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Original empirical article

INDICATORS OF PHYSICAL FITNESS AMONG THE ELDERLY BASED ON THE VALUES OF THEIR BMI

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Abstract. *The modern way of life has led to an increase in the population of the elderly. This occurrence has led to the need for further research on the factors whose action enables the elderly to fulfill their everyday needs by themselves. Some of the more significant factors include physical abilities, which are expressed by the parameters of physical fitness and body mass. With the aim of determining the differences in the indicators of physical fitness depending on the size of the Body Mass Index (BMI) of the elderly, we used the battery of the Senior Fitness Test (SFT), which consisted of the 8-Foot Up-and-Go, Back Scratch, Chair Sit-and-Reach, 2-Minute Step Test, 30-Second Chair Stand, and the Arm Curl (Rikli & Jones, 2001). The study was carried out on a sample of 1288 participants (594 men and 694 women) aged from 60 to 80, who live in their own homes in the cities or villages of Central, Eastern and South Serbia. On the basis of the value of their BMI, the participants were divided into three sub-samples: (1) participants with normal body weight, (2) participants with increased body weight (overweight) and (3) obese individuals. Further subsamples of men and women were isolated. The calculation of the statistical significance of the difference between the subsample of men and women was determined based on the unifactorial ANOVA analysis ANOVA (P≥0.05). The results are shown in tabular form, while the discussion and conclusions point out the significant difference in the indicators of SFT between the subsamples determined based on the BMI in favor of participants with normal weight.*

Key words: *physical fitness, elderly, BMI.*

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INTRODUCTION

Physical fitness of the elderly includes parameters of physical ability, which is necessary for the performance of everyday activities.

The level of physical fitness depends on the actions of factors which are both internal and external. Health is one of the more important factors, which enables independence in the performance of daily or occasional physical activities. Their health state influences the elderly to be more physically active or more passive. During the aging process, insufficient physical activities lead to changes in physical (functional) abilities, while their level is significantly related to the decrease in the functions necessary for the daily lives of men (Nagamatsu, Oida, Kitabatake, Kohno, Egawa, Nezu, & Arao, 2003).

The elderly who take part in physical activities indicate a greater level of physical fitness (Arao, Oida, & Nagamatsu, 1998). Significant differences in the indicators of physical fitness, between physically active and passive individuals, were determined by Heuvelen, Stevens, & Kempen (2002), Wong & Cheung (2005), et al.

Constant exercise enables sufficient benefits for adults, and makes special contributions to the quality of life and the perpetuation of long-term independence (DiPietro, 2001, Shephard, 1993).

Rikli & Jons (1999b) determined the norms of functional fitness among the elderly. For all the abilities which are evaluated by the battery of measuring instruments of physical fitness, a statistically significant difference was determined between the sexes. In the case of most age groups, the level of physical fitness decreases, as determined by Rikli & Jons (2001); Heuvelen, Stevens, & Kempen (2002).

The connection between cardiorespiratory fitness, body composition and the mortality rate were studied by Sui et al. (2007). The level of cardiorespiratory fitness was evaluated by using maximal intensity exercises, while body composition, that is, the level of obesity was evaluated on the basis of the values of the BMI, waist volume and the percentage of body fat. The research results have shown that the indicators of physical fitness are a significant predictor of the mortality rate of the elderly, independently of the overall or abdominal obesity.

An entire sequence of studies exists which had as its aim to determine the effects of various exercise programs on the fitness abilities of the elderly, and whose effects are primarily positive, including Suomi, & Collier (2003), Hruda, Hicks, & McCartney (2003), Toraman, Erman, & Agyar (2004), Seynnes, Fiatarone Singh, Hue, Pras, Legros, & Bernard (2004), Yamauchi, Islam, Koizumi, Rogers, Rogers, & Takeshima (2005), and Simon, & Andel (2006).

The dependence of physical fitness on nationality or a certain geographic area, as well as any comparative analysis were studied by Malina (2001) and Yuksek & Cicioglu (2005).

