

INFLUENCE OF SPECIAL FITNESS PROGRAMS ON SOME MORPHOLOGICAL CHARACTERISTICS, MOTOR AND FUNCTIONAL ABILITIES IN BASKETBALL PLAYERS

DOI: <https://doi.org/10.46733/PESH2514191sh>

(Original scientific paper)

Elhami Shabani¹, Milan Naumovski¹, Ruzdija Kalac¹, Borce Daskalovski¹,
Abdulla Elezi²

¹Ss. Cyril and Methodius University, Faculty of Physical Education, Skopje, Macedonia

²University of Prishtina "Hasan Prishtina" Faculty of physical education and sport Kosovo

Abstract

Background: The basic idea of this longitudinal study is that a well-structured fitness program will significantly improve these key aspects of physical preparation, which are necessary for sports performance and achieving top results in young basketball players. Methods: 80 basketball athletes were involved in the research. The sample was divided in two groups. The first group was the experimental one (EGB) and it includes 40 younger basketball players, who had four month of kinesiological treatment (three times weekly with one-hour exercises for strength). The second group was the control one (CGB), consisted of 40 basketball players who did standard trainings. The research includes 24 variables in total, of which: 10 variables for assessing morphological characteristics, 10 variables for assessing motor abilities and 4 variables for functional abilities assessment. Multivariate and univariate analysis of covariance (MANKOVA, ANCOVA) was applied to process the results, Results: By applying multivariate analysis of covariance (MANKOVA), in anthropometric variables a statistically significant difference was determined, Wilks' Lambda is 0.38 and for degrees of freedom $df=10/59$, it gives statistical significance at the $Q=.000$ level, the partial effect size is ($\eta^2 =0.62$), in motor variables Wilks' Lambda is 0.10 and for degrees of freedom $df=10/59$, it gives statistical significance at the $Q=.000$ level, the partial effect size is ($\eta^2 =0.90$), and in functional skills Wilks' Lambda is 0.67 and for degrees of freedom $df=4/71$, it gives statistical significance at the $Q=.000$ level, the partial effect size is ($\eta^2 =0.34$). Conclusions: The conclusion of this research clearly indicates that specially created fitness programs have a significant positive influence on the morphological, motoric and functional abilities of basketball players. According to that, their implementation can significantly contribute to good sports results and increase the competitive advantage of athletes.

Key words: fitness program, basketball players, motor abilities

Introduction

Basketball is one of the most dynamic sports in terms of complexity, intensity, fast and explosive movements and quick decisions of the players. It is one of the most popular and dynamic sports nowadays and it causes interest in many scientific researches in all age groups (Šeparović, Užičanin, Pojskij, 2010). In the specification of success, Karalejić and Jakovljević (2001) put the anthropometric characteristics of the basketball player first, and therefore the most important. They highlight the longitudinal dimension: body height, sitting height, arm span, limb length, feet and fingers. (Jakovljević, Pajić, Gardašević, and Višnjić, D. (2010). Then they list the transversal dimension, which includes measurements of width (width of shoulders, pelvis, hips), circumference, body mass and subcutaneous fat (skin folds). In addition to these dimensions, and within the framework of anthropometric characteristics, the body composition and somatotype of the player are listed. In the group of sports, basketball is considered an extremely complex game, with a very specific structure and high motor and functional abilities. Basketball is defined as a game played by two teams of five players each, where the goal of each team is to score as many points as possible from the opponent (Matković, Kjaz and Kosić, 2003; Naumovski, 2002; Abazović, Kovačević, Erceg, and Zametica, 2015). Basketball is a sport in which high-intensity activities, such as fast running or jumping,

are interspersed with low-intensity activities - so-called intermittent activities (Oudejans, Langenberg and Hutter, (2002). Conditioning is a complex and comprehensive process of applying different programs for the development and maintenance of functional and motor abilities as well as morphological characteristics in athletes. The main goal of these programs is to improve training and sports results, the quality and basic and specific abilities. Physical training should be understood as a long-term exercise process in which loads and breaks, stress and adaptation to loads are always changing. In physical abilities we can act in two ways, analytical development of each separately or synthetic development - unifying development of many abilities in the common conditional preparation (Jukić, Milanović, Šimek, 2007). The tasks of physical preparation consist in answering these questions (Malacko, 1982, 2015). On which factors does the sports result in a given sport depend, What is the role and importance of each factor, How many and what are the ratios between the factors, What are the optimal tools, methods and physical loads that can be used to change the factors that affect the overall success in a particular sport, With the help of which measuring instruments and in what way can the relevant factors best be measured and controlled and What are the structures of the training process that must be implemented.

