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Investigation of Body Compositions and Performance Values of Veterans and Young Long-Distance Runners

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ABSTRACT

This study aims to examine the body composition and performance values of veterans and young long-distance runners and to investigate the differences between them. Fifteen athletes, including seven veterans (mean age: 54.,42 ±5.,99 years; mean body weight: 72.,28±3.,72 kg; mean height: 171.,42±5.,34 cm) and eight young-distance runners (mean age: 16.12±0.83 years; mean body weight: 59.,12±5.,35 kg; mean height: 166.,50±3.,84 cm) participated in this study voluntarily. Body mass index, Hand grip strength, Flexibility measurements, Back strength test, Aerobic capacity test and Anaerobic Power test were used for obtaining the data. IBM SPSS 26 version program was used for statistical analyses and the Mann-Whitney U Test, one of the non-parametric tests, was used for pairwise comparisons between groups. It was determined that while the difference between the flexibility, hand grip, back strength and vertical jump values was not significant (p>0.,05), there was a significant difference in the participants' back strength and aerobic capacity values in favour of the young athletes (p<0.,05). According to the body composition values of the participants, it was determined that there was a significant difference in favour of young athletes in body mass index, liquid kg, fat mass and fat percentage values, and a significant difference in favour of veterans in lean body mass, muscle kg and bone mineral values (p<0.,05). While the aerobic and anaerobic capacities of veteran athletes were lower than young athletes, lean mass, muscle kg and bone mineral density values were found to be higher.

Veteran ve Genç Uzun Mesafe Koşucularının Vücut Kompozisyonları ve Performans Değerlerinin İncelenmesi

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ÖZ

Bu araştırmanın amacı; veteran ve genç uzun mesafe koşucularının vücut kompozisyonları ve performans değerlerini incelemek ve veteranlar ile genç sporcular arasındaki farklılıkları ortaya koymaktır. Araştırmaya 7 veteran (yaş ort: 54,42±5,99 yıl; vücut ağırlığı ort: 72,28±3,72 kg; boy ort: 171,42±5,34 cm) mesafe koşucusu ve 8 genç (yaş ort: 16,12 ±0,83 yıl; vücut ağırlığı ort: 59,12±5,35 kg; boy ort: 166,50±3,84 cm) mesafe koşucusu olmak üzere toplamda 15 erkek sporcu gönüllü olarak katılmıştır. Araştırma verileri beden kitle indeksi, el kavrama kuvveti, esneklik

Performans değerleri

ölçümü, sırt kuvveti testi, aerobik kapasite testi ve anaerobik güç testi ile elde edilmiştir. Araştırmanın istatiksel analizleri IBM SPSS 26 versiyon programında ele alınmış olup guruplar arası ikili karşılaştırmalarda non parametrik testlerden Mann-Whitney U Testi kullanılmıştır. Katılımcıların, sırt kuvveti ve aerobik kapasite değerlerinde genç koşucuların lehine anlamlı farklılık ($p<0,05$) olduğu görülürken esneklik, el kavrama, sırt kuvveti ve dikey sıçrama değerleri arasındaki farkın ise anlamlı olmadığı tespit edilmiştir ($p>0,05$). Vücut kompozisyon değerlerinde ise beden kitle indeksi, sıvı kg, yağ kütlesi ve yağ yüzdesi değerlerinde genç atletlerin lehine, yağsız kütle, kas kg ve kemik mineral yoğunluğu değerlerinde ise veteran atletlerin lehine anlamlı farklılık olduğu tespit edilmiştir ($p<0,05$)**.** *Sonuç olarak;* Veteran atletlerin aerobik ve anaerobik kapasiteleri genç atletlerden daha düşük bulunurken yağsız kütle, kas kg ve kemik mineral yoğunluğu değerleri ise daha yüksek bulunmuştur.