Regular physical exercise and daily physical activities are the necessary condition for normal functioning of the elderly, while the optimal functioning of the individual is confirmed by higher and more optimal levels of fitness indicators. On the basis of the results of their research, Hoehner, Handy, Yan, Blair, & Berrigan (2011) concluded that increased physical activity among individuals aged 18 to 90 are positively related to increased cardiorespiratory fitness and a smaller BMI. It is assumed that increased body weight among the elderly, that is, the values of the BMI have the appropriate influence on the performance of life activities which require strength, agility, stamina and agility/dynamic balance.

The basic hypothesis of this research is that the indicators of physical fitness among elderly men and women will depend on group affiliation based on the BMI (normal, overweight and obese), that is, that the best results will be achieved by men and women with a normal BMI, and the worst results by the men and women in the group of obese participants.

The basic aim of this research was to determine the statistical significance of the difference in the indicators of physical fitness between the subsamples of men and women classified based on their BMI into a group with normal body weight, a group with increased body weight and group of obese participants. The second aim is to determine the statistical significance of the difference in the indicators of physical fitness of the elderly depending on their age.

METHOD

The participants

The sample of participants was selected from a population of the elderly aged from 60 to 80, of both ages. The sample consisted of 1288 participants (594 men and 694 women), who live in their own households in the cities and villages of Central, Eastern and South Serbia.

To calculate the values of the BMI we used a standard procedure based on the formula BMI = Body weight [kg] / Body Height [m^2]. In the study, we considered participants with a BMI of 20.00 to 24.99 kg/m^2 as having normal body weight, overweight participants had a BMI in the range from 25.00 to 29.99 kg/m^2, and obese participants had a BMI of 30 or more, irrespective of their gender (WHO, 2000; American College of Sports Medicine, 2006; Seidell & Flegal, 1997). On the basis of the criterion of the size of the BMI and based on age, we identified three subsamples each for each gender (1) participants with normal body weight, (2) participants with increased body weight and (3) obese participants.

Table 1 shows that the classification of the participants into subsamples based on gender, age, BMI and % of the overall number of participants in relation to the category of the size of the BMI.

The research was carried out individually in facilities which satisfied the criteria for the fitness testing of functional abilities. Prior to the study, the participants voluntarily agreed to the conditions of the testing. All of the measurings were carried out by male or female students at sports departments, who were instructed in the technology of measuring and handling the elderly.

The measuring instruments

The constructors of the battery of the Senior Fitness Test (SFT) for the evaluation of functional fitness, which was used in this research, are experts from California State University in Fullerton (Rikli & Jones, 2001). The battery consisted of six measuring instruments, which were used for testing individuals aged 60 to 90.

In this research the following measuring instruments from the battery of the Senior Fitness Test were used: the 8-Foot Up-and-Go (used to evaluate agility/dynamic balance), the Back Scratch (used to evaluate shoulder mobility), the Chair Sit-and-Reach (used to

evaluate the mobility of the lower body), the 2-Minute Step Test (used to evaluate aerobic and anaerobic muscle endurance), the 30-Second Chair Stand (used to evaluate the strength of the lower part of the body) and the Arm Curl (used to evaluate arm strength). Valid metric characteristics of the cited tests were determined in the research of Rikli & Jones (1999a).

Statistical analyses

For the obtained data, the basic parameters of descriptive statistics were calculated (the means and the standard deviation). The means of the BMI were used to classify the participants into certain groups in regards to the degree of obesity. In order to determine the existence of any significant differences between the groups, an analysis of variance was used (the one-way ANOVA). The level of significance was defined as $P \geq 0.05$. The results were processed with the help of the statistical package STATISTICA 7.0 (StatSoft. Inc., Tulsa, OK, USA).

RESULTS

Table 1. The number and classification of the participants into subsamples based on the size of the BMI.

Gender	Age range	Overall number of participants	The number and percentage of participants in the subsamples based on the values of the BMI						Overall % of participants based on gender in the categories based on BMI		
			20-24,99 normal	%	25-29,99 overweight	%	≥30 obese	%	20-24,99 normal	25-29,99 overweight	≥30 obese
M	60-69	349	123	≈35	191	≈55	35	≈10	38,55	50,84	10,61
	70-80	245	106	≈43	111	≈45	28	≈11			
F	60-69	354	140	≈40	159	≈45	55	≈15	38,47	47,83	13,83
	70-80	340	127	≈37	173	≈51	40	≈12			

Table 2. The physical characteristics of the participants.

