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Effects of physical activity on women's body composition

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Abstract. *There are many publications that try to explain the problem of the influence of physical activity on body composition. The aim of this study was to determine the extent to which physical activity has an impact on the body composition of the female population. The method consisted of collecting relevant literature, tabulation and further analysis. We conclude that physical activity has significant effects on the body composition of women and as such has a positive impact on health. Encouragement towards a better diet, promotion and exercise of physical activities to a greater extent is one of the preconditions for timely sanctioning of the problem of poor body composition.*

Key words: *BIA, physical activity, fat, water, muscle, sedentary*

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Introduction

The urban and modern way of life, both in the urban and rural population, has caused a characteristic phenomenon, which in modern man is reflected in the reduced volume of mobile habitual activities. This phenomenon, defined as hypokinesia, results in negativity. The basic characteristic of hypokinesia can be recognized in the specific negative adaptation of the organism, primarily in relation to the reduction of physical ability, ie to the reduction of the level of physical - work readiness of an individua[11,3,18]. The phenomenon of hypokinesia, improper diet with consequent obesity and stressful lifestyle with consequent increased nervous tension and physical and social exhaustion of the individual, together they are the causes of the phenomenon defined as the morbid triassic - triple syndrome which is the most common cause of illness and death of modern man[13,16,22.] Health, in addition to the basic biological connotation of the absence of disease in a given individual, has other, multidimensional benefits of the individual and society as a whole, such as the social, psychological, and already mentioned, physical-work dimension. We can say that health represents the full ability to adequately and effectively realize all the challenges imposed by everyday life and is basically a condition for the full realization of the potential of each individual.

However, the indirect consequence of hypokinesia, through the adaptive biological mechanisms of the organism, conditions that the man of the modern age becomes more and more ill, primarily from the so-called. non-communicable diseases, ie diseases of the "modern age" such as: obesity and obesity, various forms of diabetes, increased levels of various cardiovascular disorders and diseases, to have more and more osteo-arthritic problems, etc. Unfortunately, the given negative tendencies were noticed in the younger population, and even in the population of school youth, both in Europe, America, and in the Republic of Serbia[5,17,20.] The aforementioned fact suggests that a sedentary lifestyle in our area includes a much higher percentage of women, and thus indicates that there is more possibility for indirect consequences for women's health. Due to all the above facts,

Subject, Aim and Tasks of the work

Subject of work

Based on numerous studies, the increasingly frequent occurrence of a sedentary lifestyle and obesity in women of different ages has been recognized. Under the influence of hypokinesia and consequently obesity, women's health is characterized by an enormous increase in the level of the presence of so-called chronic - non-communicable diseases of modern civilization.

Precisely because of this, the subject of this research is the assessment of body composition in sedentary women.

The goal of the work

In relation to the defined subject and problem of this research, as well as based on the results of previous research, it is considered and can be concluded that research in the coming periods should be more based on assessment, monitoring, control and analysis of body composition in sedentary women. the effect of exercise treatment. The primary goal of this study is to determine which method for assessing body composition is most commonly used and is most applicable in sedentary women. Secondary goals relate to 1) determining the current state of body composition in sedentary women 2) comparative results of methods of measuring and assessing body composition in sedentary women and 3) determining whether specially programmed physical activity programs have an impact on body composition characteristics in sedentary women.

Tasks of work

Based on the defined goal of the research, the following tasks were set:

- Provide adequate literature relevant to the research goal,
- Make a selection of searched literature,
- Translate foreign literature into Serbian,
- Analyze, interpret and discuss research results,
- Analyze and present the most commonly used methods for assessing body composition in sedentary women,
- Analyze the effects of specially programmed recreational programs on body composition characteristics in sedentary women.