Method

The respondents' sample is defined as a sample taken from the active population of athletes who would like to be part of this research, and it includes 80 athletes - basketball players. The sample is divided into two groups. The first group is the experimental one (EGB) and it includes 40 younger basketball players who are to undergo a four-month kinesiological treatment (three times a week one-hour strength exercises). The second group is the control one (CGB), which consists of 40 basketball players who do standard training. In selecting the sample, the only condition is to have the athletes' voluntary consent for their participation in the research. The research includes 24 variables in total, of which: 10 variables for assessing morphological characteristics, 10 variables for assessing motor abilities and 4 variables for functional abilities assessment. The measurement of the morphological characteristics was carried out in accordance with the instructions of the International Biological Program (IBP), (Lohman, Roche, & Martorell, 1988). The variables for assessing anthropometric dimensions with which we need to obtain basic data on the morphological status of the subjects are classified into two groups. To assess body volume and mass: Body mass /kg/ (AMAT) Chest average circumference /mm/ (ASOG), Upper arm circumference /mm/ (AONA), Thigh circumference /mm/ (AONK) Lower leg circumference /mm/ (AOPK). To assess subcutaneous fat tissue: Upper arm skinfold (AKNN), Skinfold on the back (AKNG), Abdominal skin fold (AK NC), Thigh skinfold (A KGN), Lower leg skinfold (AKNP). Assessment of basic motor skills was performed in accordance with standardized testing protocols (Tomkinson et al., 2007). Parameters for assessing basic motor abilities: 20-m high-start running (T20M), Hand tapping (TARA), Tapping with legs on the wall (TNOZ), Standing long jump (SKDM), Standing high jump (SCVM), 3-kg-med-ball standing chest pass (FMGS), 3-kg-med-ball seated chest pass (FMSE), Flamingo Balance (FLRA), Seated forward bend - Sit and Reach (SNSP), Agility T-Test (AGTT). Assessment variable of functional ability (Bangsbo et al., 2008): Parameters for assessing functional ability/functional capacity (Bangsbo et al., 2008): Astrand Test (ASTT) Resting heart rate (pulse) (PULSE), Systolic pressure (SIPR), Diastolic pressure (DBP)

Before beginning the experimental training program, the respondents were divided in couples according to the results obtained from the strength tests. Every strength test begins with 5-minute walk and exercises for stretching all muscular groups. After completing the training, a 5-minute stretching for all muscular groups is provided, too. The experimental treatment was 16 weeks, and the training sessions were three times a week, with 48 training sessions in total. (Nešić, 2014; according to Jukić and Marković, 2005).

Intergroup differences in the investigated areas in the final measurement were determined using multivariate and univariate analysis of covariance (MANKOVA, ANCOVA), variables measured at initial measurement were treated as fixed covariances. The data are processed with statistical package of SPSS for Windows version 22.0.

Results

To determine whether there were statistically significant differences in anthropometric measures between the experimental and control groups, multivariate and univariate analysis of covariance were applied at the final measurement (after a 16-week training period). The results of the multivariate and univariate analysis of covariance are presented in Tables 1 and 2. By applying the multivariate analysis of covariance (MANKOVA), that is, by testing the significance of the differences in the arithmetic means of

the system of anthropometric measures (after completing the 16-week training), a statistically significant difference was determined between the two groups of respondents, since the Wilks' Lambda is 0.38 and for the degrees of freedom $df=10/59$, it gives statistical significance at the level of $Q=.000$. The size of the partial effect for the whole system of determinants (partial η^2) shows a large effect on the influence of 0.62.