	Men		
	60-69 n=349	70-80 n=245	Total n=594
Age	63.87 ± 2.77	74.28 ± 3.12	67.73 ± 6.61
Height (cm)	176.34 ± 8.78	174.50 ± 11.79	175.62 ± 9.78
Weight (kg)	82.33 ± 12.01	82.65 ± 15.10	82.26 ± 31.33
BMI (kg/m^2)	26.65 ± 6.26	27.95 ± 2.72	27.04 ± 13.88

Values are Means ± Standard deviation

For the subsample of men aged 60 to 69 we noted statistically significant differences between the group with normal body weight and the obese group for Back Scratch, the 8-Foot Up-and-Go and the Chair Sit-and-Reach, while for the Arm Curl a significant difference between the obese participants and participants with increased body weight was determined.

Table 3. The differences in the parameters of the SFT of men within the age groups determined based on their BMI.

		Normal n=123	Overweight n=191	Obese n=35	Total n =349
60-69	Back Scratch	-3.27 ± 5.21¶	-3.85 ± 5.20	-5.74 ± 5.46¶	-3.84 ± 5.26
	Chair Sit-and-Reach	-0.60 ± 9.40	0.70 ± 9.94	-2.45 ±10.57	-.11 ± 9.86
	8-Foot Up-and-Go	6.01 ± 1.36*¶	6.60 ± 1.40*	6.68 ± 1.63¶	6.41 ± 1.44
	30-Second Chair Stand	15.38 ± 5.92*¶	13.95 ± 5.27*	12.27 ± 4.69¶	14.26 ± 5.53
	Arm Curl	17.48 ± 6.23	16.56 ± 6.14#	19.55 ± 6.42#	17.24 ± 6.27
	2-Minute Step Test	98.68 ±20.30	93.65 ±23.30	90.82 ±17.84	95.06 ±21.64

		Normal n=106	Overweight n=111	Obese n=28	Total n=245
70-80	Back Scratch	-4.02 ± 5.91¶	-5.03 ± 6.00#	-9.67 ± 5.01¶#	-4.99 ± 6.04
	Chair Sit-and-Reach	1.68 ±12.12	1.86 ±10.25	3.63 ±14.39	1.98 ±11.57
	8-Foot Up-and-Go	7.10 ± 1.65¶	7.57 ± 1.47	8.30 ± 1.80¶	7.46 ± 1.62
	30-Second Chair Stand	13.17 ± 6.78	12.05 ± 4.90	11.86 ± 4.69	12.51 ± 5.77
	Arm Curl	16.36 ± 7.97	15.16 ± 5.66	15.93 ± 7.05	15.76 ± 6.88
	2-Minute Step Test	88.76 ±21.67	81.97 ±26.51	81.40 ±22.72	84.73 ±24.24

* - a statistically significant difference between the Normal and Overweight participants,
¶ - a statistically significant difference between the Normal and Obese participants,
# - a statistically significant difference between the Overweight and Obese participants

For the subsample of men aged 70 to 80 there are statistically significant differences in the Back Scratch and the 8-Foot Up-and-Go between participants with normal body weight and obese participants, and for Back Scratch between participants with increased body weight and obese participants.

Table 4. Differences between the groups (based on age) in the SFT parameters among men.

