Research in Kinesiology
2023, Vol. 51, No. 1 pp. 60 - 64

CORRELATION RELATIONSHIPS BETWEEN INDICATORS OF PHYSICAL FITNESS OF SOFIA UNIVERSITY STUDENTS PARTICIPATING IN TENNIS CLASSES

Original paper

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Abstract

The main task before the teachers in Physical Education and Sports in higher education institutions is to establish the physical readiness of students for their participation in sports training. Readiness in sports training is divided into mental, tactical, and physical. The present study aims to determine the correlations between the indicators of the physical fitness of students from the University of Sofia participating in tennis classes after an applied game model of training. For the needs of the research, we used field testing, analytical synthesis, graphic, and mathematical-statistical method (correlation analysis). The analysis of the results is based on a test battery of 3 anthropometric and 12 physical fitness indicators. The investigated parameters for determining physical abilities are directly related to the nature of tennis.

Keywords: *Sofia University, tennis, students, indicators, correlation analysis, physical fitness*

INTRODUCTION

Tennis is one of the most popular and attractive sports practiced by students at Sofia University. It is part of the subject "Physical Education and Sports" curriculum. Interest in tennis training is constantly growing. In the classes, students not only gain new knowledge but also improve their physical and functional abilities. The social aspect of tennis allows them to overcome the mental tension from the intense studies and workload and provides an opportunity for active recreation and social communication - an aspect leading to good health, high academic success, and professional fulfillment (Kostadinov (Костадинов), 2018).

Physical activity in sports classes (tennis) is aimed at strengthening health, faster recovery after mental fatigue, maintaining a good mental state, and improving the mood, self-esteem, and confidence of students (Peltekova (Пелтекова), 2020).

The importance of Physical Education and the positive role it plays in the life of modern society obliges sports specialists – pedagogues (teachers) to continuously improve their professional training (Antonova (Антонова), 2019).

The improvement of tennis training is expressed in making it more accessible and interesting for university students and is one of the main tasks of the teaching staff of our sector. This led us to the idea of creating, testing, and implementing in practice a game model of learning with extensive use of game exercises, and competitive, and sports-preparatory games. The basis of the game methodology is the game activity. Teaching game-by-game training meets modern trends. The game approach in tennis training is of complex importance, helping to facilitate the assimilation of technical and tactical elements and the improvement of student's physical abilities, turning sports activities into a vital necessity (Kostadinov (Костадинов), 2017).

"The selection of means in Physical Education classes must be tailored to the abilities of the students so that they can absorb the material offered, but this absorption must be associated with a certain tension. Otherwise, the learning process will cease to attract them and will not contribute to the development of qualities such as obstinacy and persistence, there will be a lack of desire to acquire knowledge, to enrich motor experience" (Antonova (Антонова), 2017).

One of the current issues in the field of sports and Physical Education in the Republic of Bulgaria is the formation of habits for systematic sports activities of adolescents and young people and optimization of the system for self-control of the physical fitness of all age groups, including university students. Correct physical development and a high degree of physical fitness are the mandatory basis on which students must build themselves as socially active individuals. In the process of their development, physical fitness is that structural component, without which the full expression of human potential in one or another field of activity is practically unthinkable (Georgiev & Zlatarova (Георгиев & Златарова), 2018; Georgiev (Georgiev), 2020). Through it, one acquires an idea of the general working capacity of the organism, the basis of which is the complex development of physical qualities and skills necessary for their manifestation.

According to E. Yordanov, one of the main tasks in the work of tennis teachers is to establish the students' physical readiness to participate in training. The readiness for games and competitive activities is divided into mental, special (technical and tactical), and physical (Yordanov (Йодрданов), 2015).

The educational process of Physical Education and Sports in universities can be intensified by searching for means and methods to achieve higher results in the work in terms of the physical qualities and physical performance of the students (Nedkova (Недкова), 2013; Yaneva (Янева), 2011).

Aim of the study: After applying a game model of training, to determine the strength of the correlations between the physical fitness indicators of Sofia University students participating in tennis classes. To achieve the goal, the following tasks are set:

1. To study specialized literature on the problem.

2. To establish the dependencies between indicators of physical fitness.

METHODS

The pedagogical testing was conducted at the end of the 2021-2022 academic year.

