Researching worlds top swimmers‘ anthropometric indices of the past 50 years

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Summary

Objective of this investigation was to analyze the anthropometrical indices of the top men and women swimmers in the world for the past 50 years and to determine under which Zodiac sign they were born. Research methods: literature

sources' analysis, anthropometrics and mathematical statistics methods. Research took place during December, 2007 through February, 2008. Anthropometrical indices' data for the various national swimmers was found on the Internet. We analyzed anthropometrical indices of 88 women and 101 men. We analyzed their body height and weight indicators, calculated their body mass index, body surface area (Мармуросов, 1982) and determined under which Zodiac sign they were born. Statistical methodology was applied to the obtained data. We calculated indices' averages, squared deviation, averages difference reliability was determined according to T test p indicator. Obtained data shows the world's best females swimmers height of the past 50 years average was 173.6 ± 6.5 cm, weight was 62.6 ± 5.6 kg, body mass index 20.8 ± 1.6 kg/m², body surface area 1.79 ± 0,07 m². The beast male swimmers height was 188.7 ± 9.3 cm, weight 81.0 ± 10.4 kg, body mass index 21.54 ± 1.7 kg/m², body surface area average 2.08 ± 0,1 m². Anthropometric indicators differences were noted among the various representative members of their nations subject to their country of origin in the major swim events of the world. The tallest women were from Russia while the tallest men were from the USA. The most frequent zodiac sign for the women swimmers is Pisces while for men it is Taurus. The most frequently zodiac element for swimmers was Water.

Keywords: *swimming, anthropometry, female, male, Zodiac signs.*

Swimming as a sport discipline has been known for many years. International swimming federation (FINA) is heading such disciplines as swimming, diving, synchronized swimming and water polo for 100 years. Swimming is popular in all five continents. The scientists of many countries are interested in investigating swimming sport history, history of swimming pools (Wolcott, 2008), sport swimming technique, swimming facilities and its hygiene (Shields et al.). Number of investigators are interested in anthropometrical data of the swimmers. Colwin (1992), Laughlin (1995), Statkevičienė (2002), Whiten (1994), Булгкова (1995), Zampagni et al (2008) investigated swimmers of various countries. We did not find data of the best world swimmers for past 50 year period, who took part at the biggest world swimming competitions: Olympic Games, Continental Championships, World championships.

Objective. To analyze the anthropometric indices of the world's top men and women swimmers during the past 50 years and to determine under which Zodiac sign they were born.

Research methodology. Literature sources analysis, anthropometrics, and mathematical statistics methods.

Research organization. Research was conducted between December 2007 and February 2008. On the Internet we found world top swimmers' height and weight indices. We calculated their body mass index, total body surface dimensions and established the Zodiac signs of their birth. Our research covered anthropometric indicators of the Top men and women swimmers from 16 different countries who had reached world class results. There were 88 women and 101 men, world and Olympic champions and prize winners of these competitions. Mathematical statistics methods were applied to the obtained research data. We calculated the indices' averages, mean squared deviation, and the averages difference reliability was determined according to T test p indicator. The obtained data was summarized.

Obtained results. Anthropometric indices and their analysis for the world's top women swimmers of the past 50 years.

Figure 1 gives world's top class women swimmers' body heights' mean values. From the stated data in Figure 1 we see that the tallest women swimmers were from Russia, the shortest come from Japan. The difference of this data is significant ($p < 0.05$). German and Hungarian swimmers' heights are similar to the Russians', however the difference between them is not significant ($p > 0.05$). Difference between the averages data for the other countries' swimmers are also not significant ($p > 0.05$).

