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Original scientific paper

Genetically Predisposed Physical Characteristics and Performance Factors in Athletes: A Cross-Sectional Study

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Abstract: Genetic predispositions, along with a supportive social environment, personal motivation, perseverance, dedication, and susceptibility to injuries, all play a role in shaping sports performance and success. In this study, physical characteristics (height, weight, body mass index - BMI) were compared between active males and females in three sports disciplines (field and track athletics, football, and basketball) and inactive control goup. Research on the correlation between genetically predisposed physical characteristics and success in sports activities was conducted through a survey at sports clubs in Banja Luka, Bosnia and Herzegovina. A total of 118 respondents (63 female and 55 male) answered the 16-question questionnaire. The highest were male basketball players, with an average height 13 cm higher than the average male height in Bosnia and Herzegovina. Average BMI was 23.16±3.14, 23.99±1.82, and 23.61±1.14 for male athletes, football players, and basketball players, respectively. In the female group, the BMIs were 20.8±2.07, 20.76±2.36, and 22.175±2.25 for athletics, football, and basketball, respectively. The control group had a BMI of 25.59±3.81 for males and 21.74±2.4 for females. Endurance is the main quality declared by athletes who practice long-term sports, while strength is the main quality in athletes who are active in short-term disciplines. The highest rate of injuries was noted among female football players at 92%. The most frequent injury was injury to the meniscus, tendons, and hamstrings. A positive family history of sports activity showed a significant influence on sports success. Every sport brings numerous health benefits in the form of better immune resistance, maintenance of body mass index (BMI), mental and psychological stability, self-confidence, better social contacts, and more.

Keywords: sport genetics, BMI, endurance, strength, sport success.

INTRODUCTION

Sports performance and success in sports activities are influenced by genetic predispositions, as well as a stimulating social environment, personal motivation, perseverance, commitment, and a tendency towards injuries (Posthumus, 2009; Posthumus, 2010). There is abundant scientific evidence on the influence of genes on physical characteristics such as: height, arm length, muscle mass, muscle structure, heart size, lung size and volume, joint flexibility (Pickering, 2019); but also on physiological characteristics such as: resting heart rate, blood pressure, air flow in the lungs, muscle strength, muscle endurance, speed, aerobic endurance, etc. (**Table 1**).

Table 1. Genetic Influence on Physical Characteristics (Kolač, 2011)

Characteristic	Genetic Influence
Height and arm length	High
Waist circumference	Low to moderate
Muscle size	High
Muscle structure (fast and slow-twitch fibers)	High
Number of mitochondria per gram of muscle	Low

Heart size	High
Lung size and volume	High
Activity of muscle enzymes involved in energy production	Low to moderate
Resting heart rate	High
Blood pressure	Moderate
Airflow in the lungs	Moderate
Muscle strength	High
Muscular endurance (e.g., push-ups)	Moderate to high
Speed	Moderate
Balance	Low
Joint flexibility	High
Reaction time	Low to moderate
Movement precision	Low to moderate
Aerobic endurance	Moderate to high
Anaerobic threshold	Moderate

Body height is 97% hereditary, body mass 85%, and muscle fiber composition 97%. In addition to morphological characteristics, there are also functional abilities. Speed is up to 97% hereditary, reflex reaction 95%, aerobic power 92%, and anaerobic power 90%. Based on these percentages, it was concluded that genetics has a great influence on predispositions, and it is important for an athlete to have predetermined sports predispositions, but success itself does not depend only on genetics. One of the conditions for success is training that can improve these genetic predispositions. Flexibility can be improved by up to 20%, endurance by 8-20%, and speed, at least, by only 5% (Aranitović, 2018).

