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COMPARATIVE ANALYSIS OF BODY COMPOSITION

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Abstract: *The analysis of body composition is a broadly applied approach used to evaluate the health condition of the human body, with a view to improving the quality of life, physical activity and sport performance. This study focused on a body analysis of three categories of women athletes, handball players, skaters, swimmers, and compared the results with those obtained from a group of adult women who practice 2 hours of aerobics per week. The Tanita Body Composition Analyser, including the bioelectrical impedance analysis, was used on a group of 40 people, divided into four categories. The results of the analysis of the collected data show that there are similar results in terms of the athletes and that there is a relationship between electrical impedance and total body water.*

Key words: *Body composition analyser, fat mass, fat-free mass, total body water, bioelectrical impedance.*

1. Introduction

The Body composition analyser is a very frequently used method applied in several areas of life. The healthcare system uses this analyser especially regarding the influence of excess body fat and its distribution on the onset of non-communicable chronic diseases [8]. One example would be that of school-age girls, teenagers and young people who want to keep their body within the normal limits of Body Mass Index, (BMI), [1], [5]. Moreover, the method is used for chronic disease prevention and for the reconfiguration of the policies of adults' daily life regime [2]. Beestone shows that in the case of athletes staying in the recommended body composition parameters constitutes the premise for improved performance and helps to determine whether an athlete is sufficiently fuelling for performance [3]. The body analysis can determine the start of an intervention plan for a diet meant to lead to fat mass loss, or for a way of balancing the proportions between water, protein and other minerals [3].

2. Body Composition Analysis

In order to estimate body composition the Tanita Bioelectrical Impedance Analysis (BIA), one of the most clinically accurate validated and confirmed device [4] was used. A large number of

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researchers consider this method a promising approach for the quantitative measurement of tissue characteristics over time in addition to direct relativity between fluctuations in body composition equivalences and survival rate, clinical condition, illness and quality of life [7], [9]. The body composition data collected in this research are expressed in Kg and was the following:

Fat Mass, (FM), the actual weight of fat in the body, essential for maintaining body temperature and for cushioning joints and protecting internal organs [10].

Fat-Free Mass, (FFM), is comprised of muscle, bone, tissue, water, and all other fat-free mass in the body. When muscle mass increases, it helps to reduce excess body fat levels and lose weight in a healthy way [10].

Total Body Water (TBW), is the total amount of fluid in the body expressed as a percentage of total weight and is important for our health. It regulates body temperature and helps eliminate waste. In a training period, it is necessary to increase the water intake in order to improve efficiency [10].

Bioelectrical impedance analysis is one of the most accurate measures of segmental and whole body composition. It becomes a true indicator of our health and can show the beneficial impact of an aerobics programme [10].

3. Objectives

The purpose of this research is to realize a comparative Bioelectrical Impedance Analysis between four categories of people: three teams of female athletes in handball, speed skating, swimming, and a group of adult women who practice 2 hours of aerobics gym per week.

The objectives of the study:

- To analyse the Fat Mass of the segmental and of the whole body
- To analyse the Fat-Free Mass of the segmental and of the whole body
- To analyse the Total Body Water
- To analyse the impedance of segmental and of the whole body

4. Material and Methods

40 people participated in this study:

- 15 professional elite handball players, aged 22-33, with a program of 10-12 training sessions per week;
- 9 advanced speed skaters, aged 17-21, with a program of 5-7 training sessions per week;
- 6 advanced swimmers, aged 14-21, with a program of 5-7 training sessions per week,
- 10 adult women, aged 42-57, who take part in an aerobic program twice a week.

We chose to analyse handball athletes, because they make a mixed aerobic anaerobic effort, which requires roughly equally muscular upper and lower limbs. Speed skating is classified into predominantly aerobic efforts, with upper limbs muscle strain.

Swimming is also an aerobic effort with lower limbs muscle strain.