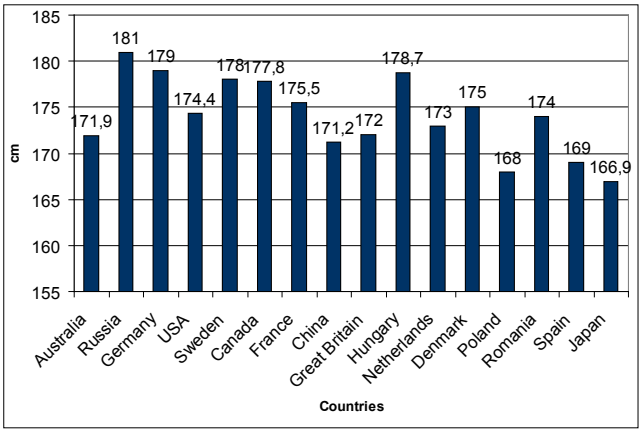

Figure 1. Mean values of body heights World's top class women swimmers'

Figure 2 shows world's top class women swimmers' body mass (weight) mean values. From this data we see that the greatest body weigh average belongs to the Hungarian swimmers, the smallest from Japan. Between the largest and the smallest weight indices the difference is significant ($p < 0.05$), however the other swimmers' obtained body weight data differences, subject to origin of their countries is not significant ($p > 0.05$).

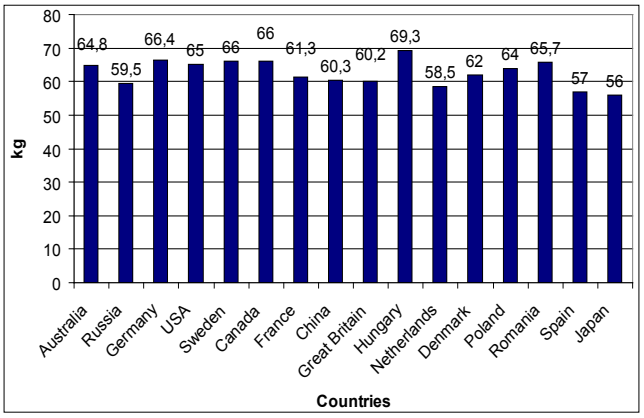

Figure 2. Mean values of body mass (weight) World's top class women swimmers'

Figure 3 presents the world's top class women swimmers' of the past 50 years body surface area mean values. From the Figure 3 we see that the largest body surface area values belong to Russian and Hungarian swimmers. The averages data between these two groups is not significant ($p > 0.05$). The smallest obtained indicators are for the Japanese swimmers. Differences between the average indicators are only significant between Russian and Japanese and Japanese and Hungarian swimmers' average indicators ($p < 0.05$).

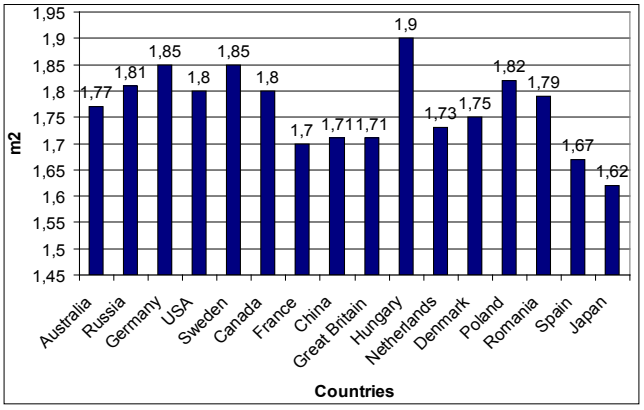

Figure 3. Mean values of body surface area World's top class women swimmers'

Figure 4 presents the top women swimmers' body mass (BMI) arithmetic averages. We established that all researched women swimmers' BMI is within normal boundaries (from 18.5 to 24.9).

Anthropometric indices and their analysis for the world's top men swimmers of the past 50 years. Table 1 gives the world's best men swimmers of the past 50 year's anthropometrical measurements. From the stated data we see that the tallest men swimmers are from Germany, the shortest come from Japan. The difference of this data is significant ($p < 0.05$). Differences between the averages data for the other countries' swimmers are not significant ($p > 0.05$). Body mass (weight) arithmetic averages for the world's top class men swimmers of the past 50 years. From this data in Figure 6 we see that the greatest body weighs average belongs to the Canada's and Germany's swimmers, the smallest from Japan. Between the largest and the smallest weight indicators the difference is significant ($p < 0.05$), however the other swimmers' obtained body weight data differences subject to origin of their countries is not significant ($p > 0.05$).