Table 1. Significance of differences in the final measurement between the experimental and control groups of basketball players in anthropometric characteristics

	Value	F	Hypothesis df	Error df	Sig.	η^2
Wilks' lambda	0,38	9,71	10	59	0,000	0,62

	Experimental group		Control group		F	Sig.	η^2
	Mean	SD	Mean	SD			
AMAT	68,50	6,78	68,03	7,73	3,06	0,085	0,04
ASOG	86,33	5,93	84,48	5,86	13,51	0,000	0,17
AONA	27,57	2,07	26,16	2,14	15,66	0,000	0,19
AONK	50,19	4,98	48,81	3,62	1,27	0,263	0,02
AOPK	35,18	2,70	34,53	2,67	3,07	0,084	0,04
AKNN	6,85	3,26	6,44	1,93	21,39	0,000	0,24
AKNG	6,64	2,48	6,41	2,03	43,98	0,000	0,39
AKNC	8,93	4,54	8,20	3,17	4,48	0,038	0,06
AKGN	6,77	4,11	6,61	2,48	20,54	0,000	0,23
AKNP	7,92	4,10	7,31	2,96	3,85	0,054	0,05

Table 2. Corrected arithmetic mean of anthropometric measurements between experimental and control groups of basketball players in anthropometric characteristics

Variable	Group	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
AMAT	Experimental group	68,35	0,07	68,22	68,48
	Control group	68,18	0,07	68,05	68,31
ASOG	Experimental group	85,54	0,05	85,44	85,65
	Control group	85,26	0,05	85,15	85,37
AONA	Experimental group	27,23	0,13	26,97	27,48
	Control group	26,51	0,13	26,25	26,76
AONK	Experimental group	49,56	0,07	49,41	49,71
	Control group	49,44	0,07	49,29	49,59
AOPK	Experimental group	34,94	0,07	34,81	35,07
	Control group	34,77	0,07	34,64	34,90
AKNN	Experimental group	6,40	0,07	6,26	6,55
	Control group	6,88	0,07	6,74	7,03
AKNG	Experimental group	6,27	0,05	6,16	6,38
	Control group	6,78	0,05	6,67	6,88
AKNC	Experimental group	8,41	0,10	8,20	8,61
	Control group	8,72	0,10	8,52	8,93
AKGN	Experimental group	6,29	0,12	6,04	6,53
	Control group	7,09	0,12	6,85	7,34
AKNP	Experimental group	7,46	0,11	7,25	7,67
	Control group	7,76	0,11	7,55	7,97

In order to determine in which anthropometric measures there are statistical intergroup differences, univariate analysis of covariance was calculated individually for each variable. From the overview of table 1, it can be seen that statistically significant differences were determined in 6 out of a total of 10 variables (anthropometric measures). Intergroup differences (after the 16-week training period) were determined in anthropometric measurements: average breast circumference, upper arm circumference, upper arm skinfold, back skinfold, abdominal skinfold and upper leg skinfold. The partial effect on the determinants η^2 is ranked between 0.06 and 0.39 and shows a small effect on the impact. The anthropometric measure skinfold on the back shows the greatest effect in determining the differences (partial $\eta^2 = 0.39$). Statistical differences between the experimental and control groups (after the 16-week training period) were not determined in anthropometric measures: body weight, upper leg circumference, lower leg circumference and lower leg skin fold. From the level of statistical significance and the values of the corrected arithmetic

means, it can be seen (tables 1 and 2) that after a 16-week training period, the experimental group (basketball players who, in addition to standard training, also have a fitness program) show higher mean values for the mean chest circumference and upper arm circumference and lower mean values for the skin folds on the upper arms, back, stomach and upper part of the legs.

To determine whether there are statistically significant differences in the motor tests between the experimental and control group of basketball players, multivariate and univariate analysis of covariance was applied in the final measurement (after the 16-week training period). The results of multivariate and univariate analyzes of covariances are presented in Tables 3 and 4.

By applying the multivariate analysis of covariance (MANKOVA), that is, by testing the significance of the differences in the arithmetic means of the system of motor tests (after a 16-week training period), a statistically significant difference was determined between the two groups of subjects, since the Wilks' Lambda is 0.10 and for the degrees of freedom $df=10/59$, it gives statistical significance at the level of $Q=.000$. The size of the partial effect for the whole system of determinants (partial η^2) shows a very large effect on the influence 0.90

Table 3. Significance of differences in motor test in the final measurement between the experimental and control groups of basketball players

	Value	F	Hypothesis df	Error df	Sig.	η^2
Wilks' lambda	0,10	52,37	10	59	0,000	0,90