The subject of research is the correlation between some indicators of physical fitness.

The object of the research is the effect of tennis training after applying a game model in the learning process.

The contingent of the research is 37 male students in different years of studies, programs, and faculties of Sofia University "St. Kliment Ohridski", participating regularly in tennis classes.

Methods used in the research: literature research, testing, analytical-synthesis graphic, mathematical-statistical method (correlation analysis). The obtained results were processed using a specialized program IBM “SPSS” 19 and “Excel”, and a correlation matrix.

At Sofia University, since 2016, a game model of training has been applied in tennis lessons, including a set of game exercises, and sports-preparatory and competitive games. This provoked the conduct of the current pedagogical experiment in search of the interrelationship between the main physical qualities and their manifestation in the process of tennis training. For the needs of the study, the following indicators were taken through field testing (Table 1).

Table 1. Test battery of the studied indicators

№	INDICATORS	MEASURING UNITS	MEASUREMENT ACCURACY	DIRECTION OF GROWTH
	Anthropometric indicators			
1	Height	cm	1	+
2	Body weight	kg	1	+/-
3	BMI	index	0,01	+/-
	Physical fitness tests			
4	Grip strength-strong hand	kg	1	+/-
5	Grip strength-weak hand	kg	1	+/-
6	Standing forward bend depth	cm	1	+/-
7	Standing long jump	cm	1	+/-
8	Sprint 30 m.	sec	0,01	+/-
9	Fan	sec	0,01	+/-
10	Squats for 20 sec	rep/sec	1	+/-
11	Beep test	levels	1	+/-
12	Sit-ups	rep/sec	1	+/-
13	Push-ups	rep/sec	1	+/-
14	Compass	sec	0,01	+/-
15	Pergel	sec	0,01	+/-

RESULTS AND DISCUSSION

The characteristic of movement capabilities in tennis has increased demands on the physical abilities of the players. They are manifested in the form of a system of meaningful, purposeful, simple, and complex movements. They are evaluated based on specific actions. According to Cv. Zhelyazkov, this transfer of overall movement capability of the individual is possible for realization only based on the physical qualities - strength, speed, endurance, flexibility, and agility. The same physical qualities find their external expression in the form of various combinations of time, space, and effort, and are materialized in special skills and habits (Zhelyazkov & Dasheva (Желязков & Дашева), 2011).

The results of the correlation analysis of the studied indicators of students' physical fitness are shown in Table 2.

Table 2. Correlation matrix of the studied indicators.

	№1	№2	№3	№4	№5	№6	№7	№8	№9	№10	№11	№12	№13	№14	№15
№1	1														
№2	0,405	1													
№3	-0,173	0,804	1												
№4	0,335	0,406	0,279	1											
№5	0,245	0,450	0,375	0,852	1										
№6	-0,108	-0,175	-0,039	0,186	0,276	1									
№7	-0,055	-0,271	-0,266	0,228	0,293	0,365	1								
№8	0,006	0,374	0,369	-0,163	-0,131	-0,303	-0,589	1							
№9	-0,029	0,305	0,324	-0,155	-0,069	-0,295	-0,529	0,673	1						
№10	0,188	0,102	0,058	0,460	0,367	0,268	0,495	-0,548	-0,569	1					
№11	0,258	-0,113	-0,222	0,102	0,018	0,240	0,386	-0,522	-0,353	0,558	1				
№12	0,281	-0,062	-0,24	0,433	0,329	0,201	0,264	-0,433	-0,369	0,307	0,319	1			
№13	0,018	-0,106	-0,131	0,380	0,288	0,141	0,377	-0,472	-0,284	0,382	0,190	0,512	1		
№14	0,06	0,298	0,243	-0,173	-0,146	-0,154	-0,500	0,445	0,549	-0,423	-0,255	-0,171	-0,247	1	
№15	-0,184	-0,152	-0,042	0,152	0,045	0,223	0,241	-0,363	-0,452	0,343	0,252	0,265	0,215	-0,268	1

The nature of the relationships and the degree of significance between the studied indicators are determined by the Spearman coefficient (r) for quantifiable values with linear dependence. Relationships are considered a significant value of the correlation coefficient (r = 0.310) according to the number of persons examined (n = 37), at α = 0.05r and Pt ≥ 95% (Gigova (Гигова), 2009 – http://4.nsa-virtualeducation.com/theory/U4_sport_manual.pdf; Haralampiev (Харалампиев), 2012a).