The effort of the adult group is an aerobic one, with equal muscles strain of the upper and lower limbs. Thus, we can consider different efforts, and study their effect on the body composition of the four groups involved in our study.

Each athlete was measured with Tanita, the Body Composition Analyser [4], and statistical data were collected for segmental and whole body Fat Mass, segmental and whole body Fat-Free Mass,

Total Body Water and impedance of segmental and the whole body.

The comparison of Fat Mass of the segmental and of the whole body showed that:

5. Results and Discussions

Table 1

Fat Mass (FM) of the segmental and whole body for the handball players, speed skaters, advanced swimmers and adult women

	FM Whole Body	FM Right Leg	FM Left Leg	FM Right Arm	FM Left Arm	FM Tronk
Handball players	13,3	3,3	3,2	0,6	0,6	5,7
Speed skater	10,1	2,2	2,1	0,5	0,5	4,8
Swimmers	10,2	2,7	2,7	0,6	0,7	4,8
Adult women	24,5	5,6	5,0	1,4	1,5	11,0

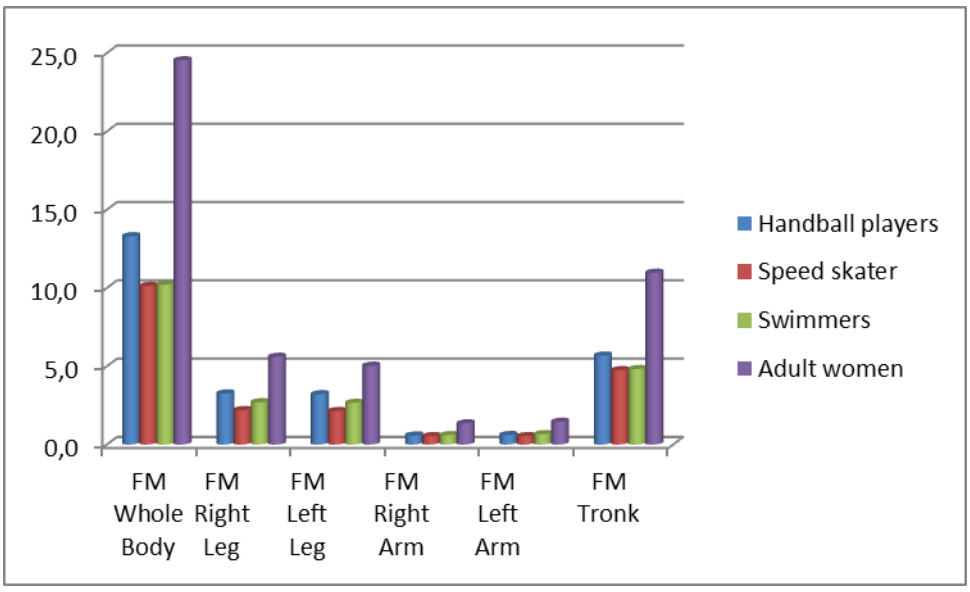

Fig. 1. *Fat Mass (FM) of the segmental and whole body for the handball players, speed skaters, advanced swimmers and adult women*

Regarding the analyses of the ***fat mass***, table 1 and fig. 1, adult women have the highest fat mass at each of the measurement, the speed skaters and the swimmers are approximatively equal in the media of the obtained data.

Fat mass in the whole body and in the right and the left leg, are more than double at the adult women than at the speed skaters and swimmers. The handball players are the value between adult women and the two other categories.

At the two arms, and at the trunk, the fat mass is almost equal to the three categories of athletes, and more than double in the adult women.

The results of our analyses highlight that the intensity of the effort has a direct effect on the value of fat mass, with the differences due to the nature of the effort. Further studies are needed to evaluate the correlations between the three categories of athletes and the muscle fibre quality.