Sports performance can also be affected by diet and the use of supplements. The influence from the environment is also important, so a supportive family in which parents and other family members play sports represents a significant social influence for achieving sports success. There are numerous examples of people who try harder than others, pay attention to diet, lifestyle, and rhythm, use illegal substances, but do not achieve success like someone who does not pay attention to other factors besides training. In athletics, if a person who does not have a genetic predisposition for speed enters the training, he can improve that characteristic by training only up to 5%. An individual who wants to engage in, for example, bodybuilding, if he is born with wide hips, small calves, small arm circumference or small shoulder circumference, will not be able to improve these characteristics even in 15/20 years and will not be able to sculpt his body in the way he would like. However, every sport brings numerous health benefits in the form of better immune resistance, maintenance of body mass index (BMI), mental and psychological stability, self-confidence, better social contacts, and more. In research on the influence of genetic factors on sports predispositions, the presence of certain genetic markers for certain morphological characteristics or functional abilities is sought out. A Genome-Wide Association Study (GWAS) is a research method used to identify genetic variations associated with specific traits or diseases by analyzing the entire genome of a large group of people. It essentially scans the genomes of individuals, looking for common genetic variants that occur more frequently in those with a particular trait or disease compared to those without it.

This paper is part of a pilot project aimed at enhancing public awareness of the importance and impact of genetic testing on individuals who intend to actively and professionally engage in sports. In this regard, key genes related to sports genetics will be identified.

To date, over 150 genetic markers have been discovered (Varilas-Delgado, 2022; Epstein, 2014). The most important ones are: angiotensin I-converting enzyme (ACE) and ACTN gene (for endurance), actinin alpha 3 (ACTN3) (Fang, 2013) and PPARγ (for power and muscle strength) (Ahmetov, 2013), Hypoxia Inducible Factor 1 Subunit Alpha (HIF1A gene) (Kaznar, 2019), Peroxisome proliferator activated receptor alpha (PPARA) (Ahmetov, 2013), COL51A gene (collagen and flexibility) (Collins, 2010; September, 2009; Releigh, 2009), ACSL1 gene (aerobic capacity) and numerous others.

Hypertrophic cardiomyopathy is the most common cause of sudden death on sports fields. HCM occurs in the general population with a prevalence of about 0.2%. The annual mortality from HCM is 3-4%, while in children it is over 6%. In HCM, three gene mutations are most common: cardiac beta-myosin heavy chains – MYH7 gene (first identified), cardiac protein C – MYBPC3 gene, myosin-related, and cardiac troponin T – TNNT2 gene (Baraković,2007).

MATERIAL AND METHODS

Survey

Research on the correlation of genetic predispositions and success in sports activities was conducted in the form of a survey in sports clubs in Banja Luka, Bosnia and Herzegovina. A survey of 16 questions was created. The questions related to height, weight, type of sports discipline, frequency and type of injuries, type of diet, as well as existing infectious diseases (coronavirus, Epstein-Barr virus, coxsackie virus). The respondents were active athletes from mainly three sports disciplines: basketball, football, and athletics, as well as a control group of respondents who were not actively involved in sports. Respondents provided information about their greatest sporting success, family sport history, hereditary diseases (cardiovascular, metabolic, malignant diseases), and they also made a self-assessment about their best sporting quality: endurance or strength.

Respondents

118 respondents answered the survey, 63 women (44 active and 16 inactive) and 55 men (41 active and 14 inactive). In summary, 85 are actively involved in sports, and the other 30 represent a control group of respondents who are not actively involved in sports.

Respondents were classified by three main sports disciplines: field and track athletics (22 females and 13 males), basketball (11 males and 3 females), and football (15 males and 13 females).

Seven women respondents declared: CrossFit, fitness, dance, volleyball, and handball as sports disciplines. Six men respondents declared some rare sport disciplines: badminton and whitewater kayaking, as well as karate, water polo, handball, and swimming. Those respondents were not statistically analyzed.

Analysis of results

All collected data were classified in a Microsoft Office Excel 2021 database. IBM SPSS 22 was used to analyze the results, calculate the BMI and the mean value of physical characteristics, and create graphs as well as descriptive statistics for the calculation of standard deviation (SD), range, p-value, confidence interval, and coefficient of correlation. Student's t-test and ANOVA test were performed for the parametric test of normally distributed data. Statistically significant p-value was all values under 0.05 ($p \leq 0.05$).