	Age 60-69			Age 70-80		
	Normal n=123	Overweight n=191	Obese n=35	Normal n=106	Overweight n=111	Obese n=28
Back Scratch	-3.27 ±5.21	-3.85 ±5.20	-5.74 ±5.46®	-4.02 ±5.91	-5.03 ±6.00	-9.67 ±5.01®
Chair Sit-and-Reach	-0.60 ±9.40	0.70 ±9.94	-2.45 ±10.57®	1.68 ±12.12	1.86 ±10.25	3.63 ±14.39®
8-Foot Up-and-Go	6.01 ±1.36Ω	6.60 ±1.40‡	6.68 ±1.63®	7.10 ±1.65Ω	7.57 ±1.47‡	8.30 ±1.80®
30-Second Chair Stand	15.38 ±5.92Ω	13.95 ±5.27‡	12.27 ±4.69	13.17 ±6.78Ω	12.05 ±4.90‡	11.86 ±4.69
Arm Curl	17.48 ±6.23	16.56 ±6.14‡	19.55 ±6.42®	16.36 ±7.97	15.16 ±5.66‡	15.93 ±7.05®
2-Minute Step Test	98.68 ±20.30Ω	93.65 ±23.30‡	90.82 ±17.84	88.76 ±21.67Ω	81.97 ±26.51‡	81.40 ±22.72

Legend: Ω - a statistically significant difference between the Normal participants,
‡ - a statistically significant difference between the Overweight participants,
® - a statistically significant difference between the Obese participants

For the subsample of men with normal body weight there are statistically significant differences for the 8-Foot Up-and-Go, the Chair Sit-and-Reach and the 2-Minute Step Test.

For the subsample of men with increased body weight there are statistically significant differences for the 8-Foot Up-and-Go, the Chair Sit-and-Reach, Arm Curl and the 2-Minute Step Test.

For the subsample of men who are obese there are statistically significant differences in Back Scratch, Chair Sit-and-Reach, the 8-Foot Up-and-Go and the Arm Curl.

Table 5. General descriptive statistical parameters of the subsample of women.

	Women		
	60-69 n=354	70-80 n=340	Total n=694
Age	63.75 ± 2.89	73.93 ± 2.94	69.23 ± 7.81
Height (cm)	164.67 ± 6.48	166.48 ± 37.35	165.17 ± 23.12
Weight (kg)	70.64 ± 12.81	68.84 ± 11.74	69.74 ± 12.44
BMI (kg/m^2)	26.10 ± 4.94	25.46 ± 4.48	25.83 ± 4.73

Table 6. The overview of the statistical significance of the coefficients of the differences in the ANOVA for the SFT parameters within the subsample of women depending on their age groups and BMI categories.

		Normal n=140	Overweight n=159	Obese n=55	Total n =354
60-69	Back Scratch	-1.50 ± 4.09*	-3.22 ± 4.84*	-3.25 ± 4.97	-2.41 ± 4.58
	Chair Sit-and-Reach	.56 ± 10.85¶	1.60 ± 10.77#	6.38 ± 10.81¶ #	1.87 ± 10.95
	8-Foot Up-and-Go	6.68 ± 1.56	6.60 ± 1.39	6.85 ± 1.52	6.67 ± 1.48
	30-Second Chair Stand	14.73 ± 4.44¶	13.38 ± 5.97	12.31 ± 4.51¶	13.75 ± 5.25
	Arm Curl	13.86 ± 6.13	13.56 ± 5.37	13.49 ± 5.37	13.67 ± 5.69
	2-Minute Step Test	84.92 ± 25.29	80.63 ± 31.73	77.24 ± 20.18	82.48 ± 26.19

		Normal n=127	Overweight n=173	Obese n=40	Total n=340
70-80	Back Scratch	-3.30 ± 4.64	-3.39 ± 5.31	-5.50 ± 4.90	-3.66 ± 4.93
	Chair Sit-and-Reach	1.39 ± 14.79	2.78 ± 14.28	2.83 ± 13.61	2.05 ± 14.40
	8-Foot Up-and-Go	7.15 ± 1.50	7.37 ± 1.37	7.53 ± 1.21	7.27 ± 1.42
	30-Second Chair Stand	12.56 ± 5.47¶	11.32 ± 4.63	9.80 ± 4.58¶	11.70 ± 5.15
	Arm Curl	11.97 ± 6.30	12.38 ± 7.30	12.44 ± 5.62	12.18 ± 6.51
	2-Minute Step Test	82.98 ± 23.17	80.87 ± 24.36	79.19 ± 22.32	81.68 ± 23.27

* - a statistically significant difference between the Normal and Overweight participants,
¶ - a statistically significant difference between the Normal and Obese participants,
# - a statistically significant difference between the Overweight and Obese participants

Table 6 shows the results for the fitness abilities of women classified into categories according to their BMI, and into two groups based on age. In the subgroup of women aged 60 to 69, statistically significant differences were determined between the participants with normal body weight and obese participants for Chair Sit-and-Reach, the 30-Second Chair Stand. For the Chair Sit-and-Reach, a difference was determined between participants with increased body weight and obese participants.

