

Original Article

Anthropometric Characteristics, Body Composition and Body Type of Young Tennis Players

Koronas Vasilios^{1*}

Tsigelidou Maria²

^{1,2} Ekpedeutiria Apostolos Paulos, Panorama Thessalonikis, Greece

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Abstract

Many coaches and doctors tend to identify an “ideal body type” that the athletes must maintain in order for them to excel in each sport. In most cases, the athletes are compared in terms of height, weight, height-weight ratios and posture and many are discouraged to do a particular type of sports based on their anthropometric characteristics. However, in reality, not all people have the same body types of bodily composition and, for the most part, weight, body fat and posture can be improved through the years by exercise and practice. The purpose of this study was to assess the anthropometric characteristics of tennis players that are still adolescents. For the purpose of the survey, real data were used, with the researcher measuring the body fat of the athletes, the bone structure, the height and weight as well as estimating the Body Mass Index of the teens.

1. Introduction

Professional athletes have become idealized figures in the modern society. From advertising to representing the nations, athletes have emerged as modern heroes that have been trained to excel. In the eyes of the modern people, especially the youngest, they are brave, strong, fast, fit and beautiful (Guttman, 2002). Most athletes, indeed, need to train extensively if they want to succeed in their profession. To be top, they have to be able to compete with others and to maintain an ideal body type (Bourgois, Claessens, Vrijens et al, 2000). For the most part of their training, they are pushed to diet, train, gain or lose muscle, strengthen their body and increase their reflexes. It has to be noted that each sport has its standards and that athletes who train, for instance, to become professional soccer players will have to follow a different diet and training than swimmers or lifters etc. (Plowman & Smith, 2013).

* E-mail: b.koronas@yahoo.gr

Tennis is a sport that is perceived as elegant, high class and prestigious as it is associated, for the average person, with the elites and the upper class. This is due to the fact that many members of the royalty used to practice it as well as that the athletes, themselves, are supposed to have a lean and strong figure and do not get themselves “dirty” in the field (Kane, LaVoi & Fink, 2013, p. 269-298). Women in tennis are also depicted as sexy and feminine. Contrary to other female athletes, many famous tennis players, have modeled or become icons. However, they, themselves, also had to maintain excellent health and physique Burr & Reader, 2013, p. 120-143). The difference between tennis and other sports is that the usual requirements for a tennis athlete is for them to be lean, tall but not too tall, flexible and fast. this means that they can have a model-like figure. At the same time, given that the uniforms of the professional athletes are tight and short, particularly girls and women will appear attractive and beautiful (Fernandez, Mendez-Villanueva & Plum, 2006, p. 387-391).

The article will try to assess the bodily characteristics of young athletes in Greece in order to highlight how the different practices and training programmes, as well as age, sex etc. can affect and impact their abilities, performance and mental and physical health.

2. Material and methods

For the purpose of the study, real – life data has been taken and used. The sample consisted of fifteen (15) teens, nine (9) male and six (6) female. The sample was varied and the data has been analyzed thoroughly with the use of SPSS as a program for interpretation of statistical data.

The main research questions of the paper are the following:

- Are there significant differences in the bodily composition of young male and female tennis players in Greece?
- If there are, how can they be explained?
- Do the teens fit the optimal criteria for a professional tennis athlete and the image that the media present as “ideal”?
- How does this affect the psychology and performance of young athletes?

The research focused on comparing the different characteristics of tennis players aged between 12 and 16 years in Greece. The sample was selected based on whether they were engaged in systematic tennis training, taken part in competition and identified themselves as athletes and not on any criteria such as nationality, social or other status and religion. Also, since the aim of the study is to compare between the two sexes, there has been effort to not limit the sample to either male or female subjects.

The main criteria used to compare the findings and assess them have been:

- Body weight, measured by a scale. Body weight is important as it can be used as a criterion for the overall nutritional status of the teenager but is affected by health and other conditions. Also, particularly for girls, it can be affected by hormonal changes, age, built etc (Chasapidou, & Fahantidis, 2003).
- Height, as it is important for the assessment of a person’s ability to jump,

his or her balance and reflexes. Also, weight and height are used to determine the Body Mass Index (BMI), the person's oxygen consumption and to correlate the muscle – tissue ratio (Horita, 2008).