RESULTS AND DISCUSSION

Results of Descriptive Statistics

Body height and body weight

The average body height (BH) of female basketball players, field and track athletes (F&T athletes), and football players was 178.7±3.2 cm, 169±7.1 cm, and 169.9±5.9 cm, respectively. The body weights (BW) in those groups were 71±9.6 kg, 59.47±7.02 kg, and 60±7.9 kg. The average height for women in Bosnia and Herzegovina is 167.5 cm, similar to that of our group of female F&T athletes and football players. However, basketball players are taller than the state average by about 11.1 cm (https://www.ncdrisc.org/).

The average height of the male F&T athletes, football and basketball players who filled out the survey, was 180.9±6.8 cm, 184.4±5.7 cm, and 195.54±9.2 cm, respectively. Men in this category weigh an average of 76.2±14.3 kg, 81.6±7.37 kg, and 90.54±10.9 kg. In the male group, basketball players are 13 cm higher than the average of 182.5 cm for Bosnia and Herzegovina. Football players tend to be slightly higher than average in the general population (https://www.ncdrisc.org/). (Table 2).

In a group of junior basketball players, age 13, the average height for boys was 177.5±8.4 cm and for girls 164±10.5 cm. According to the WHO, the average height of teenage boys and girls at the age of 13 is 156.7±7.4 cm and 156.4 ± 6.9 cm, respectively (Height-for-age boys and girls, WHO,2023). In our group of tested boys, height was 20.8 cm higher than average from WHO data, and girls were 7.6 cm higher than their peers.

BMI and diet

Body mass index (BMI) indicates body size. Normal BMI is from 18.5 to 24.9 kg/m^2. Under 18.5 is underweight, and above 24.9 is overweight.

Body mass index was calculated using the formula:

$$BMI=Weight(kg)/(Height(m))^2$$

Calculated BMI is shown in every sports group and compared between each sports discipline and the control group.

All participants in the survey had an omnivorous diet. Active sportsmen and women follow a diet recommended by a nutritionist with a balanced intake of nutrients.

A confidence interval (CI), for a confidence level value 95%, was calculated. Mean value, standard deviation (SD), CI, and range are shown in **Table 2** for measured physical characteristics in every group.

Table 2. Descriptive statistical results of physical characteristics in three sports disciplines and the control group in men and women

Men	n	BH (cm) Mean±SD	Range	95% CI	BW (kg) Mean±SD	Range	95% CI	BMI (kg/m^2) Mean±SD	Range	95% CI
Field and Track Athletes	13	180.9±6.8	172-192	176.9-184.87	76.2±14.3	55-102	67.87-84.53	23.16±3.14	18-27.7	21.33-25
Football Players	15	184.4±5.7	175-195	181.3-187.4	81.6±7.37	70-94	77.6-85.6	23.99±1.89	21-26.9	22.96-25.01
Basketball Players	11	195.54±9.2*	180-207	189.7-201.4	90.54±10.9	76-101	83.6-97.5	23.61±1.14	21.6-25.3	22.9-24.33

Control group	14	185.29±8.3	175-205	180.6-190	87.71±13.6	67-110	80.09-95.32	25.59±3.81	19.6-34	23.45-29.73
Women		BH (cm) Mean±SD	Range	95% CI	BW (kg) Mean±SD	Range	95% CI	BMI (kg/m^2) Mean±SD	Range	95% CI
Field and Track Athletes	22	169±7.1	164-180	165.8-172.2	59.47±7.02	51-84	56.3-62.6	20.8±2.07	19-26.8	19.9-21.7
Football Players	13	169.9±5.9	162-178	166.5-173.3	60±7.9	50-73	55.4-64.59	20.76±2.36	17.7-25.9	19.38-22.13
Basketball Players	3	178.7±3.2*	175-181	174.8-182.6	71±9.6*	60-78	59.3-82.7	22.17±2.25	19.6-23.8	19.44-24.9
Control group	16	170.56±5.1	160-181	167.9-173.23	63.44±9.13	47-84	58.7-68.2	21.74±2.4	17.7-26.8	20.5-23

BH- body height, BW – body weight, BMI – body mass index, CI – confidence interval; * $p<0.05$

Track and Field Athletes

There were 22 females in the athletics category. The mean value of BMI in active athletes was 20.8±2.07 kg/m^2.

