International Journal of Academic Health and Medical Research (IJAHMR)
ISSN: 2643-9824
Vol. 6 Issue 1, January - 2022, Pages:139-145

Physical Composition And Motor Skills Of Footballers

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Abstract: *The research included 11 original scientific papers. All works satisfied the problem and could give an answer to the problem. The aim of the study was to determine whether body composition affects motor skills in football players. The search was performed on the basis of collected works published between 2006 and 2020. By analyzing the obtained results, we conclude that the body composition has a positive effect on the motor abilities of football players. The results of this research can be used by future research in order to find adequate literature, in order to determine the body composition and motor abilities of football players and their mutual influence.*

Keywords-BIA, review, soccer, body fat%, agility

1. INTRODUCTION

Football is the most important sideline in the world, so many argue. However, when you consider how many people make a living from working in and around football, and how much they earn enough for their livelihood, it could be said that football is one of the most important things in the world today. Football is a phenomenon that unites the whole world and is one of the most popular sports (Bangsbo, 1994). Football as a complete sport that abounds in the most diverse possible movements is classified as a polystructural, complex sport (Malacko, 2000; Šimonek, Horička, & Hianik, 2017). That is why football players cannot afford to gain extra pounds, because activity on the field is necessary. In order for a football player to be able to perform football tasks, he must, among other things, possess the necessary level of motor skills that can only be achieved by systematically conducting physical preparation training (Verheijen, 1997; Weineck, 2000; Haff & Triplett, 2016). The most important variables for measuring performance in football are physical condition, technical abilities and tactical knowledge (Rosch et al., 2000; Veljović & Stojanović, 2013). Specific football tests should aim to identify the motor profile of the player, while respecting his advantages and disadvantages, ie. to objectively assess the effects of specific programs. Similarly, an appropriate battery of tests could be of great use, in order to monitor the progress of injured players during rehabilitation. That's why the test battery should show information about the warm-up process, flexibility, patterns of major movements in football skills such as strength, speed and endurance. (Ekblom, 1994; Köklü, Alemdaroğlu, Özkan, Koz, & Ersöz, 2015). The basic motor skills of athletes have been established in a large number of researches and represent important advice for someone to do top sports in general. Athletes' specific motor skills are upgraded to basic ones. Indicators of the situational efficiency of athletes can be registered during annual activities. Within the diagnosis of the initial, transitive and final state of athletes, procedures for assessing health status, measuring basic and specific functional and motor abilities, determining personality structure and mental abilities, and assessing situational efficiency are most often performed (Milanović, 2009).

Based on the body composition, one can get an impression of a lifestyle that includes both good and bad habits, and reflects on the structure of the body, giving a kind of personal characteristic (Maksimović, 2008; Krespi, Sporiš, & Mandić-Jelaska, 2018). Body composition according to the American Association for Health, Physical Education, Recreation, and Dance (AAHPERD, 1989) represents the ratio of adipose, muscle, and bone tissue to total body mass. Physical composition and physical appearance change under the influence of exercise. Morphological and body composition (body fat, body mass, muscle mass) of athletes, physical characteristics and technical-tactical capacity significantly affect success and performance (Booysen, Gradidge, & Constantinou, 2019). The development of strength is mainly accompanied by an increase in muscle mass, and an increase in aerobic endurance is often accompanied by a decrease in subcutaneous adipose tissue (Stoiljković, 2005). Changes in body composition can be even more significant, when, in addition to specially programmed exercise, an appropriate diet is applied (Stoiljković, Đorđević-Nikić, & Macura, 2005). The aim of the research was to determine whether body composition affects the motor abilities of football players.

2. RESEARCH METHOD

To collect relevant literature that is adequate for research of this type, the following databases were searched: Medline, Google Scholar, Web of Science and PubMed. Papers published in the period from 2006 to 2020 were searched. The found works (abstracts and whole works) were analyzed, and in order to be included in the final analysis, they had to meet two criteria: That the research was of an experimental nature and that the respondents were involved in football. Databases were searched using the following words in Serbian and English: BIA, review, soccer, body fat%, agility. The initial search identified the works that correspond to the

research problem. After the identification of the works, their screening was performed. Those works that do not meet the criteria for inclusion are excluded. The remaining papers that met the eligibility criterion were analyzed by descriptive method and theoretical analysis method, and then included in the qualitative synthesis. Each research is presented using the following parameters: references (first authors and year of publication), number of respondents, age of respondents, variables and research results.