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1. Introduction

Increasing world population, technological developments and inactivity are among the most important reasons that negatively affect human health and quality of life. It is known that people are more conscious and willing to participate in recreational and sports activities to improve their quality of life and live healthy and long.

Over the last 20 years, there has been a tremendous increase in the number of older individuals who, in addition to staying healthy, engage in regular exercise and competitive athletics. While most of these individuals prefer to exercise due to its benefits in preventing mortality and increasing physiological functions, the other part competes in veteran competitions focusing on performance (Güven, et al., 2009). Veteran athletes compete in events designed specifically for older adults. Although the age at which one becomes a veteran athlete varies depending on the sport, women are 35 years old and over, and men are 40 years old and over. Competition is graded by age, usually at 5-year intervals. For "senior" gaming events, participation is limited to those aged 50 and over (Rosenbloom and Bahns, 2005).

Determining body composition is the cornerstone of human nutritional assessment for healthcare providers, clinical researchers, and epidemiologists. Similarly, determining lean body mass, muscle mass, fat mass, and bone quantity and quality is a topic of ongoing interest and practice in the multidisciplinary field of exercise science (Lukaski, 2017). There are different methods used to estimate body composition. Bioelectrical impedance analysis is preferred due to its affordable cost and ease of use (Yavuz and Başyiğit, 2023). As age increases, a person's body weight increases. Free fat mass gradually increases after the age of 30. This condition occurs due to the previously discussed decrease in muscle mass and loss of bone mineral. The amount of body fat increases, and lean body weight decreases with aging. It is attributed to the increase in the amount of activity with aging (Günay et al., 2017)

It is known that athletes competing in different sports branches have different heights, weights, fat percentages, lean body mass, muscle mass and even different body proportions, and the potential effect of body composition on performance (Bayraktar and Kurtoğlu, 2009). There are methods to

determine performance values, track and regulate sports efficiency, and objectively reveal numerical values (Cooper and Storer, 2001). Physiological measurements such as body composition such as weight, height, BMI, muscle percentage, lean body weight, fat percentage, bone mineral ratio, body fluid amount, flexibility, hand grip strength, back strength, vertical jump, anthropometric and aerobic capacity related to posture were made in this study.

Knowing various aspects of body composition, especially the amount and distribution of body fat and the amount and composition of lean body mass, affects performance values and other components of health outcomes in athletes. Measurements are increasingly considered valuable in sports settings and clinical practice. It is essential in this study to compare the data obtained from veteran athletes with the data obtained from young athletes in the same branch and to know to what extent older athletes maintain their body composition. The study aims to know how effective veteran long-distance runners' daily running training of an average of 20 km is in maintaining their body composition values, and to reveal positive or negative differences by comparing them with the values of young-distance runners in the same branch.

2. Material and Method

2.1. Study Group

The population of the study is the long-distance runners. The samples are 15 volunteer male athletes, including 7 veterans (mean age: 54.42±5.99 years) and 8 young distance runners (mean age: 16.12±0.83 years), residing in Osmaniye. The distance runners in the study were determined by convenience sampling, one of the purposeful sampling methods. The reason for choosing the research sample was that the veteran runners were competitive athletes who had been in the national teams in the past and still do approximately 20 km of active running training on a daily basis despite their advanced age, and the inclusion criteria were that the young runners were in the national teams and were high-level elite athletes. The data of the study was obtained at Osmaniye Youth and Sports Provincial Directorate Tosyalı Athletics Track in 2023.

2.2. Data Collection Tools

Height and Weight Measurement: The height and weight of samples were measured by the Radwag brand height and weight measuring device. Height (cm) was measured barefoot, and weight (kg) was measured in a T-shirt and shorts.

Body Mass Index (BMI): Body analyses were performed with the Tanita MC-580 Segmental Body Analysis Scale (TANITA MC-580, Tanita, Japan). BMI measurement was made automatically through the program on the computer connected to this device. Participants were informed that they should be

hungry before the tests, should not exercise the day before, and should not consume alcohol and caffeine (Bostan, 2022).