50% of the whole group reported injuries: meniscus, tendons, hamstring/quadriceps, and lower back, with 17.6%, 14.7%, 8.82%, and 8.82%, respectively.

In this group, 13 women participated in the marathon or half marathon. Ten of them were aged 35 to 50 years, and three were 50+ years. Medals from the National, Balkan, and European championships were won by 5, 2, and 2 athletes, respectively. All participants with medals were 18 to 25 years old. A family history of sports activities and other active family members was reported by 14/22 (61%) respondents, of whom 11 won medals and had significant sports success. This indicates the importance of positive social influence on sports success. However, in the control group, there were 10 respondents no longer active in sports, but who were active and during the active period, had sports success, and did not have a family history of sports activities. Participants in this group have strong personal motivation, perseverance, and dedication.

Endurance as a main quality was reported by 61.76%, and 38.24% reported strength. All women who ran in out marathon/half-marathon reported endurance as the main quality.

In this group of 13 male athletes. The mean value of BMI was 23.16±3.14 kg/m^2. Injuries were reported by 46% of sportsmen: meniscus 23%, tendons 15.4%, and hamstring 7.7%.

Family history of sports activity was 53.18% (7/13), but eleven athletes won medals.

The main quality in 46% of respondents was endurance, and strength was reported by 53.8% of athletes.

Football

Thirteen junior female football players were included in this study. The mean value of BMI was 20.76±2.36 kg/m^2.

Injuries were reported in 92% of female football players: 54% hamstring/quadriceps, 31% meniscus and ligaments, and 7.7% discus hernia.

Strength was reported as the main quality in 54% of players, and endurance in 46% of cases. In this group were reported other difficulties during training (breathing, weakness, and fatigue).

Active family members in sport were reported in 8/13 girls (61%), and 6 of them noted sports success.

In the male football group were 15 sportsmen with a mean value of BMI 23.99±1.89 kg/m^2.

47.6% of football players reported injuries: 14.2% had injuries of tendons and ankle joints, and 9.5% each had meniscus and hamstring injury. Nine football players noticed other difficulties as breathing, weakness, and heart rate, during the training process.

Endurance as the main quality was chosen by 57% of sportsmen in this group, and 43% declared strength as the main quality.

Half respondents declared about sports success, and all of them had a stimulating social environment.

Basketball

In this group of respondents, there were 11 male elite basketball players, 3 female basketball players, and 13 child respondents (aged 13 years) who practice basketball (5 girls and 4 boys).

The survey was completed by elite basketball players who play in the ABA league in KK "Igokea", aged 18-32, with an average age of 22.3. The average BMI in this group was 23.61±1.14kg/m^2.

Based on the questionnaire, 55.5% of players declared endurance as the main quality, and 44.5% strength. No one noted any sports injuries.

In the female group, although a small group, the results are shown. BMI was 22.17±2.25 kg/m^2. All respondents noted injuries to the meniscus. The main quality was endurance.

In children's group BMI for boys was 18.7±1.7, and for girls, 18.6±3.7. Five young basketball players declared endurance as the main quality, and 4 noted strength.