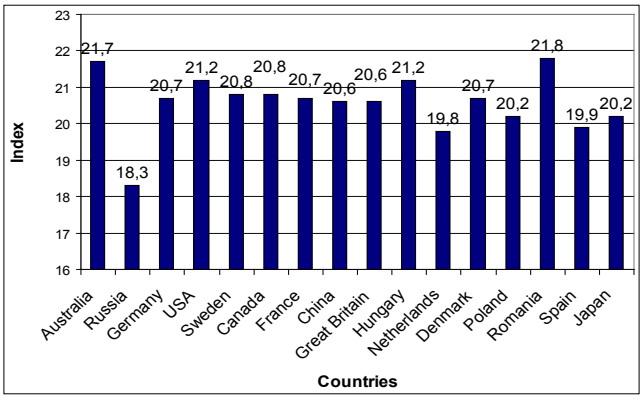

Figure 4. Mean values of BMI World's top class women swimmers'

From the Table 1 we see that the largest body surface area indicators belong to Germany's, Canada's, Australia and Great Britain's swimmers. The averages data between these three groups is not significant ($p < 0.05$). The smallest obtained indicators are for the Japanese swimmers. We established that all researched men swimmers' BMI is within normal boundaries (from 18.5 to 24.9).

World's top men and women swimmers' Zodiac signs. Figure 5 presents world's top women and men swimmers' Zodiac signs values. From the data in Figure 5 we see that among the world's best women swimmers the largest number was born under Pisces zodiac sign – 11.9%. The smallest numbers of swimmers were born

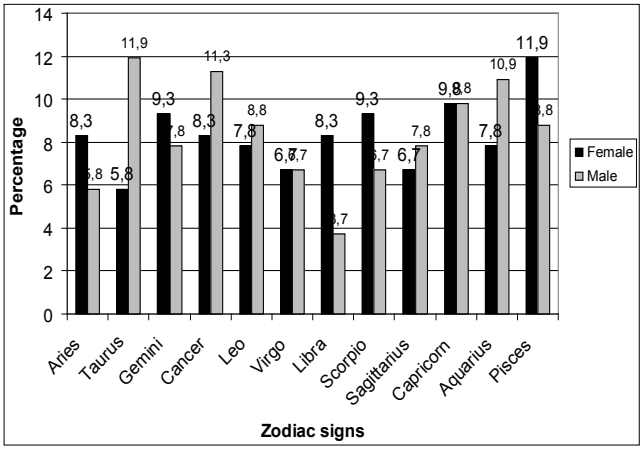

Figure 5. Mean values of Zodiac signs of world's top class swimmers'

Table 1

The past 50 years World's Top class men swimmers' anthropometrical measurements

Country	*Height, cm (M)*	*±σ*	*Weight, kg (M)*	*±σ*	*Body surface, m² (M)*	*±σ*	*BMI (M) kg/m²*	±σ
Australia	193,0	5,0	85,7	5,8	2,17	0,1	23,6	1,3
Russia	189,6	5,6	81,0	7,7	2,11	0,1	22,5	1,1
Germany	193,2	7,4	88,3	8,9	2,23	0,1	23,7	2,1
USA	190,0	7,5	84,9	6,2	2,18	0,1	23,8	2,8
Sweden	181,5	8,3	75,3	13,6	1,97	0,2	22,7	2,3
Canada	189,5	2,1	88,5	6,4	2,18	0,1	24,7	1,2
France	182,5	3,5	77,5	4,9	1,95	0,0	23,3	0,6
Great Britain	193,0	7,7	85,8	11,2	2,19	0,2	22,9	1,3
Hungary	188,5	0,7	77,0	9,5	2,06	0,1	21,7	2,2
Italy	185,5	3,8	75,7	4,7	2,01	0,1	22,0	1,1
Netherlands	191,0	7,8	82,5	13,4	2,01	0,2	21,0	1,9
Japan	174,7	4,2	69,0	3,6	1,84	0,1	22,6	0,5
South Africa	190,3	4,0	84,3	7,5	2,15	0,1	23,2	1,1
Brazil	184,0	0,0	82,3	10,7	2,14	0,2	22,3	0,7
Croatia	193,0	4,0	86,3	3,2	2,17	0,1	23,9	1,7
Finland	182,5	0,0	78,5	0,7	2,01	0,0	23,6	0,8
Ukraine	188,0	1,4	74,0	5,7	2,02	0,1	20,9	1,3
Total	187,6	5,2	80,9	5,6	2,08	0,1	22,84	1,04

under Taurus, Virgo, and Sagittarius signs (5.8%, 6.7% and 6.7%). From the obtained data we determined the tendency the world's best men swimmers the largest number were born under Taurus Zodiac sign – 11.9%, Cancer – 11.3%. The smallest numbers were born under Libra Zodiac sign – 3.7%.