Correlation coefficients are obtained in the range from -1 to +1, and the degree of dependence is determined by the rating scale (Table 3.). The strength of the dependence is determined by the absolute value of the correlation coefficient (Haralampiev (Харалампиев) 2012b).

Table 3. Scale for assessing the degree of dependence in correlation coefficients (Gigova (Гигова), 2009 – http://4.nsa-virtualeducation.com/theory/U4_sport_manual.pdf)

Degree of dependence	**The correlation coefficient in absolute value**
Weak	below 0,3
Moderate	between 0,3 до 0,5
Significant	between 0,5 до 0,7
Strong	between 0,7 до 0,9
Very strong	over 0,9

The correlation-structural model (Figure 1) presents some of the more important interdependencies between the signs, for which the studied indicators carry information. Associations both at and above moderate levels of significance are presented.

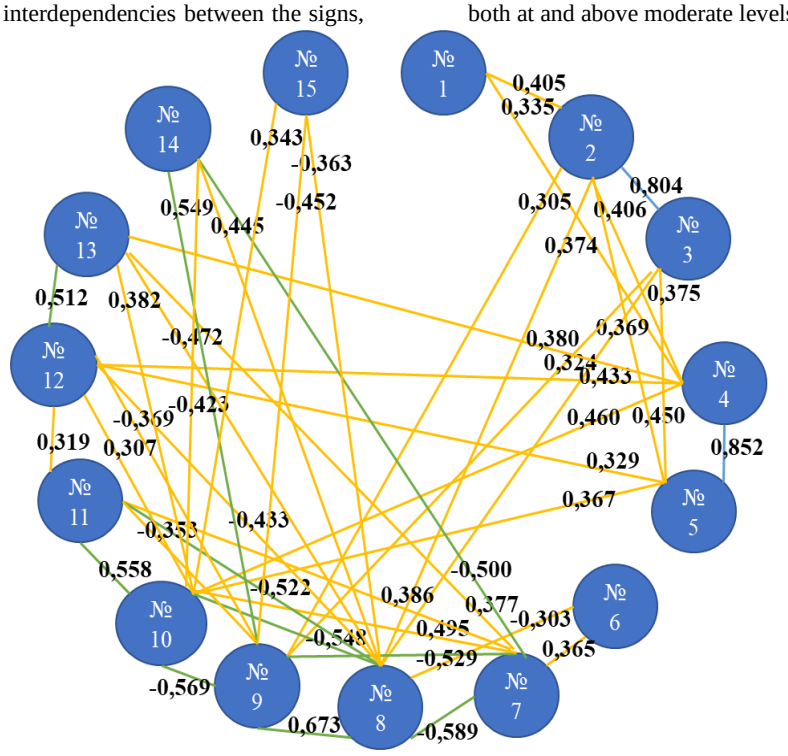

Figure 1. Correlation-structural model of relationships

What is presented in the correlation matrix brings to the fore some interesting interdependencies. A large part of the investigated indicators is in the range of moderate to high dependence among themselves (r is from 0.3 to 0.9).

-№1 "Height" has a moderate correlation with indicators №2 "Weight" (r = 0.405) and №4 "Grip strength - strong hand" (r = 0.335). - №2 "Body mass" has five correlations, of which with high dependence with №3 "BMI" (r = 0.804) and with moderate dependence with indicators №5 "Strength of a weak hand" (r = 0.450), №8 "30 m Sprint" (r = 0.374), №9 "Fan" (r = 0.305). – №3 "BMI" has three moderate dependent relationships with №5 "Weak arm strength" (r = 0.375), №8 "30 m sprint" (r = 0.369), "Fan" (r = 0.324). - №4 "Grip strength - strong arm" has one relationship with a large dependence №5 "Weak arm strength" and three relationships with moderate №10 "Squat - 20 sec" (r = 0.460), №12 "Sit-ups" (r = 0.433), №13 "Push-ups" (r = 0.380). - №5 "Weak arm strength" has two relationships with moderate dependence with №10 "Squat - 20 sec" (r = 0.367) and №12 "Sit-ups" (r = 0.329). - №6 "Standing forward bend depth" has a moderate correlation with №7 "Standing long jump" (r = 0.365) and №8 "30 m Sprint" (r = -0.303). – №7 "Standing long jump" has six correlations, of which with significant dependence are with