Method of work

Literature search

In order to collect data, an electronic search of PubMed, Google scholar and Additional databases in the form of textbooks and publications of leading institutions in the field of health was performed. Papers published in the period from 2000 to 2020 were searched. Found works (abstracts and whole works) were analyzed. The following keywords were used in the search strategy: "body composition" OR "body composition" OR "obesity" OR "nutrition" OR "level of nutrition" OR "body mass index" OR "physical activity" OR "training" OR "measurement" “OR“ anthropometry ”OR“ BIA ”OR“ DXA ”and“ women ”OR“ sedentary women ”.

The studies included in the study met the following criteria: (1) the study was written in English or Serbian, (2) the studies had to include sedentary women, (3) the studies were contained data on the method of measurement, (4) studies contained data on the degree of nutrition, (5) studies contained data on the exercise program.

Data were extracted from each study and organized in relation to the body composition characteristics measured. Basic descriptive statistics data (depending on whether they were published) were extracted from each study.

The course of the data download process

Figure 1 shows the flow of the data download process. A search of electronic databases initially identified 212 references. After removing duplicates (n = 143) ,. As they did not meet the criteria for inclusion in the study, 76 abstracts were excluded, leaving 69 studies that were assessed as potentially acceptable for full-text review. Out of a total of 69 papers included in the review, 7 studies were used for qualitative analysis.

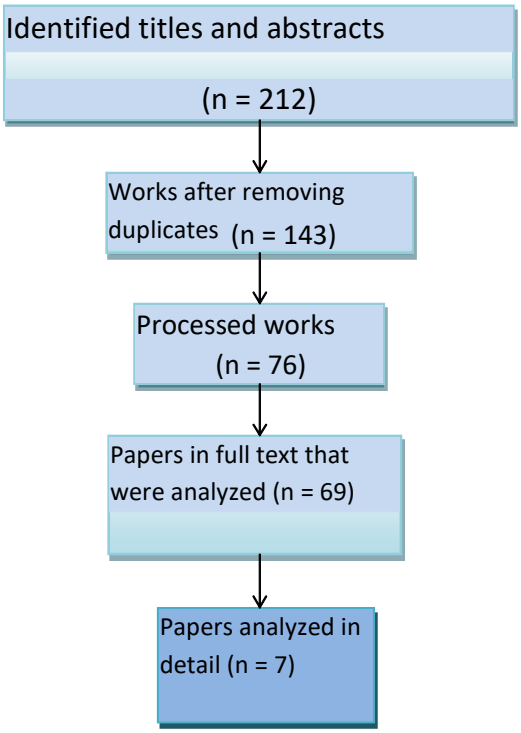

Figure 1. Flow diagram

Results

Table 1 shows the data collected and analyzed from the aspect of the influence of programmed physical exercise on the body composition of sedentary women.

Table 1. Overview of collected and analyzed research from the aspect of the impact of programmed physical exercise