3. RESULTS

Based on keywords, 263 papers were identified. The number of studies that were immediately excluded based on titles and duplicate papers was 127, while 136 papers were included in further analysis. Further analysis of 52 papers excluded 32 papers based on several criteria: abstract, because it was a systematic review of research, as well as the lack of adequate information needed for research. The remaining 20 papers met the defined criteria and were included in the systematic review. The final analysis included 11 papers, which were collected and analyzed based on the previously mentioned parameters and methods. Male and female respondents participated in the research, and in order to meet the set criteria, the respondents had to play football as a condition. All papers taken into consideration, in addition to the criteria for playing football, the research goal had to have tests of explosive strength, speed, coordination and agility. A detailed overview of the process of collection, analysis and elimination of works based on predefined criteria can be found in *Figure 1*.

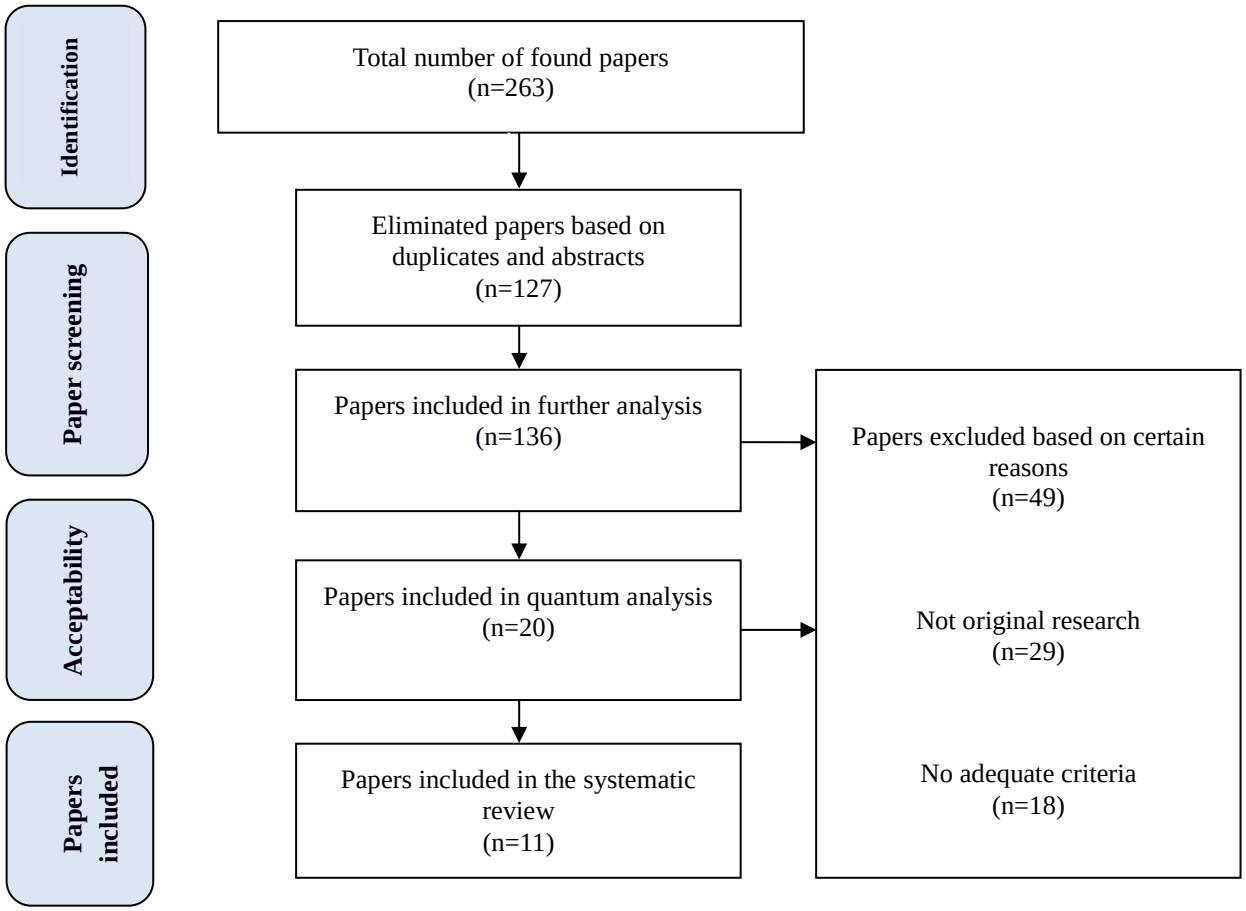

Figure 1. Presentation of the process of collecting adequate works on the basis of pre-defined criteria