In the subgroup of women aged 70 to 80, a statistically significant difference was determined between the participants with normal body weight and obese participants for the 30-Second Chair Stand.

Table 7. Differences between the groups (based on age) given in SFT parameters among the women.

	Age 60-69			Age 70-80		
	Normal n=140	Overweight n=159	Obese n=55	Normal n=127	Overweight n=173	Obese n=40
Back Scratch	-1.50± 4.09 $^{\Omega}$	-3.22± 4.84	-3.25± 4.97	-3.30± 4.64 $^{\Omega}$	-3.39± 5.31	-5.50± 4.90
Chair Sit-and-Reach	0.56±10.85	1.60±10.77	6.38±10.81	1.39±14.79	2.78±14.28	2.83±13.61
8-Foot Up-and-Go	6.68± 1.56 $^{\Omega}$	6.60± 1.39‡	6.85± 1.52	7.15± 1.50 $^{\Omega}$	7.37± 1.37‡	7.53± 1.21
30-Second Chair Stand	14.73± 4.44$^{\Omega}$	13.38± 5.97‡	12.31± 4.51$^{\circledR}$	12.56± 5.47$^{\Omega}$	11.32± 4.63‡	9.80± 4.58 $^{\circledR}$
Arm Curl	13.86± 6.13$^{\Omega}$	13.56± 5.37	13.49± 5.37	11.97± 6.30$^{\Omega}$	12.38± 7.30	12.44± 5.62
2-Minute Step Test	84.92±25.29	80.63±31.73	77.24±20.18	82.98±23.17	80.87±24.36	79.19±22.32

Legend: Ω - a statistically significant difference between the Normal participants,
‡ - a statistically significant difference between the Overweight participants,
® - a statistically significant difference between the Obese participants

Between the women with normal body weight aged 60-69 and female participants aged 70-80 statistically significant differences were determined for: Back Scratch, the 8-Foot Up-and-Go, the 30-Second Chair Stand and Arm Curl.

Between women with increased body weight and who belonged to two age groups a statistically significant difference was determined for the 8-Foot Up-and-Go and the 30-Second Chair Stand.

Between obese women of the same studied periods a statistically significant difference was determined for the 30-Second Chair Stand.

DISCUSSION

In the subsample of men and women aged 60 to 69, when we compared the results of the physical fitness of different categories determined based on the values of the BMI (Table 3 and Table 6) between participants with normal body weight and obese participants (men and women) there is a statistically significant difference in the average values for the mobility of the shoulder belt and leg strength.

The mobility of the shoulder belt enables numerous activities in everyday life. It is assumed that it is necessary for men and women in the same way, just like mobility decreases due to obesity in the same manner among men and women. Increased body weight, to the extent that the individual is classified as obese, probably decreases the volume of movement which is necessary in the shoulder belt and in that way decreases mobility itself. According to Manandhar (1995), in the research carried out by Bassey et al. (1989), significant negative relations were obtained between the BMI and amplitude movement in the shoulder belt in a sample of elderly women who lived in their own households.

Leg strength and lower body strength are necessary in order for people and women to move around normally, climb stairs, and perform everyday activities. Both men and women with normal body weight achieved better results, which are reflected in the greater

number of repetitions of the Chair Sit-and-Reach in a given period of time. We can assume that obesity decreases the speed of leg movement from a seated to a standing position and back to the seated position, and thus has a negative influence on the leg strength.

These results match those of Apovian, Frey, Wood, Rogers, Still, & Jensen (2002) who have evaluated the physical functions of elderly women. They set goals to evaluate physical fitness based on a combination of tasks in order to quantify the correlation between the derived factors and the BMI. A higher BMI is significantly related to a worse function of the upper and lower body, but not with strength or coordination. It was concluded that a higher BMI probably has a different influence on special functions of the upper body than on the lower body. The influence of the BMI on physical functions can be seen more clearly through interventions, which are constructed so that they affect the independent lifestyle of obese elderly women.