	Experimental group		Control group		F	Sig.	η^2
	Mean	SD	Mean	SD			
T20M	3,48	6,78	3,42	0,19	0,62	0,433	0,01
TARA	35,50	5,93	34,18	3,89	0,13	0,720	0,00
TNOZ	23,15	2,07	22,90	3,16	0,15	0,700	0,00
SKDM	221,73	4,98	211,98	17,83	116,24	0,000	0,63
SKVM	51,05	2,70	47,08	7,66	59,31	0,000	0,47
FMGS	805,00	3,26	758,38	93,74	121,90	0,000	0,64
FMSE	769,90	2,48	715,08	95,95	93,41	0,000	0,58
FLRA	5,95	4,54	7,35	1,33	11,42	0,001	0,14
SNSP	27,25	4,11	26,30	3,05	0,06	0,805	0,00
AGTT	10,59	4,10	10,47	0,54	0,23	0,631	0,00

From the level of statistical significance and the values of the corrected arithmetic means, it can be seen (Tables 3 and 4) that after a 16-week training period, the experimental group (basketball players who, in addition to standard training, also have a fitness program) shows better results in tests for assessing the explosive strength of the upper and lower extremities (long jump from a place, high jump from a place, throwing a 3 kg medicine ball with two hands from the chest from a standing position, throwing a 3 kg medicine ball with two hands from the chest from a sitting position) and balance assessed through the flamingo test.

In order to determine whether there are statistically significant differences in the parameters for assessing functional abilities between the experimental and control groups, multivariate and univariate analysis of covariance was applied in the final measurement (after the 16-week training period). The results of multivariate and univariate analyzes of covariances are presented in Tables 5 and 6.

By applying the multivariate analysis of covariance (MANKOVA), that is, by testing the significance of the differences in the arithmetic mean of the system of variables for the assessment of functional abilities (after a 16-week training period), a statistically significant difference was determined between the two groups of respondents, since the Wilks' Lambda is 0.67 and for the degrees of freedom $df=4/71$, it gives statistical significance at the level $Q=.000$. The size of the partial effect for the whole system of determinants (partial η^2) shows a large effect on the influence of 0.34.

In order to determine which parameters for the assessment of functional ability, there are statistical intergroup differences, univariate analysis of covariance was calculated individually for each variable. From the overview of table 5, it can be seen that statistically significant differences were determined in 2 out of a total of 4 variables (parameters for assessing functional abilities). Intergroup differences (after the 16-week training period) were determined in the parameters for the assessment of functional abilities:

astrand test (ASTT) and heart rate at rest (PULSE). The partial effect on the determinants partial η^2 is ranked between 0.08 and 0.31 and shows a small to large effect on influence.

Table 4. Corrected arithmetic mean of anthropometric measures in motor tests between the experimental and the control groups of basketball players

Variable	Group	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
T20M	Experimental group	3,45	0,00	3,44	3,46
	Control group	3,46	0,00	3,45	3,46
TARA	Experimental group	34,92	0,31	34,30	35,54
	Control group	34,75	0,31	34,13	35,37
TNOZ	Experimental group	22,93	0,33	22,27	23,59
	Control group	23,12	0,33	22,46	23,78
CKDM	Experimental group	219,35	0,31	218,73	219,97
	Control group	214,35	0,31	213,73	214,97
CKVM	Experimental group	50,95	0,33	50,30	51,60
	Control group	47,18	0,33	46,53	47,83
FMGS	Experimental group	816,37	4,20	808,00	824,74
	Control group	747,01	4,20	738,63	755,38
FMSE	Experimental group	781,37	5,37	770,64	792,09
	Control group	703,61	5,37	692,89	714,33
FLRA	Experimental group	6,21	0,17	5,86	6,56
	Control group	7,09	0,17	6,74	7,44
SNSP	Experimental group	26,73	0,27	26,19	27,26
	Control group	26,83	0,27	26,29	27,36
AGTT	Experimental group	10,52	0,02	10,47	10,56
	Control group	10,54	0,02	10,49	10,58

Table 1. Significance of differences in the parameters of functional capacity assessment in the final measurement between experimental and control groups of basketball players