- The BMI is an index that is used carefully. On its own, the BMI cannot reveal whether a person is “fit” or not, as one can have an unusual fat – muscle ratio and still have a normal BMI. A healthy person is estimated to have around 18,5 to 24,9 BMI, while people who have BMI less than 18,5 are characterized as “dangerously thin”, between 25 – 29,9 overweight and over 30, obese. However, people of certain ethnic backgrounds, such as Asians, have to be assessed with the use of a different scaling and can be perfectly health with a BMI that is 18 or less or obese with a BMI that is 28 or lower. So, one should use the figures comparatively to each other and not assess one's health and nutrition solely by using one number or index (Marquis et al, 2002, p. 809-813).

- A skin lipometrisis can be used to measure a person's fat percentage. This method can provide the medical expert, coach or professional athlete with an image of their overall health status if used along with the BMI. It is essential to, again, take into consideration factors such as age and sex, as younger women are expected to have, i.e. a larger body fat percentage than older men etc (Turocy, et al, 2011, p. 322-336). Alternatively, one can use a scale with a lipometer. Along with the use of a dermatolipometer, measuring the skin thickness, one can come up with reliable results and be able to assess the person's body type (Möller, et al, 2000, p. 221-230).

The main body types that are identified and are universally accepted are the following (Roberts & Bainbridge, 1963, p. 341-370).

- The ectomorphic, with the person having narrow hips, a weak and thin body and extreme chest – neck ratio.

- The endomorphic, with the person having a tendency to accumulate body fat, mostly in the upper part of their body and the abdomen and hip, have straight shoulders and a round face.

- The mesomorphic, with the person having “normal” proportions, body fat and bone structure.

In this research, the following have also been measured:

- The femoral arm,
- The femur,
- The peripheral EIA,
- The skinfold abdominal,
- The triceps.

Below, follows the data presentation and analysis in order to present with the findings with regard to the sample of choice.

3. Results and Discussions

Through an extensive analysis of the available findings and data, it has been found that there are non-parametric correlations between survey variables, such as weight, height, BMI and anthropometry. From the Mann-Whitney Tests, there

were found significant differences in height, weight, skin and performance. Below, there is an index of the main group statistics and findings of the study (Table 1):

Table 1. *Index of the main group statistics and findings of the study*

	Sex	Mean	
Height	Male	1.00	1.6833
	Female	2.00	1.5583
Weight	Male	1.00	63,4778
	Female	2.00	49.8500
Age	Male	1.00	14.1111
	Female	2.00	13,0000
Pro. age	Male	1.00	4,2778
	Female	2.00	5.5000
Skin_1	Male	1.00	10,3889
	Female	2.00	10,2667
Skin_2	Male	1.00	9,7556
	Female	2.00	5,7167
Skin_3	Male	1.00	17.2333
	Female	2.00	13.5333
Skin_4	Male	1.00	6,8444
	Female	2.00	9.5500
Skin_5	Male	1.00	10,0556
	Female	2.00	5,5167
Fat_Skn	Male	1.00	22.0725
	Female	2.00	24,8052
Fat_Scl	Male	1.00	21,1111
	Female	2.00	26,9333
Hum_Len	Male	1.00	26,0000
	Female	2.00	23,4167
Fem_Len	Male	1.00	33,3889
	Female	2.00	33,6667
Circumf	Male	1.00	92,7778
	Female	2.00	85,0000

When it comes to the BMI, the participants of the survey appear to be overweight or obese at a larger percentage than expected for professional athletes. The following tables illustrate those findings (Table 2).