In the subsample of men aged 60 to 69 between the subgroup with normal weight and subgroup of overweight participants, a significant difference was determined in agility, that is, dynamic balance and arm strength.

For the elderly, agility is necessary for movement and coordination in space. It is assumed that elderly men with increased body weight, as well as obese men, are less successful in certain activities which require agility and dynamic balance for their performance. Increased body weight and obesity probably decrease the speed necessary for the solution of tasks in space, and thus decrease agility as well.

On the other hand, the results for hand strength indicate that obese participants were more successful in performing tasks in comparison to participants with normal or increased body weight. Arm strength is necessary for the performance of household and other activities related to lifting a weight or performing various activities involving a load. On the basis of the results of our research, obesity does not impede the achievement of a greater number of movements involving load on the arms in the case of men.

In the subsample of women aged 60 to do 69, between the subgroup with normal body weight and the subgroup with increased body weight and subgroup of obese participants, a statistically significant difference in lower body mobility was determined. Lower body mobility is necessary for movement and motions in everyday life, which is based on the ability to lower one's upper body down towards one's feet. The movements of women with increased body weight, especially the movements of obese participants, which require lower body mobility, to a certain extent shows signs of decreased amplitudes. It is assumed that women put on more weight in the lower part of their bodies and that this creates greater difficulties for them.

In the subsample of participants aged 70 to 80, in relation to gender, no statistical significant differences were determined between the average values for the same fitness ability.

In the subsample of men aged 70 to 80, between the participants with normal body weight and participants with increased body weight and obese participants, a statistically significant difference in most of the values of the means for the variable of shoulder mobility and agility was determined (Table 3 and Table 6). These results match the results obtained on a subsample of elderly men aged 60 to 69.

In the subsample of elderly female participants aged 70 to 80 a statistically significant difference was determined for the means of the variables of leg strength between the participants with normal body weight and obese participants. These results also match the results obtained for the subsample of elderly women aged 60-69. It is assumed that obe-

sity and increased body weight have similar effects on the strength and mobility of the elderly, irrespective of their age and gender.

By comparing the sizes of the means for the studied indicators of physical fitness in the subsamples determined based on BMI, and in relation to age (Table 4 and Table 7), the obtained numeric indicators confirm that there are numeric differences in all of the studied abilities. All of the abilities show weaker results for the participants aged 70 to 80 in comparison to participants aged 60-69. Most of the obtained differences are statistically significant in the studied abilities between participants with normal body weight, participants with increased body weight and obese participants of different ages. In addition to the significance of the differences in abilities of strength and mobility, we should especially point out the difference in the abilities of agility, that is, dynamic balance, which is clear in all the subsamples based on the categories of the BMI. It is assumed that this ability to a great extent decreases depending on age, irrespective of the values of the BMI and irrespective of gender.

The indicators of muscle strength among participants who were in their 70s are significantly smaller than in the case of participants in their 60s, in the case of both genders, which has been indicated by the research results for muscle strength, flexibility and the anthropometric parameters of the elderly (Miyatake, Miyachi,Tabata, & Numata, 2012). They compared the achieved levels of strength and flexibility among men and women in relation to age, as well as in relation to the need for medication to treat various illnesses. Men and women in their 60s achieved better results than men and women in their 70s, including those who were not undergoing therapy.

Era, Schroll, Hagerup, & Jürgensen (1997), on a sample of participants aged 50 to 80, both men and women born in 1914, evaluated maximal strength five times. It was the kind of strength that can be developed through work. The participants were tested at the ages of 50, 60, 70, 75 and 80. On the basis of a cross-sectional comparison of the obtained data on the participants, it was determined that the means of the annual reduction in the maximal strength of the men was 1.56%, and 1.80% among the women. Once the results of the longitudinal and cross-sectional analysis were compared, the authors obtained similar results, which indicated a decrease in maximal strength over the years, especially in the case of the women.