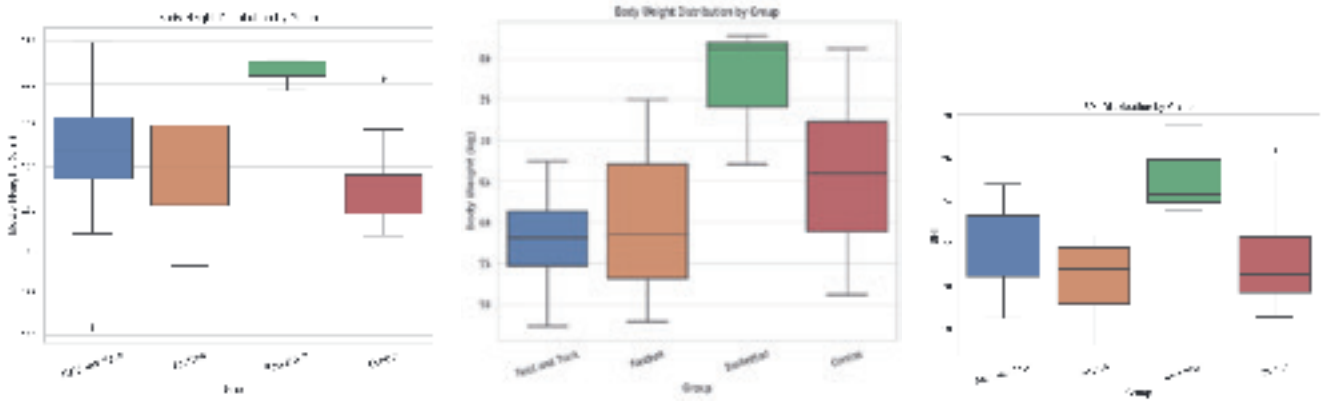
Control group

In the control group (inactive group), there were 30 respondents, 14 men and 16 women. The control group had an average height of 185.29±8.3 cm for men and 170.56±5.1 cm for women. The BW was 87.71±13.56 kg for males and 63.44±9.13 kg for females. The corresponding BMIs are 25.59±3.81 kg/m^2 for men and 21.74±2.4 for women. The highest BMI in the male group was 34, and in the female group was 26.8. The smallest BMI was 19.6 for males and 17.7 for females. All subjects had at least one chronic disease (hypertension, diabetes mellitus type 2, insulin resistance, cardiovascular diseases).

Comparative presentation of genetically conditioned traits in observed sports disciplines

The ANOVA test is used to compare arithmetic means of body height, body weight, and BMI in females (**Figure 1**) and in males (**Figure 2**) in four different groups.

Figure 1. Comparative presentation of mean height (Figure 1A), weight (Figure 1B), and BMI (Figure 1C) in the group of female F&A athletes, football and basketball players, and the control group