№8 "Sprint 30 m" (r =-0.589), №9 "Fan" (r =-0.529), №14 "Compass" (r =-0.500) and with moderate dependence №10 "Squat - 20 sec." (r = 0.495), №11 "Beep test" (r = 0.386), №13 "Push-ups" (r = 0.377). - №8 "Sprint 30 m" has seven correlations, of which with significant dependence are with №9 "Fan" (r = 0.673), №10 "Squat - 20 sec" (r = -0.548), №11 "Beep" test" (r = -0.522), and with moderate dependence №12 "Sit-ups" (r = -0.433), №13 "Push-ups" (r = -0.472), №14 "Compass" (r = 0.445), №15 "Pergel" (r = -0.363). - №9 "Fan" has five correlations, of which with significant significance №10 "Squat - 20 sec" (r = -0.569), "Compass" (r = 0.549), and moderately dependent are №11 "Beep" test"(r = -0.353), №12 "Sit-ups" (r = -0.369), №15 "Pergel" (r = -0.452). - №10 "Squat - 20 sec" has five correlations, one of which with a significant dependence №11 "Beep test" (r = 0.558), and with a moderate dependence №12 "Sit-ups" (r = 0.307), №13 "Push-ups" (r = 0.382), №14 "Compass" (r = -0.423), №15 "Pergel" (r = 0.343). − №11 "Beep test" has a moderate correlation with №12 "Sit-ups" (r = 0.319). - №12 "Sit-ups" has a significant correlation dependence with №13 "Push-ups" (r = 0.512).

From the detailed correlation analysis, we can summarize that there are a total of 43 relationships between all 15 indicators, of which:

- 2 correlations with high dependence (0.7 to 0.9).
- 10 correlations with significant dependence (0.5 to 0.7), 5 of which are negative (-).
- 31 correlations with moderate dependence (0.3 to 0.5), 5 of which are inversely proportional - negative sign (-).
- 62 correlations with weak dependence (0 to 0.3), 29 of which have a negative sign (-).

Correlation dependencies are based on research after applying a game learning model, applying three anthropometric and twelve indicators of physical fitness:

Anthropometric indicators have great and moderate dependence on each other. This is expected due to the logical dependencies of height, weight, and body mass index. The data shows that the higher the students' values for weight and BMI, the worse their scores in speed, endurance, and agility tests are. The BMI indicator is moderately dependent on the "Grip Strength" of the hands, as well as on the agility of movement "Fan" and the speed "Sprint 30 m". The established relationships can be used for comparison in subsequent periodic tests to monitor the status of the studied indicators.

Between physical fitness indicators, there are 41 correlations with moderate and significant dependence. The explosive force of the lower extremities is in significant downward correlation with the indicators "Sprint 30 m", "Fan" and "Compass". This dependence confirms the claim that the explosive force of the lower extremities strongly affects the speed-force capabilities and agility - "transforming the force into speed". It is noteworthy that the indicators "Sprint 30 m", "Fan", "Squat - 20 sec. ", "Beep test", "Sit-ups", "Push-ups", "Compass" and "Pergel" have a large number of correlation relationships. In our opinion, this is because tennis is a complex and athletic sport that places great demands on the mobility of tennis players, as well as on the applied game training model including a range of game exercises, sports preparatory and competitive games.

CONCLUSION

Such research helps sports professors at higher education institutions in the selection of means and methods for developing and improving the movement capabilities of students. They are essential to improve the quality of training work.

Summarizing the above and the analysis made, we can say that the application of the game methodology is oriented toward the objectives of Physical Education in the system for higher education. It responds to the current trends in tennis training and is crucial for increasing the efficiency of the learning process. Its skillful combination with the traditional methodology improves the mobility of the students and helps to increase their physical qualities through their complex development.

We recommend that sports specialists test and implement new methodological approaches that directly affect the motivation of students to actively participate in sports activities.

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Online resources:

Дистанционно обучение. НСА „Васил Левски“. http://nsa-virtualeducation.com/

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