Table 2. *Illustrate those findings*

		Body Type				Total
		Physical	Fat	Pacman		
Sex	1.00 (Male)	Count	6	2	1	9
		% within Sex	66.7%	22.2%	11.1%	100.0%
	2.00 (Female)	Count	2	0	4	6
		% within Sex	33.3%	0%	66.7%	100.0%
Total		Count	8	2	5	15
		% within Sex	53.3%	13.3%	33.3%	100.0%

Comparing two age groups, individuals over 13 years old and less, regardless of sex, there were found important variations in their body type, height, weight and BMI. Age group 1 (12-13) is noted as 1,00 and age group 2 (14-16) as 2,00. When it comes to the individuals body type, the findings are presented in the table below (Table 3):

Table 3. *The findings individuals body type*

		Frequency	Percent	Valid Percentage	Cumulative Percent
Valid	1.00	6	40.0	40.0	40.0
	2.00	9	60.0	60.0	100.0
	Total	15	100.0	100.0	

There is no difference in the distribution of obesity in the two age groups. Also, there was no evidence and no statistically significant difference between the two leaves or between the two age groups when it comes to their body type, as shown above. Through a performance test, it has been revealed that there are variations in their activity levels and reflexes as well as abilities do not solely depend on their body type or bodily composition.

The two tables 4 and 5, that follow illustrate this fact, as the findings include the results of the lipometric analysis and with two methods, as explained in the methodological sector of the paper.

Table 4. *The findings include the results of the lipometric analysis and with two methods (1)*

	Age Group	N	Mean
			1,5167
	Height	1.00	6
Weight	1.00	6	44,8167
	2.00	9	66.8333
Age	1.00	6	11,5000
	2.00	9	15.1111
Pro. age	1.00	6	3,8333
	2.00	9	5,3889
D.Sc.	1.00	6	18.9833
	2.00	9	22,7667
Skin_1	1.00	6	9.5333
	2.00	9	10.8778
Skin_2	1.00	6	7,6167
	2.00	9	8,4889
Skin_3	1.00	6	11,4667
	2.00	9	18,6111
Skin_4	1.00	6	11.3500
	2.00	9	5,6444
Skin_5	1.00	6	6.1833
	2.00	9	9,6111
Fat_Skn	1.00	6	22.9370
	2.00	9	23,3180
Fat_Scl	1.00	6	24,7500
	2.00	9	22,5667
Hum_Len	1.00	6	23,5000
	2.00	9	25,9444
Fem_Len	1.00	6	31,0833
	2.00	9	35,1111
Circumf	1.00	6	79,8333
	2.00	9	96,2222

Table 5. *The findings include the results of the lipometric analysis and with two methods (2)*

	N	Min.	Max.	Mean	SD
Front_Hand	15	4	8	6.33	1,047
Back_Hand	15	4	8	6.80	1,146
Serve	15	3	9	5.67	1,345
Sum	15	4.33	8.33	6,2667	1.06309
Valid N (listwise)	15				

Discussions

For decades, trainers, doctors and academics alike, have struggled to categorize athletes and sports based on the study of real data to determine whether and how the bodily characteristics of athletes affect their performance and whether and why certain people are more capable to do specific sports than others. In many studies, it has been argued that the height, bone structure and overall health of the person are essential criteria (Krane, Stiles-Shipley, Waldron & Michalenok, 2001, p. 247-264). Others argue that body fat, posture and bodily strength are equally important. Particularly for sports such as gymnastics, ballet and running that the athletes start training from a very young age, it being less than three to ten years old, the coaches tend to appear strict and judgmental to young children who aspire to become professionals in a sport (Ericsson, Krampe & Tesch-Römer, 1993, p. 363).

This practice, however, is strongly critiqued by some sports professionals and doctors. On the one hand, not all children want to become Olympic athletes and, on the other, in many cases, it is the parents who push their children to perform sports at high levels (Cushion, Armour & Jones, 2003, pp. 215-230). After all, sports are meant to enhance the physical and mental abilities of a person as well as entertain them. When a child is being dealt as a “body” that is or is not “good enough” and has to be pushed to its limits, then several problems can occur. In countries such as China and Russia, where there is a tradition of training and raising athletes in an effort to prove the nation’s “supremacy” over others, trying to push children to choose certain sports over others based on strictly bodily criteria is dangerous for the mental health of children and can affect their performance (Snyder, 1994).