As Table 2 and Figure 2 indicates, the results of our analyses regarding the free fat mass (FFM), highlight that there are no significant differences between the four categories of people. An explanation could be that FFM sums up the mass of muscle, bone, tissue, water, and all other fat-free mass in the body, not only the muscle one.

Table 2

Free Fat Mass (FFM) of the segmental and whole body for the handball players, speed skaters, advanced swimmers and adult women

	FFM Whole Body	FFM Right Leg	FFM Left Leg	FFM Right Arm	FFM Left Arm	FFM Tronk
Handball players	56,4	9,2	9,3	3,1	3,2	30,9
Speed skater	53,3	9,3	9,2	2,8	2,8	29,3
Swimmers	46,0	7,2	7,0	1,9	1,9	24,4
Adult women	47,3	8,0	7,8	2,4	2,5	26,8

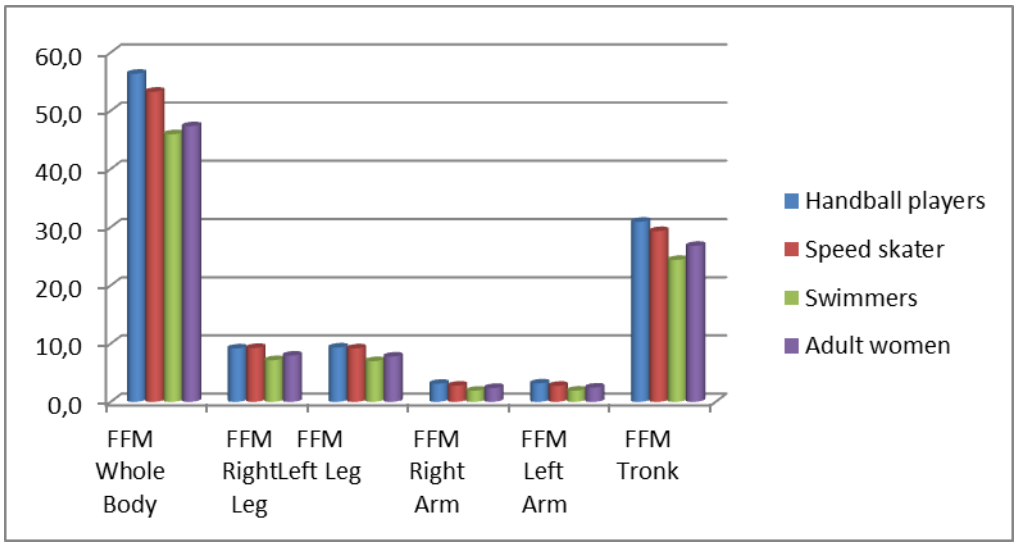

Fig. 2. *Fat Free Mass (FFM) of the segmental and whole body for the handball players, speed skaters, advanced swimmers and adult women*

Figure 3 shows us that the swimmers have the lowest value of fluid in the body, follow, in ascending order, of adult women, speed skaters and the handball players. It results that this outcome does not depend by the movement quantity or the effort made.

At the same time, as figure 4 indicates, the whole body and segmental impedance has the highest values for swimmers. The handball players have the slightest value at the whole body impedance and at the both arms. The adult women have the slightest value at the both legs, and the speed skaters are in the middle with all these values.

