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Evaluating the Physical Condition of Students of the Military Academies of the Greek Armed Forces based on Simple Tests. Comparison of the Physical Condition of First Year Students to Third Year Students

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ABSTRACT

The present study provides useful information on the Hellenic Armed personnel and their physical condition. To evaluate this, five tests of the Eurofit bundle were used. These tests were: a) shuttle run (endurance run), b) 30 meters sprint, c) hand grip strength test, d) Vertical jump test, e) sit and reach test. There was a comparison between first-year and third-year students at the school of Regular Non-commissioned officers from the Hellenic Armed Forces. A total of 75 students at the School of Regular Non-Commissioned Officers were evaluated for their physical condition, through the aforementioned Eurofit tests. They were divided in two groups, 33 first-year students and 42 third-year students. All of them were male individuals between the ages of 18 and 21. The working hypothesis was thus related to the possibility of different results in the physical condition of first year students as compared to third-year students. The subjects were tested on the shuttle run endurance test, the 30-meter sprint, the hand grip strength, the vertical reverse motion jump and the sit and reach test (flexibility test). The average values of the tests were at a fairly high level compared to the results of similar studies (endurance: 8.57 - 8.93 stages, sprint: 4.32 - 4.32sec, grip strength: 48.5 - 58.2kp, jump: 30.1 - 34.4cm, flexibility: 18.10 - 18.17cm). Comparison of performance between freshmen and third-year students revealed that there were no statistically significant differences between the two groups, with the exception of the vertical jump (three-year students' dominance, 34.4 ± 5.7 vs 30.1 ± 5.5 cm). The correlation analysis showed low to moderate correlation coefficients between the performance of sprint and other tests (r = -0.28 to -0.39) and of course a high correlation of performance on the grip strength between right and left hand (r = 0.87). Studies that are longer in duration and with a larger sample should be conducted to assess the performance of applied training programs in the Schools of the Hellenic Armed Forces. Scientific research must be conducted in that direction. At the same time, basic physical fitness parameters should be analyzed to examine the performance and preparedness of the Hellenic army.

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Introduction

Training and physical condition is of high essence for the successful completion of military tasks. The conditions military personnel are facing demand that they have strength, flexibility and endurance when using military equipment, the ability to jump over obstacles and mobility during battles. The activities that could be included in military operations are walking long distances (even up to 90km or more), carrying weight ranging between 25 to 65kg, high intensity activities during breaks that simulate battle engagement (fire and movement), landing from low jumps (means of transport) as well as landing from great heights (parachutes) [1]. In addition to those, other activities like the carriage of heavy weaponry (mortars, machine guns), movement in rugged and mountainous terrain or unreliable ground or during adverse climate conditions (very high or very low temperature), special conditions related to the army branch (ex. Special forces, artillery) and operations in conditions of lack of sleep or nutrition (16-22 hours of continuous activity) [2].

Relative to the Hellenic Armed Forces (HAF), there is a research paper by Kontodimaki to be of value, referring to trainers as leaders in the acquisition of proper physical condition for army personnel (MFTL-Military Fitness Training Leaders) [3]. They are a group of individuals that boosts the effectiveness of physical ability training for the Hellenic Army. In the aforementioned research paper, 5 different types of MFTL were tested and evaluated by comparison. The ANOVA test was used, with corrections and ad-hoc comparisons in some of the pre-selected cases of a sample consisting of 2,864 questionnaires. The statistical error margin was calculated at 0.05 in the effort of comparing those 5 types of MFTL, which were subdivided in three large categories: the middle-ranking commissioned officers (OF-3, OF-4, OF-5), the low-ranking commissioned officers (OF-2, OF-1) and the non-commissioned regular (petty) officers (OR-1 to OR-9) and conscripted servicemen (privates, who hold no-regular army

positions). Also, of relative value for the research very significant is the work of Šitvjenkins et al. administering the Eurofit test bundle in the Latvian army [4]. The researchers from the National Armed Forces of the Republic of Latvia (NAF/RL) in conjunction with researchers of the Riga Technical University (RTU) and the Latvian Academy of Sports Education (LASE) evaluated the quality of the personal protection system (CIPS), based on the Eurofit test bundle.