At the same time, many sports and exercises can help reducing the body fat and the weight and increase strength, reflexes and muscle. The perception that a person is, by definition, incapable of becoming an athlete not only can affect their self-image but can also limit the possibilities of evolving and improving sports and training (Nelson et al, 2007, p. 1094). Gymnastics, soccer and dancing are among the sports that have largely evolved through time. During the early 20th c., the men and women who competed in dancing and gymnastics have been expected to be

tiny, lean and fast. Nowadays, as the sports have become more competitive and the exercises have changed, the athletes need to be muscular, strong and flexible, yet, stable. The better the balance and the more the strength of, i.e. a female gymnast, the more capable she will be to cope to pressure and perform exercises such as the double back – flip (Ross & Shiness, 2008, p. 40-57).

When it comes to soccer and other, previously, male-dominated sports, the athletes are becoming stronger and the criteria have become less strict. The average goal keeper is usually expected to be tall and strong, yet, through a study of the composition of the leading national and professional teams worldwide, one will realize that the athletes vary significantly between them (Andrews & Andrews, 2003, p. 531-550). Women, too, have become more willing and eager to play soccer and it has evolved to become one of the most important sports in Europe and a profitable business (Frey & Eitzen, 1991, p. 503-522).

Tennis, which is the main topic of this article, is slightly different. This type of sports is closely associated with British royalty, although it is being practiced all around the world and is considered to be “fitting” for both sexes. Male and female athletes start practicing from a relatively older age, usually around eight to fourteen years and, so, the coaches can have a clearer image as to whether the person actually wants to practice it or not. Also, the body has evolved enough for one to be able to assess whether the young athlete has the “ideal body type” or not (Harris & Clayton, 2002, p. 397-413). Yet, even in this case, there are indications that a strict bodily assessment cannot be used as a criterion of selection between young athletes. Each body type has its strong and weak points. Although none of the assumptions are absolute, usually, it is observed that (Schipske, 1988):

- Heavier athletes are more likely to be able to withstand more pressure, are more stable and can be stronger. At the same time, they can grow muscle faster.
- Lighter athletes can be more flexible and are expected to be faster and have better reflexes.
- Taller athletes will be more likely able to perform better against an opponent of similar height who could try and use height as an advantage and have larger limbs so they can cover a larger part of the court.
- Shorter athletes have better balance, can be fast and stable and able to tackle hits that are aimed lower.

Even though it is proven that certain body types have advantages over others, in reality, an athlete’s performance depends on various factors such as (Ericsson, 2004, p. 70-81):

- Their psychology and motive. An athlete that is determined to win can be more competitive and resilient than an athlete who is not as motivated and encouraged. Coaches, family and friends play an important role in this case.
 - Their overall health status and training progress. Even if an athlete does not have the “ideal” body type, by constant training and practice, he or she can turn his or her weaknesses to strengths and compete against stronger athletes by using a strategy and strengthening the body.
 - Weather and other conditions. Some people can perform well in extreme
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weather conditions and some others are more able to adjust. At the same time, a shorter athlete can be more stable and be more able, physically, to endure the pressure.

Moreover, sexualizing women can impact their self-image and mental as well as physical health. Young women tend to malnourish themselves to fit the international standards on beauty as projected by the media. Even if elite and high-class athletes do not, in fact, always have the 90-60-90 measurements that are required by a model, young girls and women may actually try and reach those standards, neglecting the fact that bad nutrition and excess training can be dangerous for them (LeBesco, 2004). If not an Olympic level athlete, no one should be pushed to their limits and there should be no standardizing that will affect a person's self-image and turn people away from sports.

The body type and anthropometric characteristics of the athletes indeed, affect their performance. However, each person and each coach can have a different technique and expectations. Different sports have different requirements and particularities so, the body shape and type can affect the athlete but should not be considered absolute factors. Instead on focusing on the physical characteristics and body composition of the children and teenagers, one should focus on technique and the improvement of one's performance through proper exercising. Coaches should be able to adjust their training programs to fit the needs of the athlete instead of discriminating them and demotivating them.

4. Conclusions

There has been proof that, there have been significant positive correlations that depended not on the body type but coaching age and significant negative correlations with several weight and fat variables. The results of the survey showed that there were no significant differences between the participants in their performance according to their body type. Also, even if some of the teenagers were obese or overweight, they were able to compete and perform. One should take into consideration that, with puberty, the bodily composition and metabolic rate of the teenager will change.