	Value	F	Hypothesis df	Error df	Sig.	η^2
Wilks' lambda	0,67	8,95	4	71	0,000	0,34

	Experimental group		Control group		F	Sig.	η^2
	Mean	SD	Mean	SD			
ASTT	51,87	4,91	52,62	5,32	33,76	0,000	0,31
PULSE	63,95	4,30	65,25	3,85	6,72	0,011	0,08
CYPRUS	121,38	5,43	120,75	3,85	0,02	0,883	0,00
DIPR	76,50	7,00	77,25	4,38	0,03	0,858	0,00

Table 6. Corrected arithmetic mean of anthropometric measures in parameters for assessing functional ability between the experimental and the control of basketball players

Variable	Group	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
ASTT	Experimental group	52,44	0,05	52,35	52,54
	Control group	52,05	0,05	51,95	52,14
PULSE	Experimental group	64,16	0,24	63,69	64,63
	Control group	65,04	0,24	64,57	65,51
CYPRUS	Experimental group	121,10	0,40	120,32	121,89
	Control group	121,02	0,40	120,23	121,81
DIPR	Experimental group	76,95	0,55	75,85	78,04
	Control group	76,81	0,55	75,71	77,90

The greatest effect in determining the differences is shown by the functional indicator Astrand's test (partial $\eta^2 = 0.31$). Static differences between the experimental and control groups (after the 16-week training period) were not determined in the functional indicators: systolic pressure (CYPRUS) and diastolic pressure (DIPR). From the level of statistical significance and the values of the corrected arithmetic means,

it can be seen (Tables 5 and 6) that after a 16-week training period, the experimental group (basketball players who, in addition to standard training, also have a fitness program) shows better results in the indicator for assessing aerobic capacity (the Astrand test) and have lower average resting heart rates.

Discussion

The research assessed the effect of a fitness program with strength exercises over a period of 4 months on morphological characteristics, motor and functional abilities in young basketball players. The longitudinal research conducted shows that a well-designed and programmed fitness program based on scientific experiences yields greater results in increasing information on the positive impact on all characteristics and skills in the field of anthropology (Storer et al., 2014), in this specific case on anthropometric characteristics, motor and functional skills that are important in increasing performance in young basketball players. Functional adaptation to the specific demands of the sport was particularly pronounced in basketball players, where significant improvements were observed in speed and explosive motor skills. This is in line with research by Bosco et al. (2016), who show that a combination of strength and explosive training leads to improvements in reactive power, jumping skills and reaction speed in athletes. This is particularly important in sports such as basketball, where rapid changes of direction, explosive movements and jumping skills are crucial for sports performance. Basketball players achieved improvements in speed and explosiveness, which allows them to be more effective in defense and offense. These results confirm the findings of Vaquera et al. (2015), which indicate that training programs should be specifically targeted according to the nature of the sport to maximize the effects. It is important to emphasize that although a significant improvement was recorded in several parameters, no significant changes were identified in the total body weight of the athletes. This can be explained by the fact that muscle mass is thicker than fat, so even though there is a reduction in subcutaneous fat, at the same time there is an increase in muscle mass, which resulted in a relatively stable body weight (Ben Abdelkrim, El Fazaa, El Ati, 2007). This is especially important for athletes because a higher percentage of pure muscle mass contributes to greater strength and endurance without unnecessary weight gain, which can be a limiting factor in certain sports. The primary mechanism behind the improvements in morphological characteristics is hypertrophy of type II muscle fibers, stimulated by progressive loading (70–75% 1RM) and repetitions (3x15) in the latter phases of the program. This is supported by a study by Schoenfeld (2010), which highlighted the importance of mechanical strain and metabolic stress for muscle adaptation. The increased aerobic endurance can be attributed to improved cardiovascular efficiency, such as increased stroke volume and muscle capillarization (Bangsbo et al., 2008). Finally, this research emphasizes the importance of an integrated approach in the training of athletes. Fitness programs should not be universal, they should be adapted according to individual needs and sporting requirements. The obtained results can serve coaches and sports scientists as a basis for the development of a more effective methodology for training, which will lead to an improvement in the performance of athletes in various disciplines.

Conclusion

The fitness program impact on the morphological characteristics and general motor and functional abilities of basketball players has been partially investigated in many studies, so we can rightly say that in the mentioned area there is still a lack of comprehensive scientific data that could effectively help in solving scientific and professional problems of this nature in the basketball game. The information obtained in this research can be used in the process of planning and programming the training during the preparatory period. The sports training program can focus on the development of those morphological characteristics, basic motor and functional abilities that give the greatest contribution to achieving results in this sport.