Hand Grip Strength Measurement: The dominant hand grip strength of the participants was measured with a hand dynamometer (Takei, TKK-5401, Japan). While the participant was in an upright position, the dynamometer was adjusted so that the participant could grasp it comfortably. Hand grip strengths were measured while the participant's arm was straight and open to the side at an angle of 10-15 degrees from the shoulder joint. Measurements were made twice with an interval of 3 minutes. The best of the two measurements was calculated and recorded in weight (kg) (Temur and Türker, 2023).

Flexibility Measurements: Sit and Reach test was used to measure flexibility. The participant sat on his hips and stretched his feet on the barefoot test bench. He reached forward with his hands in front, leaning his body forward without bending his knees. He waited at the farthest point for 1–2 seconds without stretching forward or backward. Measurements were made twice, and the highest (cm) value was recorded as the flexibility score (Güder et al., 2022).

Back Strength Test: Back strength was measured with a back and leg dynamometer (Takei, TKK-5402, Japan). After the athletes placed their feet on the dynamometer with their knees slightly bent, their arms stretched, their backs straight and their bodies slightly bent forward, they pulled the dynamometer bar, which they held with their hands, vertically upwards, using the highest amount of force from their back. Athletes performed this pull twice and each athlete's highest value was recorded (Saygın et al., 2005).

Aerobic Capacity Test (20 Meter Shuttle Run): Participants were placed between designated buoys at 20 meters from each other. The sound recording required for the test was started with the sound of a whistle. Participants were asked to reach the next line (one foot must cross the line) by the next sound. The distances of the whistle sound coming from the audio recording started to get shorter and shorter. The tests of the participants who missed the whistle sound twice before reaching the line were completed. Vo^2 max values (ml/kg/min) of each participant were calculated with a calculation ruler specific to this test (Günay et al., 2006).

Anaerobic Power Test (Vertical Jump): Some tests can evaluate an athlete's peak power (a measure of muscular power and speed) and anaerobic capacity, or both. One is the vertical jump test (Sands et al., 2004). Anaerobic power capacities, body weight and vertical jump values of the participants were calculated in Watts (W) by applying the formula in the "Lewis Protocol" (Fox et al., 1988).

$P=\sqrt{(4,9)} * (Body\ weight) * \sqrt{(Jump\ Distance)}$

The athlete stood under the measurement system marked on the wall for the vertical jump test. The participant was asked to fully extend dominant arms and touch them at the highest possible point to

determine the maximum standing reaching height. The athlete was then asked to jump as high as possible with two legs. The difference between the athlete's arm reach and jumping distance was determined and recorded. The test was repeated twice for the athlete, with at least three minutes of rest, and the best result was recorded (Martinez, 2017).

2.2. Statistical Analysis

IBM SPSS 26 version program was used for statistical analysis, and the Mann-Whitney U Test, one of the non-parametric tests, was used for pairwise comparisons between groups.

3. Results

Table 1. Identifying information of participants

Groups	Variables	N	Minimum	Maximum	Mean	Std. Deviation
Veterans	Age (year)	7	44.,00	62.,00	54.,42	5.,99
	Height (cm)	7	163,.00	178.,00	171.,42	5.,34
	Weight (kg)	7	68,00	78.,00	72.,28	3.,72
	Sports age (year)	7	8.,00	23.,00	15.,71	5.,43
Young athletes	Age (year)	8	15.,00	17.,00	16.,12	.,83
	Height (cm)	8	164,.00	170.,00	166.,50	3.,84
	Weight (kg)	8	50.,00	65.,00	59.,12	5.,35
	Sports age (year)	8	3.,00	6.,00	4.,50	1.,06