Author and year of publication	Number of respondents	Age of respondents	Variables	Results
Wittich, A. et al (2001)	75	Professional footballers	X-Ray, bone mass, BMI, adipose tissue, muscle mass	Adipose tissue was more present in the control group, while bone mass and muscle were more pronounced in professional players. Midfielders had a higher percentage of BMI than attackers and defenders. The percentage of adipose tissue ranged from 6.1-19.5% in football players and 9.1-29.9% in the control group. Research can serve all coaches.
Noel, et al (2003)	69	Footballers, first division players	Body composition, hydrostatic weighing, adipose tissue	The increase in body fat and the composition of the players are on the rise, but to make differences in relation to the positions of the players. Thus, the lowest percentage of fat was observed in defensive and offensive players of defense and stoppers, and the highest in goalkeepers.
Silveste, R. (2006)	N = 27	A = 19.9 +/- 1.3	BC, vertical jump VJ, speed, body mass, body fat BF, physical performance., Vo2.	Significant correlations were found between BC and PP ranging from −0.38 to 0.61 for weight, VJ, S, TPV, and Vo (2) max. BF showed a positive correlation with S (r = 0. 60) and a negative correlation with Vo (2) max (r = -0.67). The values for BC and PP were similar in starters and non-starters, and only TPV showed a significantly higher value in starters.
Suman, D. (2010)	N = 15	A = 19-24	Body fat, lean body mass, speed, agility, explosive leg strength and belly strength.	There is a significant inverse relationship between body weight and abdominal strength, but there is no significant relationship between lean body mass and speed, lean body mass and agility, lean body mass and explosive leg strength, body fat and agility.
Pettersen, SA (2015)	N = 132	E1 = 10.8± 0.50 E2 = 13.9± 0.50 E3 = 15.5± 0.24	Anthropometric characteristics, sprint 20m, agility test	Body height and weight were significantly correlated with sprint performance at 13 and 16 years of age

Atakan, M. (2017)	N = 17	A = 17	Jumps in counter-movement CMJTT, squat jumps CJTT, agility test, 30m sprint test, body weight, fat mass, bone mineral content, lean body mass.	In conclusion, for football players, changes in body composition are of great importance in athletic performance, especially in sprint and agility, appendicular LM and appendicular LMI ($p < 0.05$). In addition, there was a negatively significant correlation between t-agile test, body weight and LM ($p < 0.05$). A slight correlation was observed between CMJT, SJT and body mass index and other anthropometric variables. In conclusion, for football players, changes in body composition are of great importance in athletic performance, especially in sprint and agility, appendicular LM and appendicular LMI ($p < 0.05$). In addition, there was a negatively significant correlation between t-agile test, body weight and LM ($p < 0.05$). A slight correlation was observed between CMJT, SJT and body mass index and other anthropometric variables.
Zerf, M. (2017)	N = 163	A = 19.56 ± 1.22 M = 163	Fat percentage, abdominal test, modified dynamic balance test, standing balance	Fat affects the mobility and stability of football players, where it directly suggests postural anomalies, coordination, agility and balance.
Tareq (2018)	N = 16	A = 15-18	Speed, agility, body fat percentage, reaction time	There is no significant difference between reaction time and speed in the subjects. There is a negative correlation between body fat percentage and reaction time
Clael, S. (2019)	N = 20	A = 20.95 ± 1.84	Acceleration and maximum speed at 30m, Balsom agility test, JoJo test, anthropometric characteristics	Body composition is a deciding factor in motor tests
Bajramovic, I. (2019)	N = 22	A = 16-18	Body height; body weight; body mass index (BMI); fat component content, 10m sprint (s); 0-30 ball running (s) and slalom running ball (s)	Statistically significant relationships were observed between body weight and explosive power of the 10m sprint ($r = .473$; $p < .05$), and body mass index and explosive power of the 10m sprint ($r = .576$; $p < .01$).
Zanini, D. (2020)	N = 44	A => 12.13	Agility, vertical jump, body fat	A significant correlation was found between agility ($p = 0.000$; $\rho = 0.530$) and vertical jump tests ($p = 0.003$; $\rho = -0.437$) with body fat percentage. It was concluded that there is a relationship between the percentage of body fat and agility and the explosive power of the lower limbs.

