A Modelling of the Effect of Biomotor Capabilities on the Special Ability Test Course

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Abstract

The aim of this study is to evaluate some bio motor capabilities which are thought to have an effect on Special Ability Test Course (SATC) test scores applied as an entrance exam in the School of Physical Education and Sports (SPES). 70 participants who were successful in the SATC (51 male (181 ± 5.5 cm, 73.9 ± 9.8 kg) and 19 female (165 ± 5.6 cm, 54.7 ± 6.49 kg) were included in the study. The bio motor capability performances of the participants, such as speed (10 m, 20 m, 30 m, 100 m sprint), agility (T-test, 505 agility test), and anaerobic power (Sargent vertical jump test) were measured two weeks after the SATC tests. The performances of the participants in the 2018 SATC of the Tekirdag Namik Kemal University SPES were used as the scores of the SATC. The mean of a difference test, a correlation analysis, and a multiple linear regression analysis were used as the statistical method (p<0,05). While there was a significant positive correlation between the SATC agility (r = 799 **) and speed (r = 895 **) scores, there was a negative correlation between SATC scores and anaerobic power output (r = -719 **). Statistical analysis was performed by taking the gender factor into account in the linear regression estimation due to the significant difference (p <0.05) between the SATC scores according to the gender variable. The bio motor capabilities of the male participants, which contributed the most to the SATC scores, were determined as 505 agility (Beta = 424) and 30 m (Beta = 379) speed (SATC Male=-9.992 + (10.478 x 505 test) + (6.742 x 30 m). However, the bio motor capabilities of the female participants did not contribute to the SATC scores.

Keywords: bio motor capabilities, agility, speed, anaerobic power, special ability test course

1. Introduction

1.1 Introducing the Problem

Bio motor capabilities include an organism's acquired abilities in the process of development and maturation, as well as being defined as some genetically programmed abilities of the organism. Basic motor capabilities are strength, endurance, speed, mobility, and coordination (Helgerud et al., 2001; Balčiūnas et al., 2006; Komi, 2008; Baker & Newton, 2008). These skills are inherited but can be developed and improved (Çakıroğlu, 1997; Balyi, 2001). These features encoded in the genetic structure and are analyzed as basic (strength, speed, endurance) and auxiliary bio motor capabilities (balance, ability, stretching, coordination, agility, orientation, mobility, etc.) (Acar, 2001). While Bompa (1998) defines speed as the athlete's ability to move from one place to another at maximum speed or the ability to apply the movements at the maximal speed, Fox (1997) refers to speed as covering a specific distance as fast as possible, varying according to the different sports branches. Physical abilities such as agility, deceleration, change of direction, and acceleration movements are considered efficient implementation in a short time (Verstegan & Marcello, 2001). The value of the anaerobic work capacity, which means explosive power generated by using anaerobic energy transfer systems, is considered to be anaerobic power (Sirnonsau et al., 1986; Gastin, 1994; Yıldız, 2012).

In terms of gaining new techniques and tactics or to perfect a learned achievement, the ability to work in perfect harmony in generating complex movements can be defined as coordination capability. Some skills require hand-eye or hand-foot coordination while some skills need full body coordination (Gökmen et al., 1995).

In the SATCs, bio motor capabilities interact with each other at the maximum level. Schools of Physical Education and Sports in Turkey schools generally test the participants with their own set of SATCs. SATCs are physical competence tests which are designed to evaluate basic bio motor capabilities despite the fact that these tests reveal differences between universities. The main aim of these tests is to complete the SATCs as fast as possible by implementing by bio motor capabilities coordinatively. It is thought that improving the bio motor capabilities, which have a considerable effect on success in the SATCs, will increase the possibility of success for SPES candidates.

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A good introduction answers these questions in just a few pages and, by summarizing the relevant arguments and the past evidence, gives the reader a firm sense of What was done and why (Beck & Sales, 2001).

2. Method

2.1 Research Model

The research design was randomized as a single-blind cross-over study. Each participant completed SACT and bio motor capabilities testing. Each bout of the testing sessions was completed at maximum load. Participants were instructed to exercise 24 hours before the test sessions. In addition, it was assured that no dietary supplementation could affect cardiovascular function or blood components.