Table 2. Performance values of participants

Groups	Variables	N	Minimum	Maximum	Mean	Std. Deviation
Veterans	Sports age (year)	7	8.,00	23.,00	15.,71	5.,43
	Flexibility (cm)	7	9.,00	19.,00	12.,57	3.,59
	Hand grip(kg)	7	40.,00	52.,50	44.,92	4.,54
	Back strength(kg)	7	103.,00	155.,00	121.,28	16.,74
	Aerobic capacity (ml/kg/min)	7	40.,80	46.,20	43.,31	2.,24
	Vertical jump (watt)	7	737.,00	1027.,00	873.,71	119.,98
Young athletes	Sports age (year)	8	3.,00	6.,00	4.,50	1.,06
	Flexibility (cm)	8	9.,00	22.,00	16.,12	4.,35
	Hand grip(kg)	8	40.,00	49.,00	45.,00	2.,61
	Back strength(kg)	8	120.,00	166.,00	138.,50	16.,12
	Aerobic capacity (ml/kg/min)	8	46.,80	60.,00	53.,41	4.,30
	Vertical jump (watt)	8	790.,00	975.,00	901.,25	69.,21

Table 3. Mann-Whitney U Test for comparison of performance values of participants

Variables	Groups	N	Mean Rank	Sum of Ranks	U	p
Sports age (year)	Veterans	7	12.,00	84.,00	0.,00	0.,01
	Young athletes	8	4.,50	36.,00		
Flexibility (cm)	Veterans	7	6.,07	42.,50	14.,50	0.,16
	Young athletes	8	9.,69	77.,50		
Hand grip (kg)	Veterans	7	7.,50	52.,50	24.,50	0.,68
	Young athletes	8	8.,44	67.,50		
Back strength (kg)	Veterans	7	5.,50	38.,50	10.,50	0.,04
	Young athletes	8	10.,19	81.,50		
Aerobic capacity (ml/kg/min)	Veterans	7	4.,00	28.,00	.,00	0.,01
	Young athletes	8	11.,50	92.,00		
Vertical jump (watt)	Veterans	7	7.,14	50.,00	22.,00	0.,48
	Young athletes	8	8.,75	70.,00		

As seen in Table 3, it is understood that there is a significant difference between the sports years of veterans and young distance runners in favour of the veterans, and in the back strength values and aerobic capacity values in favour of the young athletes ($p<0.05$). It was determined that the difference between the participants' flexibility, hand grip, back strength and vertical jump values was not significant ($p>0.05$).

Table 4. Body composition values of participants

Groups	Variables	N	Minimum	Maximum	Mean	Std. Deviation
Veterans	BMI (kg/height2)	7	21.,70	27.,00	24.,45	1.,87
	Liquid (kg)	7	40.,20	44.,40	42.,44	1.,69
	Fat mass (%)	7	8.,00	14.,70	11.,85	2.,55
	Lean body mass (kg)	7	54.,70	63.,90	60.,11	3.,16
	Muscle (kg)	7	52.,00	60.,70	57.,10	3.,00
	Body fat percentage (%)	7	11.,70	21.,20	16.,45	3.,27
	Bone mineral density (kg)	7	2.,80	3.,20	3.,01	.,13
Young athletes	BMI (kg/height2)	8	15.,70	20.,90	18.,98	1.,67
	Liquid (kg)	8	36.,90	43.,10	39.,60	2.,08
	Fat mass (%)	8	3.,10	8.,10	5.,35	1.,84
	Lean body mass (kg)	8	49.,20	59.,60	55.,07	3.,50
	Muscle (kg)	8	48.,00	56.,60	52.,46	3.,03
	Body fat percentage (%)	8	5.,20	11.,90	8.,65	2.,50
	Bone mineral density (kg)	8	2.,60	3.,00	2.,80	.,11

Table 5. Mann-Whitney U Test regarding the body composition values of the participants