Literature

- Abazović, E., Kovačević, E., Erceg, M., & Zametica, E. (2015). Functional profile young people basketball. Proceedings Book: 5th International Scientific Conference "Contemporary Kinesiology": Split, August 28-30.
- Astrand, P.O. & Ryhming, I. (1954). A nomogram for calculation of aerobic capacity [physical fitness] from pulse rate during submaximal work. *Journal of Applied Physiology*, 7, 218–221.
- Ben Abdelkrim, N., El Fazaa, S., El Ati, J. (2007). Time-motion analysis and physiological data of elite under-19-year-old basketball players during competition. *British Journal of Sports Medicine*, 41(2), 69–75.
- Bangsbo, J., Iaia, F. M., & Krstrup, P. (2008). The Yo-Yo intermittent recovery test. *Sports Medicine*, 38(1), 37–51. <https://doi.org/10.2165/00007256-200838010-00004>.
- Bosco, C., et al. (2016). *Explosive strength training and its impact on athletic performance*. *Sports Biomechanics*, 14(2), 312–329.

- Jakovljević, S., Pajić, Z., Gardašević, B., and Višnjić, D. (2010). Single anthropometric i strong characteristics basketball i soccer player uzrasta 12 i 13 godina. International scientific congress, (pp. 42-46). Banja Luka: FFVS.
- Jukić, I., Milanović, D., Šimek, S. (2007): " Condition preparation sportaša ", zbornik radova , Kineziološki faculty University of Zagreb.
- Karalejić, M., Jakvoljević, S. (2001). Osnove košarke. Beograd: Fakultet sporta i fizičkog vaspitanja. 9. Karalejić, M., Jakovljević, S., (2008). Teorija i metodika košarke. Beograd: Fakultet sporta i fizičkog vaspitanja.
- Malacko, J. (1982). Osnove sportskog treninga - kibernetički pristup [Fundamentals of sports training - a cybernetic approach]. Beograd: Sportska knjiga. OCLC
- Malacko, J., Doder, D., Stanković, V., Dokmanac, M., Savić, Z., & Doder, R. (2015). Differences in morphological characteristics between elite athletes in different sports. *Acta Kinesiologica*, 9(2), 54–59.
- Matković, B., Knjaz, D., Ćosić, B. (2003). Smjernice fizičke pripreme u košarci. *Kondicijska priprema sportaša* (12), 390 – 394.
- Naumovski, M. (2002): Relationships between quantitative and qualitative variables in basketball players from the European national team. *Science in the function of sport*. Skopje.
- Nešić, N. (2014). Uticaj aerobnog treninga i treninga snage na nivo mineral u telu. Doktorska disertacija. Novi Sad: Fakultet za sport i turizam, Univerzitet Educons.
- Oudejans, R.R.D., Langenberg, R.W., & Hutter, V.R.I. (2002). Aiming at a far target under different viewing conditions: visual control in basketball jump shooting. *Human movement science*, 21(4), 457-80. pmid:12450679.
- Schoenfeld, B. J. (2010). The mechanisms of muscle hypertrophy and their application to resistance training. *Journal of Strength and Conditioning Research*, 24(10), 2857–2872. <https://doi.org/10.1519/JSC.0b013e3181e840f3>
- Storer, T.W., Dolezal, B.A., Berenc, M.N., Timmins, J.E., Cooper, C.B. (2014). Effect of supervised, periodized exercise training vs. self-directed training on lean body mass and other fitness variables in health club members. *J Strength Cond Res*. 28(7):1995-2006.
- Šeparović, V., Užičanin, E., Pojskić, H. (2010). Uticaj standardnih pokazatelja situacijske efikasnosti na konačan rezultat košarkaških utakmica evropskog prvenstva
- Tomkinsona, G. R., Timothy, O. S., & Borms, J. (2007). Who Are the Eurofittest. Basel: *Medicine and Sport Science*. 50 , 104-128.
- Vaquera, A., Santos, S., Villa Jose, G., Morante, J. C., Garcia - Torno, V. (2015). Anthropometric Characteristics of Spanish Professional Basketball Players. *Journal of Human Kinetics*, 27(46), 99-106.