Legend: N-total number of subjects, M- male, F-female A- age, CMJTT- Jumps in counter movement, CJTT- squat jumps, BC- body composition, VJ- vertical jump, BF- body fat, LM- lean body mass, LMI-index of lean body mass, PP- physical performance, TPV- total amount of power produced in the body CMJT-test of jump in counter movement

4. DISCUSSION

Based on the interpreted results of the 11 papers we included in the research, we present the most important details of the mentioned authors. A total of 1,190 respondents participated in the research and all of them met the criteria for playing football. The largest number of respondents was 163 (Zerf, 2017), and the smallest 15 (Suman, 2010). When observing or examining the body composition and body constitution of football players during adolescence, it can be concluded that goodins have a positive relationship with muscle mass, and a negative relationship with body fat mass. When respondents are compared to the general population of the same years, the results are equal body weight, higher growth and body mass index, and lower percentage of fat (Nikolaidis & Karydis, 2011). Differences in flexibility appear only at a later age (14 years), while the differences in explosive power (estimated different jumps) are moderate. The most prominent advantage of the control group, throughout the age period, was agility and coordination. For this reason, the explosive strength of the legs, and especially agility and coordination, characterize football players of this age, but not the size and composition of the body, which means that these two motor skills should be crucial for the later success of these eleven-year-olds. into account. In contrast, body size and composition do not play such an important role in this time period. A significant effect with age occurs with age in all variables except fat, addition test, and peripheral consciousness test. Based on discriminant analysis. The correlation of the coefficient determines that the variables are related to performance time in a specific laboratory test, perceptual consciousness test in ten-year-olds, hormonal profile, dribbling test, addition test in twelve-year-olds and agility, squat jumping, dribbling test and addition test in fourteen-year-olds. As for the accuracy of the addition, the appropriate relationships with body weight are the percentage of fat, 10m sprint and squat jump in ten-year-olds, and in fourteen-year-olds, eye-arm-leg coordination.

The relationship between the time of performance in the laboratory-specific test and the predicted time is significant only in fourteen-year-olds. All this means that the agility with the ball in special laboratory conditions improves with age. Age has a significant impact on each footballer's measured variable, except for fat percentage (Vanttinen, Blomqvist, Nyman, & Hakkinen, 2011). In order to identify potential talents, (Hirose & Seki, 2016) measured two-year changes in anthropometric variables and motor skills in top football players and came to the conclusion that both groups had minimal changes in some variables, thinking primarily of height, weight, sprint speed at 40m , with a significant correlation between initial values two years later. But on the 10x5m sudden change of test test, there was a big change in ranking, without a statistically significant correlation on the final measurement, which may be a good indicator that the subject is talented, but on the other hand muscle strength and agility are variable during the growth period. This means that these parameters are not useful for the talent identification index. When it comes to the game in football and the role of players in it, the results are that the attackers are characterized by a higher height and a higher level of development of active body tissue and the cardiovascular system. Defensive players are characterized by a slightly higher body weight, while midfielders show a slightly higher percentage of extracellular fluid (Burdukiewicz, Chmura, Pietraszewska, Andrzejewska, Stachon, & Nosal, 2013). There are trends in the composition of body tissue and cardiovascular efficiency of football players, depending on the position they play, what should be paid attention to,

The greatest influence on the quality of players have specific motor abilities and generally a factor of motor abilities. These factors have been identified as the most important. With the arrival of this knowledge, we gained insight into the structure of the relationship of motor, morphological and specific motor variables, as they conclude (Mandić, Jelaska & Katić, 2013). Pettersen, & Mathiesen (2015) in their study measured boys divided by age categories, 10–12, 13–14, and 15–16 years. In the first group, it can be concluded that there are no significant correlations between body weight and sprint test, except for body weight that correlated in the 10-20m sprint. In the second group, body height correlated with both sprint tests, as well as the 10-20m sprint and the agility test. In the third group, body height correlated with the 20m and 10-20m sprints. Body weight was significantly correlated in the 10m sprint test in the second group, as well as in the 20m and 10-20m sprints in the third group. Body height and body weight correlated significantly with the agility test in thirteen-year-olds and sixteen-year-olds. Sharma (2015) came to the conclusion that the respondents of all three levels have a below-average body mass index, which is related to motor abilities. When it comes to motor skills, similarities occur between agility, speed, arm and shoulder strength, explosive leg strength, cardiovascular endurance, and body mass index. But the differences are as follows: the university level group is more agile compared to the state level group, and the state level group is less agile compared to the national level group.

5. CONCLUSION

The aim of the research was to show the influence of body composition on the motor abilities of football players by critical analysis of previous research and generalization of the results of all analyzed research that studied the physical composition and motor abilities of football players. There is a connection between the body composition and the motor abilities of football players. Higher weight and a higher proportion of body fat are associated with low levels of motor performance, regardless of gender. Therefore, the need to assess and monitor body composition has been increased to minimize the negative effects of this variable on sports performance. These results can be useful for assessing the effects of new strategies, monitoring players and their physical status.

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