Variables	Groups	N	Mean rank	Sum of ranks	U	p
BMI (kg/height2)	Veterans	7	12.,00	84.,00	0.,00	0.,01
	Young athletes	8	4.,50	36.,00		
Liquid (kg)	Veterans	7	11.,00	77.,00	7.,00	0.,15
	Young athletes	8	5.,38	43.,00		
Fat mass (kg)	Veterans	7	11.,86	83.,00	1.,00	0.,02
	Young athletes	8	4.,63	37.,00		
Lean body mass (kg)	Veterans	7	10.,86	76.,00	8.,00	0.,21
	Young athletes	8	5.,50	44.,00		
Muscle (kg)	Veterans	7	10.,86	76.,00	8.,00	0.,21
	Young athletes	8	5.,50	44.,00		
Body fat percentage (%)	Veterans	7	11.,86	83.,00	1.,00	0.,02
	Young athletes	8	4.,63	37.,00		
Bone mineral density (kg)	Veterans	7	11.,07	77.,50	6.,50	0.,11
	Young athletes	8	5.,31	42.,50		

According to Table 5, it was determined that there was a significant difference in favour of young athletes in BMI, liquid kg, fat mass and fat percentage values, and in favour of veterans in lean body mass, muscle kg and bone mineral values ($p<0.05$).

4. Discussion

In this research, which was conducted to examine the body composition and performance values of veteran and young long-distance runners and to reveal the differences between the groups, the following results were obtained and supported by discussion with literature information.

It was concluded according to Tables 2 and 3 that the average back strength values were 121.,28±16.,74 kg in veterans and 138.,50±16.,12 kg in young people, and the average aerobic capacity values were 43.,31±2.,24 ml/kg/min in veterans and 53.,41±4.,30 ml/kg/min in young athletes. It was concluded that there was a significant difference between the groups' back strength and aerobic capacity values in favour of young distance runners ($p<0.,05$). Bayraktar et al. (2012), in their study on athletes and wrestlers at Athlete Training Centres, reported that the aerobic capacity values of young athletes were 56.,28±6.,81 ml/kg/min. Bayraktar (2017), in a study involving 685 actively licensed athletes and wrestlers between the ages of 13-17, reported that the aerobic capacity values of young athletes were 58.,31±5.,26 ml/kg/min.

According to the analysis results of 109 studies conducted in 37 countries in which aerobic capacity was determined by the 20 m Shuttle Running Test conducted with children and young athletes, Olds et al. (2006) reported that the average aerobic capacity was 53.,1 ml/kg/min for 15-year-old males (n=22465), 54.,1 ml/kg/min for 16-year-old males (n=13311), and 54.,3 ml/kg/min for 17-year-old

males (n=15108). The results in the literature are parallel to this study in terms of the aerobic capacity values of young athletes.

Eleven males (mean age 58±5) and nine females (mean age 63±6) competing in the 18th European Veterans Athletics Championship (EVAC) held in Germany participated in the study conducted by Bagley et al. (2019), and they concluded that the aerobic capacity values of the athletes were 40.,0±2.,7 (ml/kg/min) for males and 41.,7±3.,1 (ml/kg/min) for females. It has been stated that this situation is related to the slowing down of the heart rate with aging due to degenerative changes in the autonomic nervous system, and as a result of these changes, prolongation of atrioventricular conduction in the conduction pathways, heart rate variability, a decrease in the heart rate response due to exercise and a corresponding decrease in maximum oxygen consumption (aerobic capacity), (Zoghi, 2010).

The reasons for the decrease in muscle strength and volume with aging can be listed as the decline in the nervous system, the decrease in growth hormone, androgens and oestrogen hormones, and the decrease in basal metabolic rate (Nair, 2005; Saini et al., 2009). In parallel with this statement, it was concluded in this study that the back strength value of veterans was lower than that of young athletes.