Importance of the Research

The importance of the current study has to do with the fact it is the first time a wholesome and dependable bundle of tests, like Eurofit is being applied to test students at the School of Regular Non-Commissioned Officers (SRN-CO), in Greece. This study aims at testing the condition of students and potential petty officers of the Hellenic Army. It is a process through simple tests, students were tested for strength, speed, flexibility, endurance, informing us about their course of improvement through administering the ordinary programs of fitness. The aim of the study is to test the fitness and physical condition of the students of the SRN-CO in Trikala, Greece. For this purpose, as stated, the European bundle of Eurofit tests shall be administered. The speed, strength, flexibility and endurance of a group of first-year students will be put to the test against another group of third-year students, to evaluate the level of their physical ability. Also, there will be a comparison of their test results, so as conclusion related to the progress of their physical condition will be made.

Material & Methods

Participants

The examined sample consisted of 75 (n=75) aspirant petty officers of the Hellenic Army, divided in two groups, 33 first-year students and 42 third-year students at the school of Regular petty officers of the Hellenic Army in Trikala, Thessaly, Greece. All of them were individuals between the ages of 18 and 21. Those put to the test were examined based on their physical condition (based on the Eurofit bundle of tests) in a shuttle run, in the 30-meter speed test, in the power grip, in the vertical counter-movement jump, in the sit and reach test. Before administering these tests, the height and weight of the participants was measured, being metric elements necessary for the functional application of the test. Only male participants were chosen to participate and the variables of age and year of enrollment were examined. The working hypothesis was thus related to the possibility of different results in the physical condition of first-year students as compared to third year students.

Procedure/Test Protocol/Skill Test Trial/Measure/Instruments

For the endurance test, it was used a chronometer, a measuring tape of 20m, adhesive tape and cones. It was also used a speaker to play the sound prompt. For the 30m sprint, it was used a measuring tape of 30m and adhesive tape to define the track. For the hand grip strength test, it was used a graded dynamometer with adjustable grip. For the vertical jump test, it was used a Bosco electronic device, and for the sit and reach test, it was used a special box measuring 45 X 35 X 32cm, which features a ruler to measure flexibility.

Shuttle Run: The examined factor is cardiovascular endurance. It was used a track of 20m inside a gym, a measuring tape of 20m, adhesive tape and cones to define the beginning and the end of the 20m track. It was also accustomed a chronometer and the protocol for the administration of the test. Before administering the test, it was checked the speed of the magnetic tape using a one-minute scoring period. The participant had to run between the two lines that define the 20m track, placing one of his legs behind the line until the next sound prompt is heard. If the participant reaches the line before the sound prompt, then he had to wait in line until the prompt is heard. The pace of the race picks up every minute that passes. Every participant has to run in a straight line and not in circles. Every participant should run continuously, for as long as he can, following the indicated pace. The criterion for taking a participant away from the test is when he is at least two steps before the finish line at the time the sound prompt is heard, in a period of two consecutive 20m tracks. Regarding the scoring process, this has to do with the number of successful stages a participant has managed to complete. The measure was the best of the two measured attempts.

Sit and Reach Test: The examined factor of this test is flexibility. The equipment used was a special box measuring 45 X35 X 32cm. The measurements of its upper surface are 55x45cm. This surface expands 15cm beyond the side that the feet of the participant are placed. In the middle of this surface, a scale of 0 to 50cm is marked. A ruler measuring 30cm is freely moving over the surface of the box. The examined subject moves this ruler as he moves his arms over the box. The test happens this way: the tested subject is in a sitting position, and he places his foot soles against the box. The tested subject then reaches for the edge of the box, touching the free moving ruler. The participant folds his torso and stretches his body forward for as long as he can, keeping his knees at tension. He pushes slowly and gradually the ruler with his hands without wobbly movements. He is advised to breathe out while folding his torso, and he is also asked to remain in the final position for at least 2secs. The test is scored by the maximum distance the examined subject can reach with the edge of his fingers. For example, when the participant reaches the toes of his feet, he obtains 15 points. If he overstretches his toes by 7cm, he obtains 22 points. Two tries (for each participant) were allowed, and the participants were given a 15sec break between the tries.

