and poor performance (2). The US Army had a bad experience in the first days of war for physically unprepared (eventhough they were fully armed) soldiers against trained Korean soldiers in June 1950. They had to leave the battlefield and left their citizen fellows and equipment because they were not trained enough to carry heavy loads. The valuable lessons by Smith team in Korean war provoked a movement in training headquarters in the Western region countries for improving body composition and physical fitness of their soldiers (3).

A review on the Iranian defense against 8-year Iraq war demonstrated that although Iranians benefited from inspired and devoted soldiers with spiritual power, they didn't have enough time for appropriate and systematic physical trainings for the volunteers who rushed toward the battlefields to protect their country only after a short-training period. Although the post-war peace provided

Implication for health policy/practice/research/medical education:

Assessment of physical fitness would enhance our understanding about possible influential factors in order to improve training methods in particular for military forces. Furthermore, it may reveal potential weaknesses in our current program which leads to a better plan.

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an opportunity for better scientific trainings of military forces, it seems that more information about the current situation is required. Several evidences showed that high cardiovascular endurance and long-term exercising ability, would highly impress the physical and psychological health of the people (4). Knapik (1993) reported that physical trainings from low to severe extent such as gun practices and marching are significantly correlated to the physical fitness indices. They can also be used for the people quitting smoking and their fortification along with other activities (3). Armed trainees must own favorable martial and carnal readiness during training periods like successful crossing through barrier field, preparation field, military practices, and body building programs (1).

2. Objectives

This study aims to evaluate the physical fitness of junior and senior military officer trainees in a military university of Iran. Description and adoptive examination of these features according to the available standards of army can provide applied suggestions for the similar cases in the future.

3. Materials and Methods

3.1. Sample Selection

In this study we considered at least 10% difference in the variables among the groups, with 80% power and 5% type 1 error, 65 patients were entered in each group. To overcome the potential problems, 150 military officer trainees (75 juniors and 75 seniors) were randomly selected by coding. Forms of work trend, fitness and health were distributed to make sure about physical status and personal satisfaction of the participants. To keep sample homogeneity, none of the students had regular participation in

any sport field. They only attended in university courses offered as common sport programs including swimming, body building, hiking, and group aerobic activities as well as marching, marathon racing with or without guns, camp practices, gun shooting which accord with physical training of other countries (1). Since the admission criteria for the officer training course had not been changed during the past 5 years, it can be supposed that senior students were at the same physical fitness level of junior students at the time of entry. There was no disabled or critically injured person in those groups. Although it was proposed that any trainee with acute respiratory infection, fever, injuries in their lower extremities and the one with acutely ill condition was considered as exclusions, nobody had these criteria for exclusion.

3.2. Data Gathering Tools

The following tests were used for measuring the physical indices of military officer training: body mass index (BMI), body fat percent (BF%), body bioelectric resistance (adopted from in body 220 model) (5, 6), cardiovascular endurance (using 2 miles running), muscular endurance by push-up test (for shoulder girdle endurance), sit-up test (for middle trunk endurance) for 2 minutes according to the maximum movement measured in afternoon time (1, 7) and then they were compared with APFT standards.

3.3. Statistical Analysis

Both descriptive and analytic methods were used. Means and standard deviations were used for data descriptions. For inferential statistics, Kolmogorov-Smirnov (K-S) test was applied to check the normality, an independent t-test was used to compare data means. SPSS software (Version 16) was used for data analysis. The value of 0.05 was regarded as the significance level.

Table 1. Distributing Statistical Indices of the Variables Mean of 18-24 year-old Junior and Senior Students

Variable	Mean		Standard Deviation		Variance		Minimum		Maximum		P value
	Junior	Senior	Junior	Senior	Junior	Senior	Junior	Senior	Junior	Senior	
Age, y	18.5	23.1	0.50	0.31	0.25	0.09	18	23	19	24	-
Height, cm	174.4	174.1	5.38	5.68	29	32.2	162	162	186	187	-
Weight, kg	65	67.4	7.05	8.13	49.8	66.1	47	51	84	88	-
Body mass index, kg.m ²	22.13	22.76	1.92	2.12	3.68	4.50	17.60	18.20	28	28.1	0.246
Body fat, %	16.60	17.12	3.50	3.85	12.29	14.87	9	10.3	28	29.4	0.267
Push-up, No.	51.96	74.59	7.97	4.97	63.6	24.70	38	61	70	82	0.000 ^a
Sit-up, No.	66.45	85.89	7.91	4.68	62.5	21.9	50	74	85	93	0.000 ^a
2 Mile running, min	13.78	13.24	0.75	0.58	0.573	0.343	12.15	12.28	15.23	14.68	0.008 ^a

^a Based on the results, no significant difference of p-values for junior and senior students exists

4. Results

The main features of the two aforementioned groups are represented in Table 1.

4.1. Muscular Endurance Index

The mean muscular endurance of junior students was significantly lower than the senior students ($P = 0.0001$). The obtained scores for the sit-up test of junior and senior students are 100 and 81, respectively; and for the push-up test and based on APFT standard, these scores are 99 and 100 (out of 100), respectively.