The study should be used as a benchmark study and not an absolute assessment of the performance of the young Greek athletes or the teenage tennis players in the country. Moreover, one should take this case study as an example and a proof of the fact that, regardless of one's shape or physique, they can be capable of becoming athletes and that coaching and training can and, in fact, does, improve one's image and physical health.

References

1. ANDREWS, J.P., & ANDREWS, G.J. (2003). Life in a secure unit: the rehabilitation of young people through the use of sport. *Social Science & Medicine*, 56(3), 531-550.
2. CUSHION, C.J., ARMOUR, K.M., & JONES, R.L. (2003). Coach education and continuing professional development: Experience and learning to coach.

- Quest*, 55(3), 215-230.
3. ERICSSON, K.A., KRAMPE, R.T., & TESCH-RÖMER, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological review*, 100(3), 363.
 4. ERICSSON, K.A. (2004). Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains. *Academic medicine*, 79(10), pp. 70-81.
 5. FERNANDEZ, J., MENDEZ-VILLANUEVA, A., & PLUIM, B.M. (2006). Intensity of tennis match play. *British journal of sports medicine*, 40(5), 387-391.
 6. FREY, J.H., & EITZEN, D.S. (1991). Sport and society. *Annual review of sociology*, 17(1), 503-522.
 7. GUTTMANN, A. (2002). *The Olympics: A history of the modern games* (Vol. 14). University of Illinois Press.
 8. HARRIS, J., & CLAYTON, B. (2002). Femininity, masculinity, physicality and the English tabloid press: The case of Anna Kournikova. *International review for the sociology of sport*, 37(3-4), 397-413.
 9. HORITA, L.T.L. (2008). The relationship between fundamental movement skills and the health and fitness of Canadian children (Doctoral dissertation, University of British Columbia).
 10. KANE, M.J., LAVOI, N.M., & FINK, J.S. (2013). Exploring elite female athletes' interpretations of sport media images: A window into the construction of social identity and "selling sex" in women's sports. *Communication & Sport*, 1(3), 269-298.
 11. KRANE, V., STILES-SHIPLEY, J., WALDRON, J., & MICHALENOK, J. (2001). Relationships among body satisfaction, social physique anxiety, and eating behaviors in female athletes and exercisers. *Journal of Sport Behaviour*, 24(3), 247-264.
 12. LIPPINCOTT, W. & WILKINS ROSS, S.R., & SHINEW, K.J. (2008). Perspectives of women college athletes on sport and gender. *Sex roles*, 58(1-2), 40-57.
 13. CHASAPIDOU, M. & FAHANTIDIS, A. (2003). *Nutrition for Health Exercise and Sports*, Pashalidis Ltd.
 14. MARQUIS, K., ET AL (2002). Midthigh muscle cross-sectional area is a better predictor of mortality than body mass index in patients with chronic obstructive pulmonary disease. *American journal of respiratory and critical care medicine*, 166(6), 809-813.
 15. MÖLLER, R., ET AL. (2000). Estimating percentage total body fat and determining subcutaneous adipose tissue distribution with a new noninvasive optical device LIPOMETER. *American Journal of Human Biology: The Official Journal of the Human Biology Association*, 12(2), 221-230.
 16. NELSON, M. E., ET AL. (2007). Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association. *Circulation*, 116(9), 1094.
-

17. ROBERTS, D. F., & BAINBRIDGE, D. R. (1963). Nilotic physique. *American Journal of Physical Anthropology*, 21(3), 341-370.
18. PLOWMAN, S. A., & SMITH, D. L. (2013). Exercise physiology for health fitness and performance. Lippincott Williams & Wilkins.
19. SCHIPSKE, D. (1988). *U.S. Patent No. 4,718,668*. Washington, DC: U.S. Patent and Trademark Office.
20. SNYDER, C. R. (1994). The psychology of hope: You can get there from here. Simon and Schuster.
21. TUROCY, P. S., ET AL (2011). National athletic trainers' association position statement: safe weight loss and maintenance practices in sport and exercise. *Journal of athletic training*, 46(3), 322-336.



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