Research first author and year	Sample of respondents		Experimental program			
	Number i Age	Number of groups	Exercise intensity	Exercise program and frequency	Tested body composition parameters	Results
Hernández-Reyes et al., 2019[13]	117 (60 completed the program) healthy women Andalusia (Spain) 42.97 ± 10.84 years	K = 21, E1 = 19 E2 = 20	K = 1–4 MET low intensity E1 = 10,000 5-8 MET moderate intensity E2 = 70% VO2max,> 8 MET, high intensity	6 months K = 30 minutes, 5000 steps 1–4 MET; E1 = 60 minutes, 10000 steps 60% of VO2max, 5-8 MET; E2 = 70% VO2max three times a week (> 8 MET),BodyPump TS K + E1 + E2 hypocaloric diet reduction of 500 kcal / day.	BMI, % BF, MM BIA	No differences in TM were found between E1 and E2. % BF was lower in E2 compared to E1. E2 increased MM at the end of the intervention, stands out above moderate activity (ßstand. = 0.182 vs. ßstand. = 0.008). Significant loss of UTM under the influence of FA; the higher the intensity of FA, the greater the fat loss in 6 months. K - decrease of% TM from 3% in 6 months, E2 decrease of% TM of 16% in 6 months.
Bjelica et al., 2017[5]	151 (from 25 to 51 years) Obese or recreational or sedentary	Clear, included 6 studies		The minimum duration of the Zumba program is 6-8 weeks. For the best results and benefits of the Zumba program, a duration of 12-40 weeks is recommended	Changes in BMI, body fat, lean body mass, body fluids, and the health benefits of the program were monitored. Body composition was measured by BIA	Zumba programs have a very large impact on changes in body structure, ie. compositions. These changes are reflected primarily in the reduction of body weight, reduction of the percentage of adipose tissue and the total amount of adipose tissue expressed in kg. Body fluids grow statistically slightly, which we justify by the effect of activities. Muscle mass also has a small increase, which is not significant due to the intensity and duration of the program.
Jotov & Kolev, 2020[16]	84 respondents, between 30 and 40 years old	E = 28 E1 = 28 E2 = 28		E = fitball, 3 times 15 minutes during the week - 12 weeks, until 50% HRmax E1 = aqua aerobics, 3 times a week for 45 minutes - 36 hours for three months E2 = Nordic walking,3 times a week for 45 minutes	TV; TM; circumferences of chest, abdomen, hips, thighs; skin fold triceps, supriliac; BMR; BMI; % TM; ANTR; BIA	Upper arm circumference in favor of E1 and E2, thickness of triceps skin fold and supriliac in favor of E1 and E2. Maximum fat reduction and BMR increase in E1.

Stavres et al., 2018[22]	19 48 ± 5 years,	One group	TS with progressive load increase From the initial 9 exercises 2 series of 5-8 repetitions to 9 exercises 4 series of 9-10 repetitions	6 weeks 2 times a week, 60 minutes TS with progressive load increase	ADP % TM, TM, UTM, BK, BMR	BMR increased significantly (+ 246.76Kcal * day-1 ± 231.48, t = 4.64, p <.001), while no changes were observed in% TM, BK, UTM or BMI (p> .05). A moderate increase in total mass was also observed (+0.63 ± 0.87 Kg t = 3.16, p = .005).
Castro et al., 2020[8]	162, 18–50 years	TS YOU TS + TI FA	TS, TI, TS + TI 2-5 weeks - 50% HRR and 15RM, 50 min 6-14 weeks - 60% HRR and 15RM, 50 min 7-23 weeks - 60% HRR and 15RM, 60 min	24 weeks TS, TI and TS + TI - 3x a week Strength training, endurance and combination with 25-30% restrictive calorie diet FA- general recommendations for exercise	DXA TM, BMI,% TM, BK	Decrease in TM, BMI,% TM with increase in BK after intervention
G awali et al. , 2015[25]	51 42 to 48	IX - 19 KH - 16 K - 17	IH + KH -30-60% HRmax, 3-5 x per week IH - progressive increase in the number of repetitions (from 3-8 to 5 minutes of walking) KH - progressive increase in continuous walking (from 20 to 40 minutes)	10 weeks 3-5 times a week	DXA BMI, UTM,% TM, BK	The ANOVA results show that UTM (p <.000) and% TM (p <.000) decreased for all three groups under the influence of time as the main factor.
Bozoljac, 2019[7]	160 25 - 50 years	E1 = 40 aerobics, E2 = 40 swimming E3 = 40 walking- walking K = 40		6 months 3 times a week E1 = aerobic endurance training, strength exercises and stretching exercises from 60% to 85% HRmax E2- combinations of different swimming styles, 60 minutes, 55% to 85% HRmax E3 = 5 minutes of warm-up, 5 minutes of cooling and progressive increase of time on a weekly level of fast walking from 5 to 30 minutes	% TM, BK, UTM, BMI, BMR, TBW; BIA	The biggest differences between the groups on the final measurement, with neutralization of differences on initial measurement, determined in BMI, on level p = .000,% TM p = .000 and UTM p = .007. Statistically significant differences were found for all other applied body composition variables, at the level of p = <.05.