Summarizing the world's top swimmers'(men and women) of the past 50 years Zodiac signs spread we determined a tendency that the most dominant Zodiac element for swimmers is Water. They comprise 28.2% of the world's top swimmers participating in this research, the smallest number belong to the Zodiac element Fire – 22.7% (The Earth element – 25.3%, the Air element – 23.8%).

Discussion of the results

Scientists of various countries have been investigating anthropometrical indices for many years. They are investigating data of athletes various ages and various sports (Vauhnik, et al., 2008; Janz, et al. 2008; Visnapuu, Jürimäe, 2008; Kerr et al., 2008; Sheppard, 2008; Keogh et al., 2008; Anderson et al., 2008). Elite class athletes' anthropometrical indices were investigated by scientists from Italy (di Cagno et al., 2008). Scientists from Spain Casajus, Castagna C. (2007) investigated soccer players, Sánchez-Muñoz et al. (2007) described the anthropometric characteristics, body composition and somatotype of elite male and female junior tennis players, and compared the anthropometric data, body composition and somatotype of the first 12 elite junior tennis players on the ranking with the lower ranked players, and to establish an anthropometric profile chart for elite junior tennis players. Scientists from Granada Izquierdo et al. (2007) compared physical characteristics (body height, body mass, body fat, and fat free mass, one repetition maximum bench press, jumping explosive power, handball throwing velocity, power-load relationship of the leg and arm extensor muscles, 5- and 15-m sprint running time, and running endurance in elite and amateur female handball players aged 17 - 38. Data received by these authors shoved that amateur female handball players and elite players presented similar values in body mass and percent body fat, but higher values ($p < 0.001 - 0.05$) in body height (6 %), fat free mass (10 %), jumping explosive power (10 %), handball throwing velocity (11 %), power-load relationship of the arm (25 %) and leg (12 %) extensors, as well as 5- and 15-m sprint (3 - 4 %) and endurance running velocities (13 %). Gabbett's (2007) received results shows that elite women rugby league players have slower speed and agility, lower muscular power, and greater body mass and skinfolds thickness than previously reported

for other elite women team sport athletes. Hasa's, et al. (2007) study was based on anthropometric measurements of 60 female Asian handball players competing in the continental championship, the aim of investigation was to identify any differences between countries and between playing positions. These female international handball players differed in some respects in anthropometric characteristics according to their country of origin. The Asian players were found to be relatively homogeneous across the different positions. Leicht (2007) investigated anthropometric characteristics of elite basketball referees. Cuk et al. (2007) analyzed the data of which were received in the 1933, at the 5th Regional Sokol Meeting in Ljubljana which was at the time a place in the Yugoslav Kingdom, Skerlj carried out the first measurements of 189 gymnasts, active competitors; in 2000, at the World Cup Meeting in Ljubljana, Cuk et al. carried out measurements of 40 top gymnasts. Analysis of identical variables has shown that there is no difference in body height and weight of the gymnasts in 1933 and those in 2000, while there is a significant difference in the width of their shoulders and pelvis, the contemporary athletes being wider in their shoulders and narrower in their pelvis. The differences can be assigned to the new requirements in contemporary gymnastics as exercises are becoming more difficult, including more rotation around the vertical and horizontal axis.

We found anthropometrical data swimmers of various ages. Sekulić et al. (2007) tried to identify the significance and character of the linear and non-linear relations between simple anthropometric predictors: body height, body weight , and body mass index, and swimming performance: freestyle swimming 50 and 400 meters , in a sample of young (15 years old on average) male (N = 40) and female (N = 28) swimmers was shown that the best results in 400 freestyle can be expected for the subjects that are average in body weight (which guarantees solid muscle mass – the generator of force), but above average in body height (because of the physical law of lever).