Of course, we should also mention the results obtained for the 2-Minute Step Test, which was used to evaluate aerobic and muscle endurance. The division of the participants based on the values of the BMI has not indicated any differences between the subsamples of men and women for 2-Minute Step Test in our study. The results for this test are not in agreement with those from the research of Lakoski, Barlow, Farrell, Berry, Morrow & Haskell (2011), who have indicated that there is a statistically significant interaction between BMI and cardio-respiratory fitness, that is, participants with normal body weight achieved better results when compared to obese participants. It was concluded that the BMI is the most significant risk factor related to cardiorespiratory fitness. For a similar amount of physical activity, a participant of normal weight in the cited research, achieved higher levels of cardiorespiratory fitness in comparison to obese participants.

By comparing the results of our research achieved during the aforementioned tests on the subsamples of participants belonging to different categories based on the BMI of elderly men, in relation to age, statistically significant differences were obtained for aerobic/muscle endurance among participants with normal body weight and participants with increased body weight. We could conclude that even the indicators of ability on the 2-Minute Step Test permanently decrease depending on age, irrespective of gender.

CONCLUSION

A sample of 1288 participants aged 60 to 80, of both genders, was used to study the differences in the achieved results on a battery of SFT tests. The differences were determined for the subsamples which were obtained based on age and membership in a category based on the BMI. The differences were determined by a statistical significance of the coefficients in the ANOVA analysis ($P \geq 05$).

The determined statistically significant differences confirm the basic assumption that the indicators of physical fitness of elderly men and women differ in a statistically significant manner depending on the group they belong to, based on their BMI (normal weight, overweight and obese). The best results were achieved by men and women with a normal a BMI, while the worst results were achieved by men and women belonging to the group of obese participants.

On the basis of the indicators of the significance of these differences, the analysis and discussion of the results for the physical fitness of elderly individuals, the indicators on the SFT have been proven to decrease depending on age. At the same time, we can prove that obese participants achieved lower values on the SFT test, which leads us to conclude that the recommendation that elderly individuals should be physically active is justifiable, and that they might even be included in various programs of regular physical education exercise.

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POKAZATELJI FIZIČKOG FITNESA STARIJIH LJUDI U ZAVISNOSTI OD VREDNOSTI INDEKSA TELESNE MASE

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Savremeni način života uslovio je uvećanje populacije starijih osoba. Zbog te pojave istaknuta je potreba da se istražuju faktori čije delovanje omogućava starijim osobama da same mogu da zadovoljavaju svoje životne potrebe. Neki od značajnjih faktora su fizičke sposobnosti, koje se iskazuju parametrima fizičkog fitnesa i telesna masa. Sa ciljem da se istraže razlike u pokazateljima fizičkog fitnesa u zavisnosti od veličine Ineksa Telesne Mase (engl. Body Mass Index-BMI) starih ljudi primenjena je baterija Senior fitnes testa (SFT) koja sadrži 8-Foot Up-and-Go, Back Scratch, Chair Sit-and-Reach, 2-Minute Step Test, 30-Second Chair Stand i Arm Curl (Rikli i Jones, 2001). Istraživanje je organizovano na uzorku od 1288 ispitanika (594 muškarca i 694 žena) starih od 60 do 80 godina, koji žive u sopstvenim domaćinstvima u gradovima i selima Centralne, Istočne i Južne Srbije. Na osnovu veličine BMI ispitanici su klasifikovani i tri subuzorka: (1) sa normalnom telesnom težinom, (2) sa povećanom telesnom težinom i (3) gojazne osobe. Izdvojeni su subuzorci za muškarce i žene. Izračunavanje statističke značajnosti razlika između subuzoraka za muškarce i žene, utvrđeno je jednofaktorskom analizom ANOVA ($P \geq 0.05$). Rezultati su prikazani tabelarno, a u diskusiji i zaključcima istaknuta je značajna razlika u pokazateljima SFT između subuzoraka prema BMI u korist ispitanika sa normalnom telesnom težinom.

Ključne reči: *fizički fitnes, starije osobe, BMI.*