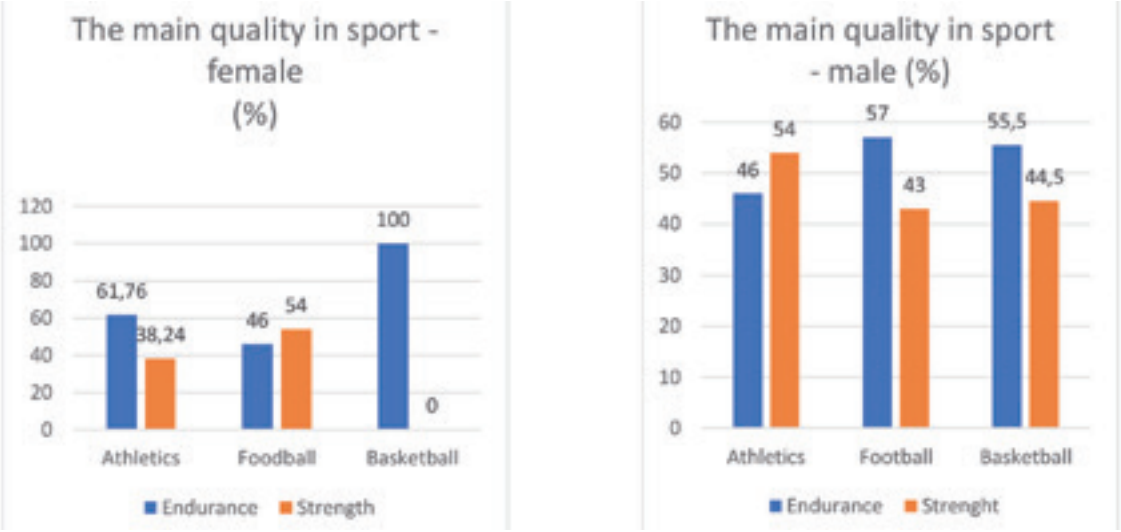


A B C

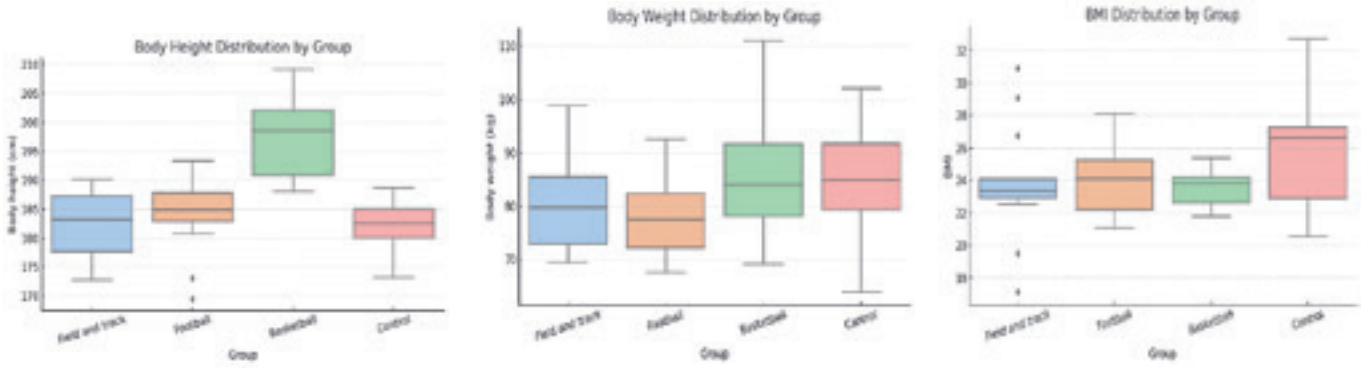
In four observed groups, statistically significant differences are observed in category BW with $p<0.05$. Although there is no statistically significant difference between the groups in BMI, it is important to note that 10 women from the control group were active in sport for many years, and even though they are not active for more than 5 years, their history of sport activity had a positive influence on the maintenance of health BMI values.

In the male group, there is a statistically significant $p<0.05$ in height for basketball players and other groups.

Figure 2. Comparative presentation of mean height (Figure 2A), weight (Figure 2B) and BMI (Figure 2C) in the group of male F&A athletes, football and basketball players, and the control group



A B



A **B** **C**

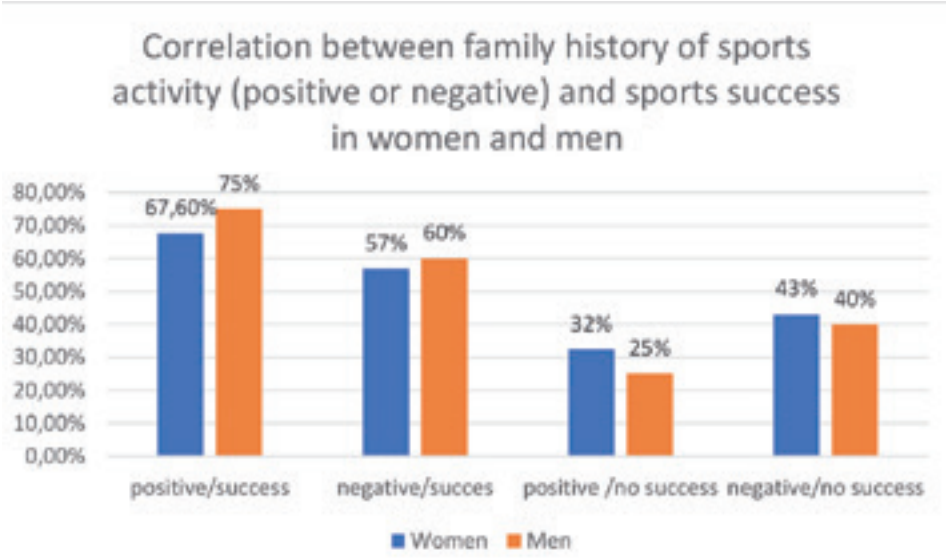
The analysis of height in three sports disciplines indicates that the tallest participants were in basketball, both in females and males. That is the result of positive selection by height for this sport. But, based on analyses of the other two disciplines and the control group can be concluded that sports activity, especially in young age, could help to achieve genetically predisposed height (Dubois,2012).