Our investigation shows that the world‘s best swimmers females of the past 50 years average of their height is 173.6 ± 6.5 cm, weight is 62.6 ± 5.6 kg, body mass average 20.8 ± 1.6 kg/m², body surface area average 1.79 ± 0,07 m². The best swimmers males average height is 188.7 ± 9.3 cm, average weight was 81.0 ± 10.4 kg, body mass index was 21.54 ± 1.7 kg/m², body surface area average 2.09 m². It appears that among men and women swimmers the dominant Zodiac sign is Aquarius. Significant anthropometric indicator differences were noted among the various representative members of their nations subject to their country of origin in the major swim events of the world. The tallest women were from Russia while the tallest men were from the USA. The world's best swimmers were born under various Zodiac signs but there appears a higher frequency in Aquarius.

Conclusion

Of the past 50 years world‘s best women swimmers‘ anthropometric data averages are: 173.6 ± 6.5 cm, weight was 62.6 ± 5.6 kg, body mass index 20.8 ± 1.6 kg/m², body surface area 1.79 ± 0,07 m². World‘s top men swimmers‘ of the past 50 years anthropometric data averages are: 188.7 ± 9.3 cm, average weight was 81.0 ± 10.4 kg, body mass index was 21.54 ± 1.7 kg/m², body surface area average 2.08 ± 0,1 m². The most frequent Zodiac sign for the women swimmers is Pisces while for men it is Taurus. The most frequently zodiac element for swimmers is Water. The obtained data supplements the world‘s top swimmers‘ anthropometric scientific databases inasmuch as this data has not been studied as related to the swimmers‘ zodiac signs and anthropometric indicators subject to the countries the swimmers represented.

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PASTARŲJŲ PENKIASDEŠIMTIES METŲ GERIAUSIŲ PASAULIO PLAUKIKŲ ANTROPOMETRINIŲ RODIKLIŲ TYRIMAS

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SANTRAUKA

Tikslas – išanalizuoti pastarųjų penkiasdešimties metų geriausių pasaulio plaukikų vyrų ir moterų antropometrinius rodiklius nustatant jų zodiako ženklus. Tyrimo metodai buvo šie: literatūros šaltinių analizė, antropometrija, matematinė statistika. Tyrimas buvo atliktas 2007 m. gruodį – 2008 m. vasarį. Buvo surasti įvairių šalių sportininkų antropometriniai rodikliai, taip pat išnagrinėti 189 plaukikų (88 moterų ir 101 vyro) antropometriniai rodikliai (ūgis, svoris), be to, apskaičiuotas kūno masės indeksas, kūno paviršiaus plotas, nustatyta, kokie šių sportininkų zodiako ženklai. Gauti duomenys apdoroti matematinės statistikos metodais. Apskaičiuoti rodiklių vidurkiai, vidutiniai kvadratiniai nuokrypiai, vidurkių skirtumo patikimumas nustatytas pagal T testo p rodiklį.

Tyrimo metu nustatyta, kad pastarųjų penkiasdešimties metų geriausių pasaulio plaukikių moterų ūgio vidurkis 173,6 ± 6,5 cm, svorio vidurkis 62,6 ± 5,6 kg, kūno masės indekso vidurkis 20,8 ± 1,6 kg/m², kūno paviršiaus ploto vidurkis 1,78 ± 0,07 m^2. Geriausių pasaulio plaukikų vyrų ūgio vidurkis 188,7 ± 9,3 cm, svorio vidurkis 81,0 ± 10,4 kg, kūno masės indekso vidurkis 21,54 ± 1,7 kg/m², kūno paviršiaus ploto vidurkis 2,08 ± 0,1 m^2. Matoma tendencija, kad

tarp plaukikių moterų dominuoja vandens zodiako ženklų atstovės. Buvo pastebėti reikšmingi sportininkų antropometrinių rodiklių skirtumai priklausomai nuo šalies, kuriai jie atstovavo svarbiausiose pasaulio plaukimo varžybose.

Raktažodžiai: plaukimas, antropometrija, vyrai, moterys, zodiako ženklai.

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