Legend: HRmax - maximum heart rate; HRR - reserve heart rate; VO2max - maximum oxygen consumption; TS - strength training; K - control; *E* - experimental; TI - endurance training; TM - body weight; % TM -% body fat; MM - muscle mass; RM - repetition maximum; MET-metabolic equivalent; IH - intermittent walking; KH - continuous walking; UTM - total body fat; FA - physical activity; TV; BMR - basal metabolism; BIA - bioelectrical impedance; ANTR - anthropometric measurements; DXA - double-energy X-ray absorptiometry;

Discussion

In the available literature, significant attention is paid to the assessment of body composition in sedentary women[2,6,15,19] from different aspects. One group of authors examined the impact of programmed physical exercise[5,7,8,13,16,22,25].

Out of a total of seven presented papers, the positive effects of the presented programs on the components of body composition were determined in all papers[4,9,10]. In studies that had positive effects on the body composition of the subjects, the following effects were compared: high / moderate / low-intensity walking training[26] zumba exercise program[5], fitball, aqua aerobics and Nordic walking[16] strength training with progressive load increase[22] strength training and endurance training and their combination[8] training continuous and intermittent walking[25] aerobic endurance training, swimming and brisk walking[7]. Given that the subjects were sedentary women mostly middle-aged and elderly, high-intensity training had an intensity of about 70% VO2max[26] or up to 85% of HRmax[7].

In relation to the primary goal of this study, analyzing the results of available studies, it can be concluded that the authors used different methods to assess body composition in sedentary women. A total of six different methods were used: atropometric measurements, bioelectrical impedance (BMI), hydrodensitometry - underwater measurement method, double-energy X-ray absorptiometry (DXA), air extrusion plethysmography (ADP), and magnetic resonance imaging (MRI). Anthropometric measurements are a set of relatively simple procedures for assessing individual components of body structure, where by measuring the dimensions of the human body (body height, body weight, skin fold thickness, body circumferences and diameters) and using adequate equations, body density data are obtained in a relatively simple way. ,, sizes of fat and lean body mass. The largest number of analyzed[14,23,24] anthropometric measurements was used for objective monitoring of general physical development and control of nutritional status. In addition, the results showed that these relatively simple methods can be used to monitor the adaptive changes that occur in the body, in persons involved in organized, dosed physical activity type of training[16]. The simplest procedure within anthropometric measurements is to determine body weight and height and through them calculate the body mass index using a formula that represents the quotient of body weight (TM) and the square of body height (TV) expressed in meters. The thickness of the folds of subcutaneous adipose tissue is considered a useful parameter in estimating the total size (mass) of the body fat component, as well as the regional distribution of adipose tissue, that is, in defining the android and gynoid type of obesity. The analysis of the total amount of fat in the body is based on the fact that most of it is in the composition of subcutaneous adipose tissue, with biological variations conditioned by gender, age and degree of nutrition. By measuring the thickness of skin folds in certain regions of the body, and based on specific equations, body density is calculated and then the total amount of fat in the body. Therefore, it is not surprising that the authors who used anthropometric measurements also measured the thickness of the skin fold[6,14,23]. It is not surprising that in the analyzed literature, the largest number of authors used the method of estimating body composition by bioelectrical impedance (BIA). In the last

decade, a common and widely applicable method of assessing body composition has been performed by using this device[18,21,26] for various purposes.

Due to all the above facts, more and more attention in the available literature is paid to measuring and monitoring changes in the structure of body composition and the share of adipose tissue in its composition and the impact on it through programmed physical exercise. Based on numerous researches[3,6,25], an exceptional preventive and therapeutic - health role of physical activity and optimal level of physical ability to reduce the risk of dying or contracting chronic non - communicable diseases in both young and adults has been recognized.