Hand grip strength is a function of the muscles in the forearm in addition to the muscles in the hand (Zorba, 2000). As a result of the study, it was concluded that the average value of hand grip strength of veterans was 44.,92±4.,54 kg and that of young people was 45±2.,61 kg. According to Mackenzie (2005), in hand grip strength tests for male athletes between the ages of 16-19, norm values are medium between 45-50 kg, above average between 51-56 kg, and excellent for values bigger than 56 kg. The value determined for young athletes in this study findings is parallel to the norm level values (medium).

According to the results in Tables 4 and 5, the average body fat percentage was 16.45±3.27% in veterans and 8.,65±2.,50% in young people, and this result was found to be significant in favour of young people ($p<0,05$). Body fat percentage is considered not only a health criterion but also an important indicator of sports performance (Bayraktar, 2017). It is known by sports scientists that there is a negative relationship between performance criteria and body fat percentage in many sports branches (Açıkada et al., 1991). It was concluded in this study that the average body fat percentage was 16.,45±3.27% in veterans and 8.,65±2.,50% in young athletes and that this result was significant in favour of young people. Bayraktar (2017) reported that the average body fat percentage of young athletes between the ages of 13-17 who actively engage in licensed sports was 10.,80±3.,76. Mackenzie (2005) stated that the body fat percentage value should be between 6-12% in young male athletes and reported 8-10% as the norm value in runners. The body fat percentage values of the young athletes in the study group are similar to the values in these studies.

It is known that the body mass index (BMI) value, which indicates a person's weight limits, is related to total body fat (Açıkada, 2008). As a result of this study, it was concluded that the average BMI value of veterans was 24.,45 kg/m² and that of young athletes was 18.,98 kg/m². In the study

conducted by Kusy and Zieliński (2014), the BMI values of distance runners with an average age of 46.,8±15.,4 years were reported as 23.,0±2.,0. According to the BMI classification made by the World Health Organization (WHO), if BMI is below 18.,5 kg/m^2, it is underweight; if it is between 18.,5-24.,9 kg/m^2, it is normal; if it is between 25-29.,9 kg/m^2, it is overweight; and if it is above 30 kg/m^2, it is obese. When the study findings were compared with these values, it was observed that BMI values in both groups were at the accepted normal level.

According to the bone mineral density results in Tables 4 and 5, it was determined that there was a significant difference in favour of young athletes in BMI, liquid kg, fat mass and fat percentage values, and a significant difference in favour of veterans in lean mass, muscle kg and bone mineral values ($p<0.,05$). In the study, which was conducted to determine the intensities of different exercise and load types on the values, in which 15 runners, consisting of women cyclists, swimmers and sedentary women, participated, the bone mineral density of the participants' total body, waist and femoral neck was measured and it was reported that the values of runners were higher than those of swimmers and sedentaries. Because running activities place greater stress on bones, bone mineral density in certain areas has been reported to be higher than in other groups (Duncan et al., 2002). As a result of the study investigating the bone mineral density levels of sedentary people in the same age group, athletes and individuals in different occupational groups (barbers, industrial workers and drivers), the bone mineral density of athletes and industrial workers was found to be higher, and it was emphasized that the exercises planned for the prevention of osteoporosis should be resistance exercises with high impact impact (Hazar et al., 2020).

In conclusion, veterans' aerobic and anaerobic capacities were low, but their lean mass, muscle kg and bone mineral density values were high. It is thought that the high values found in veteran runners are due to the fact that they have been practicing sports for many years. Considering that the average age of veteran runners is 54.42, daily 20 km running training may cause different physiological adverse effects in these people. For this reason, despite the old age, it is thought that it would be appropriate for them to focus on moderate aerobic exercises rather than intense and maximal loads in their training content. In addition, it is recommended that they focus on exercises such as high-impact games (rope jumping, climbing and descending stairs, volleyball, basketball) to preserve bone mineral content, and to investigate the physiological negative effects of heavy and intense training in veteran distance runners over the age of 50.

Conflict of Interest

The authors of the article declare that they do not have any conflict of interest.

Researchers' Contribution Percentage

The authors declare that they have contributed equally to the article.

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