Sports activity has a big influence on the value of BMI. Even in those who are no longer active in sports, their past activities have a positive effect on BMI values. The biggest variation in BMI was in the male control group. There is an increase in BMI, which, once more time, elucidates that physical activity is crucial for the maintenance of healthy values of BMI.

The main quality (endurance and strength) of the three sports disciplines

In this study, respondents self-assessed their main quality. The results are shown in **Figure 3**.

Figure 3. Comparative presentation of self-assessment about the main quality (endurance or strength) between female (Figure 3A) and male (Figure 3B) F&T athletes, football, and basketball players



Endurance was the main quality for the male football and basketball players and female basketball and field and track athletes. Strength was the main quality of female football players and male field and male field and track athletes. Endurance is the key quality in long-duration sports, while strength plays a major role in short-duration activities.

It could be interesting to compare the results of genetic testing for genetic markers of endurance and strength, and self-assessment of these respondents in some future projects.

Influence of a positive social environment on sports success

In the female sports group, 37 women had positive family sports activity, and 25 of them (67.6%) had significant sports success in international or national competitions. The other 21 female participants had no positive family history, but 12 of them (57%) had success in sports.

In the male group, 24 men had positive family sports activity, and 18 of them (75%) had significant sports success in international or national competitions. The rest of the 20 sportsmen had no positive family history, but 12 of them (60%) had won medals. (**Figure 4**)

Figure 4. Correlation between family history of sports activity (positive or negative) and sports success in women and men

Based on these results, it is obvious that a positive social environment had a significant influence on sports success, but personal motivation, dedication, and determination could not be ignored.

Infection diseases

In the survey, respondents reported being aware of infectious diseases such as coronavirus, Epstein-Barr virus, and Kaposi's sarcoma-associated herpesvirus (KSHV), also known as Kocsakyi virus. Viral infections can cause health problems, which can reduce physical and athletic performance, but on the other hand, it was expected that active athletes had a stronger immune response and lower rates of viral infections.

In this research, only fourteen responders (11.8%) got COVID-19. That is a significantly lower rate than 42.4% in the common population (in 2022) (https://www.unicef.org/bih/media/7481).

Mononucleosis caused by EBV was reported in 3 athletes (2.52%). Mononucleosis is not uncommon in Bosnia and Herzegovina — it regularly ranks among the 5 to 10 most common infectious diseases. In this research, EBV infection was quite rare in the specific population of sportsmen and women.

CONCLUSION

Based on the results presented in this study, several conclusions were drawn. The tallest male participants are basketball players; both females and males are significantly taller than the average in the general population in Bosnia and Herzegovina. This is a sign that positive selection by height was present in basketball. Sports activity at a young age could help to achieve genetically predisposed height. Sports activity has a big influence on BMI, even after stopping sports. The highest BMI was noted in the control inactive men group. A strong correlation was found between a family history of engaging in sports and the personal athletic success of the participants in all three examined sports categories, highlighting the importance of a stimulating and supportive environment for athletic achievements. The highest percentage of injuries was found among female football players. The most frequent injury in all three sports disciplines was injury of the meniscus and tendons. None of the participants from the three sports categories reported chronic health problems, while all individuals in the control group reported certain health issues (hypertension, insulin resistance, or diabetes). Genetic testing is important for determining athletic predispositions at an early age, as well as for the early detection of hereditary diseases that may lead to fatal outcomes during intense physical activity. Based on such findings, it would be possible to implement protective and preventive genetic testing, especially for those young sportsmen who plan to pursue professional activity in sports.

Conflict of interest
The authors declare no conflict of interest.