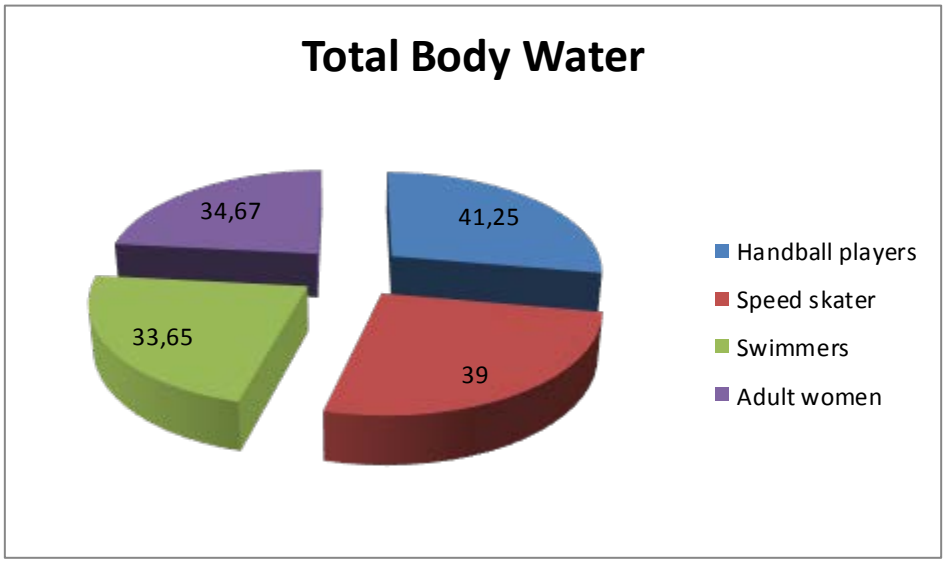

Fig. 3. *Total Body Water for the handball players, speed skaters, advanced swimmers and adult women*

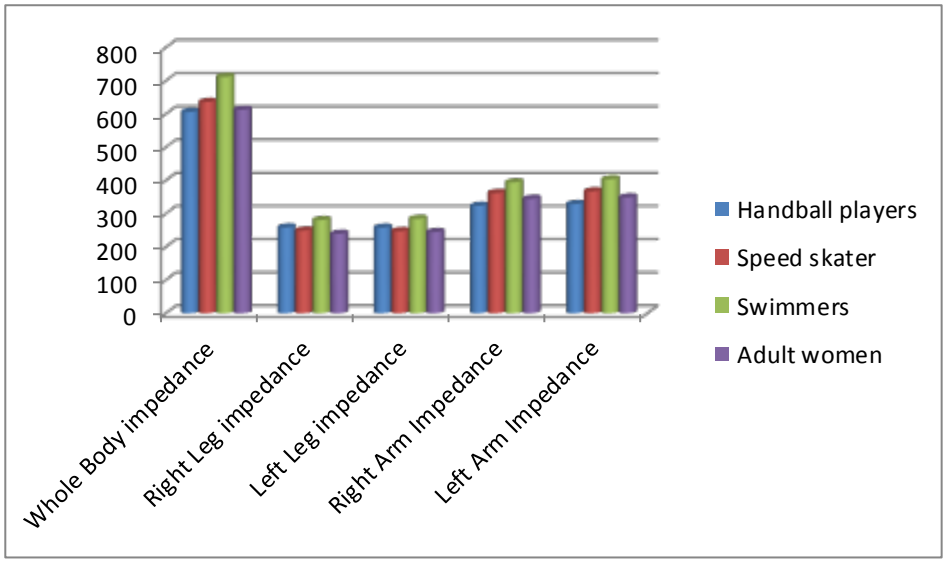

Fig. 4. *Whole body and segmental impedance for the handball players, speed skaters, advanced swimmers and adult women*

5. Conclusions

The comparative analysis of the body composition indicates us that there are differences between the four categories of people. The swimmers and skaters have the smallest value at the fat mass, the adult women the highest. Movement quantity and intensity of the effort has an inverse relationship on the value of fat mass. The swimmers and skaters values at fat mass can also be low due to the fact that they perform in special climatic conditions, in water and ice respectively.

At the Free Fat Mass there are no significance results in our study; further researches are needed to evaluate the correlations between the whole or segmental analyses of the muscle and the effort in different categories of people.

This paper point that there is a relationship between electrical impedance and total body water [6]. Specifically, there is an inversely proportional of distribution of Total Body Water and the electrical impedance [8]; the swimmers are the reduced total water body value, and the significant value at the electrical impedance.

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