Conclusion

Summarizing the results of previous research, at the general level, it can be concluded: The most commonly used method of assessing body composition in sedentary women is bioelectrical impedance; In relation to the available research that has dealt with the comparison of different methods for assessing body composition in sedentary women, the authors estimate that magnetic resonance imaging is the most competitive option for advanced and complex assessment of body composition; The authors of all analyzed works agree that the prevalence of obesity and the established low values of various parameters of body composition are high in sedentary women; The results clearly show the benefit of programmed physical activity in the reduction of body composition and adipose tissue in sedentary women.

In addition, the results of this study once again indicated the increasing occurrence of a sedentary lifestyle and consequent obesity in women of different ages. Given that under their influence the possibility of the presence of so-called chronic - non-communicable diseases of modern civilization is enormously increasing, this type of research is extremely desirable.

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REFERENCES

1. Azevedo, LM, Oliveira, MFD, Motta dos Santos, ADSA, Mota, MR, Hemmings, S., & Pardono, E. (2018). Anthropometric profile of sedentary women with and without hypothyroidism.*Rev.andal.med. deporte*. http://dx.doi.org/10.1016/j.ramd.2015.12.005

2. Baščevan, S., Vucetic, V., & Rodić, S. (2011). Comparison of different body composition assessment systems. *Anthropological aspects of sports, physical education and recreation*, 2,165-169. http://dx.doi.org/10.5550/SP.2.2010.19.

3. Bea JW, Going, SB, Wertheim, BC, Bassford, TL, LaCroix, AZ, Wright, NC, Nicholas, JS, Heymsfield, SB, & Chen, Z. (2018). Body composition and physical function in the Women's Health Initiative Observational Study, *Preventive Medicine Reports*, 11, 15-22.

4. Bićanin, P., Milenković, S., Radovanović, D., Gajević, A., & Ivanović J. (2018). Effects of programmed fitness exercise on body composition among pre-school children. *Facta Universitatis, Series: Physical Education and Sport*, 16 (1), 47-56.

5. Bjelica, B., Gojkovic, D., & Fulurija, D. (2017). Effects of zumba dance on body composition and improving health in women. *Sport and Health*, 11 (2), 5-10. 10.7251 / SIZ1602005B.

6. Borga, M., West, J., Bell, JD, Harvey, NC, Romu, T., Heymsfield, SB, Dahlqvist Leinhard, O. (2018). Advanced body composition assessment: from body mass index to body composition profiling. *J Investig Med*, 66 (5), 1-9. doi: 10.1136 / jim-2018-000722.

7. Bozoljac, J. (2019). Determining the effects of different models of kinesiological activities on the transformation of anthropological dimensions of women (doctoral dissertation). Brcko: Faculty of Health Sciences.

8. Castro, EA, Carraça, EV, Cupeiro, R., López-Plaza, B., Teixeira, PJ, González-Lamuño, D., & Peinado, AB (2020). The Effects of the Type of Exercise and Physical Activity on Eating Behavior and Body Composition in Overweight and Obese Subjects. *Nutrients*, 12 (2), 557 ..

9. Ćopić, N., Dopsaj, M., Ivanović, J., Nešić, G., & Jarić, S. (2014). Body composition and muscle strength predictors of jumping performance: differences between elite

female volleyball competitors and non-trained individuals. *J Strength Cond Res*, 28 (10), 2709-16.

10. D'Alonzo, KT, Aluf, A., Vincent, L., & Cooper, K. (2009). A comparison of field methods to assess body composition in a diverse group of sedentary women. *Biol Res Nurs*, 10 (3), 274-83.http://dx.doi.org/10.1177 / 1099800408326583.