Power Grip: This test examines the factor of isometric strength. To administer this test, it was used a graded dynamometer with adjustable grip. The tested subject takes hold of the dynamometer in his preferred hand, and he grips the handle with maximum strength for at least 2sec. The participant is placed in standing position with his torso and elbow in a 90-degree angle, near his body. The test protocol defines /indicates that the three best tries for each hand should have the duration of 5secs, with a 60secs break between each try per hand. In this case the participants were examined three times in the left and three times in the right hand. The score was the maximum indication of the measuring instrument in kp. So, a result of 24kp scores 24 points for the tested participant.

30m Sprint: The goal of this test is the evaluation of the running speed and it is measured by a chronometer, a measuring tape and cones. The examined participant starts in a standing position runs a straight line of 30m, without competition, at maximum speed based on his personal ability. The timing of his effort starts when his back foot leaves the ground. Before the final test, a warm up and a trial run are allowed, including a break of total rehabilitation (around 5mins). The counting is accurate to centimeters of the second. The time from the start to the crossing of the finish line is noted. Two tries per participant are allowed, while a break of 3 minutes divides those tries.

Vertical Counter Movement Jump in Height (CMJ): The participant of the tests from a standing position, with his feet apart at shoulder length and the hands at the waist, should perform a maximum vertical jump in height after a counter-movement downwards

(the knees bend to almost 90 degrees). The participants have to land in the tip of their toes in the same position where they started their jump. The launch of the jump has to be in one, continuous motion, avoiding the pauses between the contracted and the expanded phase [5]. CMJ is a try when the vertical jump happens due to the activation of the cycle of stretch-contraction [6]. The instrument we used is the Bosco electronic device. In every test it was administered three tries and as a result it was chosen the try with the best result.

Data Collection and Analysis / Statistical Analysis

Somatometrics: To measure the body mass, the participant stands lightly dressed in the middle of the scale, with the weight of his body falling equally between his two feet. The measurement accurate to half a kilo of the participants' body weight (0.5kg) and is repeated twice. Regarding height measurement, each participant stands with the weight of his body equally distributed between his legs, hands, freely hanging on the sides, the soles of his feet touching each other and the head up straight. The height is determined by using a measuring tape, placed on a wall, the moment the examined subject had taken a great breath in and before he starts breathing out again. This measurement follows the accuracy of half a centimeter (0.5cm) and is repeated twice. The progression of the administered tests was a.) sit and reach test, b.) vertical counter-movement jump in height (cmj), c.) shuttle run of 20m, d.) power grip with left and right hand, e.) 30m track race.

Results

Somatometric indexes of the examined students are presented here (table 1):

Table 1: Somatometric Indexes of those Examined

	Height (m)	Body mass (kg)	Body Mass Index (BMI)
1st year students	1.78±0.5	75.30±8.5	23.6±2.3*
3rd year students	1.78±0.6	78.10±7.9	24.7±1.6
SUM	1.78±0.5	76.63±8.2	24.1±2.0

* R < 0.05

As it seems in table 1, significant statistical differences in height were not observed ($t(61) = 0.714$, $p = 0.478$) and the body mass ($t(61) = 1.352$, $p = 0.181$) between first year and third-year students. Although, it was found a significant statistical difference in the mass body index (MBI) ($t(61) = 2.209$, $P = 0.031$) where first years had the advantage over third-years (since they had a smaller MBI = 23.6 compared to 24.7 of the third years). The aim was to show that first year and third-year students were actually the same.

The results of the examined subjects are presented here on table 2.