4.2. Cardiovascular Endurance

The mean cardiovascular endurance of junior students is lower than senior students as shown in Table 1 ($P = 0.008$). For junior and senior students, the scores in APFT standard are 87 and 95 out of 100 and the maximum oxygen consumption (VO_{2max}) values are 53.53 and 55.34 $mL \cdot kg^{-1} \cdot min^{-1}$ respectively (Table 2); so, compared with Western army standard (1), junior and senior officers had very good and excellent ranks, respectively.

Table 2. Maximum Oxygen Consumption Data Analysis

Variable	VO_{2max}^a , $mL \cdot kg^{-1} \cdot min^{-1}$	Time, min
Juniors 2 mile running mean	53.53	13.78
Seniors 2 mile running mean	55.34	13.24

^a $VO_{2max} = 99.7 - [3.35 \times [2\text{-mile-run-time}(\text{min}) \text{ in decimal form}]]$ for male, $VO_{2max} = 72.9 - [1.77 \times [2\text{-mile-run-time}(\text{min}) \text{ in decimal form}]]$ for female

4.3. Body Composition Indices

There is no significant difference between BF% ($P = 0.267$) and BMI (0.246) of the junior and senior students (Table 1). They were both in normal range.

5. Discussion

Our findings demonstrated a better muscular endurance among senior students compared with their junior counterparts in the military officer training center. As a result, physical activities in university have been in a correct direction; so, by completing training periods, juniors are expected to enhance these indices in future. Achieving a high score of APFT standard, it can be said that muscular endurance of the students, especially seniors, is at Western officers' level. It shows that related training programs including marathon racing, marching, hiking, swimming and body building have been as effective as physical activities of Western army.

Bagni (2008) reported that physical training competi-

tions would improve the physical fitness among army personnel, since he concluded a significant correlation between physical fitness, military readiness, and the lack of physical problems of the officers particularly in terms of their muscular strength and endurance (8). They must be able to carry bullet boxes, injured individuals and military equipments for long distances and move them several times. All of these activities require high muscular endurance, particularly during fighting against enemies (5).

The results also showed that senior officers own higher cardiovascular endurance than juniors; high scores based on APFT standard and VO_{2max} showed that their endurance is similar to the Western officers' endurance. Aerobic exercises including cycling, swimming, running, body building, and increasing muscle mass of lower body members by specific sports like soccer would improve cardiovascular and respiratory fitness and muscle competencies in the trainees. They accord with the training programs of Western army that yield stronger and more effective military forces.

Wright et al. (1994) performed a 5-year longitudinal study on Western army and reported that the cardiovascular risk factors reduced and cardiovascular endurance increased significantly by doing systematic aerobic activities (6). Continuous improvement in this index is necessary for maintaining body preparation and preventing from body emaciation (1, 5). Although, cardiovascular endurance is considerably influenced by genetic and muscular fiber characteristics, it could be improved by appropriate trainings in military officer training center. Also, the factors like age, gender, body composition, height, and distribution of muscular veins have impact on it (9, 10).

The body composition indices showed more desirable results of seniors compared with juniors. This shows the effectiveness of physical activities of the university. The students have probably been healthy in respect to the cardiovascular risk factors (light lipoprotein VLDL, LDL, and high blood sugar) since, they had normal scores in WHO standard for BMI. According to Western army standard, the in BF% index in both groups under the defined limit which is evaluated as a positive result.

Bishop (1999) and Vanderburgh (2006) demonstrated a strong correlation between military officers BF%, weight, and their APFT score (11, 12). Jones et al. (2007) and Bryant (2008) found a strong relationship between physical fitness score, health, and BMI in military personnel (13, 14). Talbot (2009) evaluated cardiovascular risk factors and physical fitness scores and reported a positive correlation between APFT score and HDL, a negative correlation of that score and triglyceride level, and a relationship between total cholesterol and diastolic blood pressure and BMI (15).

In conclusion, in order to have an appropriate physical capability for fulfilling military duties without exhaustion and muscular strains, particularly in emergency situations with rapid reactions in battlefield, a systematic

effective training program must be arranged. Iranian officers had a high score APFT score system. They showed a normal level of body composition based on WHO and Western army standard. So, it seems that their training program effectively improves their cardiovascular endurance and muscular performance.

Generally, a strong and positive correlation was observed based on APFT and body composition indices (i.e. BF% and BMI). This not only improves their martial preparation, self-confidence, group collaboration, persistence, life quality, and intelligence during military actions, but also reduces their illnesses and the number of inefficient or semi-prepared officers.

Acknowledgements

The authors appreciate sincere cooperation of Physical Education Faculty, Tehran University, Education and Research Departments of AJA University of Medical Sciences, Military Epidemiology Research Center, The University of Military Sciences and Officer Training, and The Academy of Physical Training in Iranian Army for their assistance in this study.

Authors' Contribution

All authors actively contributed in research either in the field or in analysis and manuscript writing and reviews.

Financial Disclosure

There is no financial benefit for the study group, sponsors or the training centers. No conflict of interest is declared.

Funding/Support

This study was supported by AJA University of Medical Sciences, Tehran, Iran.

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