11. Đorđević-Nikić, M., Dopsaj, M., Rakić, S., Subošić, D., Prebeg, G., Macura, M., Mlađan, D., & Kekić, D. (2013). Morphological model of the population of working women in Belgrade measured by the method of electrical multichannel bioimpedance - a pilot study. *Physical Culture*, 67 (2), 103-112.

12. Hasselstrøm, H., Hansen, S., Froberg, K., & Andersen, L. (2002). Physical Fitness and Physical Activity During Adolescence as Predictors of Cardiovascular Disease Risk in Young Adulthood. Danish Youth and Sports Study. An Eight-Year Follow-Up Study. *International Journal of Sports Medicine*, 23, 27-31.

13. Hernández-Reyes, A., Cámara-Martos, F., Molina-Luque, R., Romero-Saldaña, M., Molina-Recio, G., & Moreno-Rojas, R. (2019). Changes in body composition with a hypocaloric diet combined with sedentary, moderate and high-intense physical activity: a randomized controlled trial. *BMC Womens Health*, 27,19 (1), 167. http://dx.doi.org/10.1186/s12905-019-0864-5.

14. Houtkooper, LB, Going, SB, Sproul, J., Blew, RM, & Lohman, TG (2000). Comparison of methods for assessing body-composition changes over 1 y in postmenopausal women. *American Journal of Clinical Nutrition*, 72 (2), 401-406. https://doi.org/10.1093/ajcn/72.2.401

15. Institute of Public Health of Serbia. (2014). *Results of the research on the health of the population of Serbia in 2013*. Belgrade: Institute of Public Health of Serbia "Dr Milan Jovanović Batut".

16. Jotov, N., & Kolev, D. (2020). Physical Activity In Function Of Quality Of Life. *Economy & Market Communication Review*, 10 (1): 42-64. doi: 10.7251 / EMC2001042J.

17. Kaur, G. Bains, K., & Kaur, H. (2012). Body Composition, Dietary Intake and Physical Activity Level of Sedentary Adult Indian Women. *Food and Nutrition Sciences*, 3, 1577-1585. 10.4236 / fns.2012.311206.

18. Malina, RM (2007). Body composition in athletes: Assessment and estimated fatness. *Clinics in Sports Medicine*, 26, 37-68.

19. Norton, K., Marfell-Jones, M., Whittingham, N., Kerr, D., Carter, L., Saddington, K., & Gore, C. (2000). *Anthropometric Assessment Protocols. In SJ Gore (Ed), Physiological Tests for Elite Athletes*. Champaign, IL: Human Kinetics.

20. Olearo, B., Soriano, JM, Boselli, P., & Pascual, L. (2014). Assessment of body composition, Through anthropometric and non-anthropometric methods, Of University students from Valencia (Spain). *Nutricion hospitalaria*, 30, 911-918. 10.3305 / nh.2014.30.4.7676.

21. Schutz, Y., Kyle, UU, & Pichard, C. (2002). Fat-free mass index and fat mass index percentiles in Caucasians aged 18-98 y. *Int J Obes Relat Metab Disord*., 26, 953-60.

22. Stavres, J., Zeigler, M., & Bayles, M. (2018). Six weeks of moderate functional resistance training increases basal metabolic rate in apparently healthy adult women. *International Journal of Exercise Science*, 11, 32-41.

23. Vuori, I. (2004). Physical inactivity is a cause and physical activity is a remedy for major public health problems. *Kinesiology*, 36 (2), 123-153.

24. Ugarkovic, D. (2004). *Biomedical basics of sports medicine*. Novi Sad: FB "Print".

25. Gawali, UP, & Daulatabad, V. (2015). Assessment of Body Composition of Sedentary Working Women. *Journal of Current Research*, 7 (11), 23261-23264.

26. Wilsgaard, T., Jacobsen, BK, & Arnesen, E. (2005). Determining lifestyle correlates of body mass index using multilevel analyzes: The Troms study, 1979-2001. *American Journal of Epidemiology*, 162 (12), 1-10

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