REFERENCES

Ahmetov I, Egorova E, Mustafina L. (2013). The PPARA gene polymorphism in team sports athletes, Central European Journal of Sports Sciences and Medicine, Russia; 1(1):19-24.

Aranitović K. (2018). Komparativna analiza morfoloških karakteristika i motoričkih sposobnosti prve i druge postave ženske odbojkaške ekipe. MASTER RAD, Beograd. https://phaidrabg.bg.ac.rs/open/o:17255

Baraković F, Kušljugić Z, Mašić I. (2007). Mutacije gena u primarnim kardiomiopatijama. MEDARH: 61(2,supl.1)

Collins M, Posthumus M, Schwellnus MP. (2009). The COL1A1 gene and acute soft tissue ruptures; Br J Sports Med; 44(14):1063-4. doi:10.1136/bjsm.2008.056184

Dubois L, Ohm Kyvik K, Girard M, Tatone-Tokuda F, Pérusse D, et al. (2012) Genetic and Environmental Contributions to Weight, Height, and BMI from Birth to 19 Years of Age: An International Study of Over 12,000 Twin Pairs. PLOS ONE 7(2): e30153. https://doi.org/10.1371/journal.pone.0030153

Epstein D. (2014). The Sports Gene: Inside the Science of Extraordinary Athletic Performance. PORTFOLIO. ISBN-13 978-1617230127

https://www.unicef.org/bih/media/7481/file/Procjena%20posljedica%20COVID-19%20na%20dru%C5%A1tvo%20u%20Bosni%20i%20Hercegovini%20.pdf

https://www.ncdrisc.org/

https://www.who.int/tools/child-growth-standards/standards/length-height-for-age

Kaznar O, Bilici M.F, Sercan C, Ulucan K. (2019). Determination of HIF-1A rs11549465 Polymorphism in Elite Skiers, TURKISH JOURNAL OF SPORT AND EXERCISE, Turkey, 22(2). doi:10.15314/tsed.544566

Kolač M. (2011). Genetika i sport. FITNESS.HR.

Pickering C, Kiely J, Grgić J, Lucia A, Del Coso J. (2019). Can Genetic Testing Identify Talent for Sport? Genes (Basel). 10(12):972. doi: 10.3390/genes10120972.

Fang M, Yu Y, Xiangwei L, Feng Z, Cong G, Mufei L, Lei G. (2013). The Association of Sport Performance with ACE and ACTN3 Genetic Polymorphisms: A Systematic Review and Meta-Analysis, PLOS ONE. doi.org/10.1371/journal.pone.0054685

Posthumus M, Colins M, Cook J, Handley C, Ribbans W, Smith R, Schwellnus MP, Raleigh S. (2010). Components of the transforming growth factor-beta family and the pathogenesis of human Achilles tendon pathology–a genetic association study; Rheumatology; 49(11):2090-7. doi: 10.1093/rheumatology/keq072.

Posthumus M, September AV, O'Cuinneagain D, van der Merwe W, Schwellnus MP, Collins M.(2009). Am J Sports Med. 37(11):2234-40. doi: 10.1177/0363546509338266.

Raleigh SM, van der Merwe L, Ribbans WJ, Smith RK, Schwellnus MP, Collins M. (2009) Variants within the MMP3 gene are associated with Achilles tendinopathy: possible interaction with the COL5A1 gene. Br J Sports Med.43(7):514-20. doi: 10.1136/bjsm.2008.053892. September AV, Cook J, Handley CJ, van der Merwe L, Schwellnus MP, Collins M. (2009). Variants within the COL5A1 gene are associated with Achilles tendinopathy in two populations. Br J Sports Med. 43(5):357-65. doi: 10.1136/bjsm.2008.048793.

Varillas-Delgado D, Del Coso J, Gutiérrez-Hellín J, Aguilar-Navarro M, Muñoz A, Maestro A, Morencos E. (2022). Genetics and sports performance: the present and future in the identification of talent for sports based on DNA testing. Eur J Appl Physiol. 122(8):1811-1830. doi: 10.1007/s00421-022-04945-z.

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