Table 2: Test Results

	sitar (cm)	Endurance (stages)	sprint (sec)	Lgrip (kp)	Rgrip (kp)	jump (cm)
1st year students	18.10±9.1	8.57±1.6	4.35±0.2	48.5±18.5	55.0±19.4	30.1±5.5**
3rd year students	18.17±11.1	8.93±1.5	4.32±0.3	51.0±14.1	58.2±18.5	34.4±5.7
SUM	18.13±10.0	8.75±1.6	4.34±0.2	49.7±16.4	56.6±18.8	32.2±5.9

** R < 0.01

As far as it concerns about the results in table 2, the main hypothesis in the beginning was that third year students would have better results than first year students by comparing them. Nevertheless, any statistical significant differences were not observed in the tests that were administered, between the first-year and the third year students (for the flexibility test $t(61) =0.025$, $p = 0.980$, for the endurance test $t(61) = 0.889$, $p = 0.378$, for the test of speed $t(61) = 0.485$, $p = 0.630$, for the test of power grip with the left hand $t(61)= 0.572$, $p = 0.569$, for the test of power grip with the right hand $t(61) = 0.648$, $p = 0.520$). The only test in which there was a significant difference between the average values of the first-years compared to the third-years was in the test of the vertical jump (in height) ($t(61) = 2.920$, $p = 0.005$), with the third years achieving a higher jump (34.4cm in comparison to 30.1cm of the first-years).

The relationships between the tests are presented on table 3:

Table 3: Relationships between the Tests

	Endurance	Lgrip	Rgrip	jump
sprint	-0.344**	-0.389**	-0.378**	-0.285*

The relationships between the tests are presented on table 3. As it seems, the subjects' ability to sprint was significantly related with the tests in endurance, power grip, jump (low and average co-relations). Also, as expected, there was a strong correlation between the power grip between the left and the right hand of each tested subject ($r = 0.868$**).

Discussion

Regarding the shuttle endurance run, third-year students completed (on average) 9 stages (tracks) (8.93 με ± 1.5 variance), compared to 8.57 of the first-year students. They are placed in a lower level, when compared to similar test results conducted in the British Armed Forces (BAF) (10.03 ± 1.7 variance) [7]. Regarding the 30m sprint, third-year students ran (on average) 3 hundreds of a second faster than the first-year students (4.32sec in comparison to 4.35sec), again, a result lacking in comparison to British troops / soldiers (4.11 ± 0.2sec variance) [8]. The power grip of the right hand is stronger in comparison to their left-hand power grip, and the differences are: 6.5kp difference in first-year students and 7.2kp difference in third-year students.

In the tests of Bilzon, Scarpello, Smith, Ravenhill, & Rayson troops of the British Navy (BN), appear to be stronger in strength tests (power grip) (the data they collected show: left hand: 52 ± 12.3kp variance and right hand: 59.7 ± 14.7kp variance) [9]. In the test of vertical jump on the spot, it was observed the maximum difference between the scores of the two groups. Third-year students achieved (on average) a jump of 34.4cm in comparison to 30.1cm of the first-year students. Bibliographical references for armies of other countries present similar results: 32.2±5.9cm to 35.3±4.6cm [10]. The results of the study show some superiority when compared to the corresponding results / scores achieved by the crews of the British Navy (BN) (31.7±6.4cm) [11].

The results of the flexibility (sit and reach test) are similar to the corresponding study results performed on military personnel of the United States Armed Forces (USAF) (18.13 ± 10.0cm in comparison to 18.03 ± 8.76cm of the American soldiers [12].

Conclusions

A Comparison Between first- and third-year students of the Military Academy of the Greek Armed Forces Showed Little Change in Strength Tests. This study provides crucial information for the poor database on the ability of physical conditions in the Hellenic Armed Forces (HAF). It is necessary to urge future researchers to up the scale of their sample base and to add more variables to evaluate the physical condition of the Greek servicemen. A safer comparison and a more representative research picture could be painted if someone was to conduct a long-term study featuring the same test-subjects in their regular testing as they grow from first-year students and until they reach their third year. Longer duration studies with larger samples should be conducted to assess the effectiveness of applied training programs in the Schools of the Hellenic Armed Forces. Scientific research in this direction is imperative. Concurrently, fundamental physical fitness parameters should be analyzed to evaluate the performance and readiness of the Hellenic Army [13-40].

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