2.2 Researche Sample

51 male (181 ± 5.5 cm, 73.9 ± 9.8 kg) and 19 female (165 ± 5.6 cm, 54.7 ± 6.49 kg) participants who were successful in the Tekirdag Namik Kemal University SPES 2018 SATC participated in the study. Before the tests, a PARQ test was conducted to determine the general health conditions of the participants. The candidates who had no health issues were included in the study. All experimental procedures of the study were performed in accordance with the Declaration of Helsinki.

2.3 Procedures (Methods of Data Collection)

During the data collection process, bio motor capabilities such as agility, speed, and anaerobic power abilities were tested. Measurements of height (Holtain, stadiometer), weight (Tanita, BC 545), speed (10 m, 20 m, 30 m, 100 m) and agility (T-test, 505 agility test) tests (New test Power timer 300 device) were administered. The 2018 Tekirdag Namik Kemal University SPES SATC scores (http://bhi.nku.edu.tr) of the participants were used in order to identify SATC scores.

2.3.1 Test Procedures

Taking into consideration the fact that studies about intense exercises such as form roller, local vibration, and post activation have positive effects on jump height (Sağıroğlu, 2017) all participants were subjected to a 10-minute warm up protocol including short sprints before the tests. For the sake of standardization, all tests were performed on the same surface.

2.3.1.1 Sprint Tests

The scores of the 10 meter, 20 meter, and 30 meter sprint tests were recorded as seconds by photocell devices at the start and finish points. The better score of two trials was accepted as official. A full rest was given between the two trials.

2.3.1.2 Agility Tests

To determine agility, a T-test (Pauole et al., 2000), which included forward, lateral, and backward running, and a 505 agility test (Draper & Lancaster, 1985) which included testing of 180 degree turning ability, were performed.

2.3.1.3 Vertical Jump Test

The vertical jump, defined as explosive power which can be achieved by maximum muscle contraction in less than a second, is the highest power output (Klavora, 2000). To determine the vertical jump height, the higher score achieved by standing and jumping is recorded in cm (Sargent, 1921). To determine the anaerobic peak power the Sayer formula (2007), (51.9 x jump height (cm) + (48.9 x body mass (kg)) was used (Sayer et al., 1999).

3. Results

Table 1. Age, Height, Weight and BMI Statistics of the Participants

	N	Minimum	Maximum	The Mean
Age / years	70	18	26	19.6 ± 1,5
Height / cm	70	159	194	176,7 ± 9,1
Weight / kg	70	46	118	68.7 ± 12.4
BMI	70	17,30	31,35	21,85 ± 2,59

51 male and 19 female participants were included in the study. The average age of the participants was 19.6 ± 1.5 years, the average height was 176.7 ± 9.1 cm, the average body weight was 68.7 ± 12.4 kg, and the average BMI was 21.85 ± 2.59.

Table 2. Test Data of the Participants in Terms of Gender Variable

	N		Mean	SD	Min	Max	p
10 m (sec)	51	Male	2,09	0,19	1,60	2,73	,003
	19	Female	2,35	0,31	1,85	3,06	
20 m (sec)	51	Male	3,45	0,20	3,13	3,96	,000
	19	Female	3,97	0,33	3,22	4,50	
30 m (sec)	51	Male	4,61	0,30	4,00	5,60	,000
	19	Female	5,50	0,36	4,50	6,03	
100 m (sec)	51	Male	13,80	0,64	12,32	15,06	,000
	19	Female	17,41	0,94	15,84	18,84	
T-test (sec)	51	Male	9,69	0,84	8,06	12,00	,000
	19	Female	11,18	0,76	9,39	12,50	
505 (sec)	51	Male	2,36	0,21	1,99	3,26	,000
	19	Female	2,93	0,33	2,39	3,73	
Anaerobic Power (W)	51	Male	4530,5	456,3	3415,8	6393,6	,000
	19	Female	2893,4	406,1	2296	3670	
SATC (sec)	51	Male	45,92	4,94	41,30	62,10	,000
	19	Female	72,95	6,95	60,90	84,35	

In terms of the gender variable, there was a significant difference in favor of male participants as a result of the evaluation of males and females bio motor capabilities (10 m, 20 m, 30 m, 100 m, T-test, 505 agility test, anaerobic power) and SATC scores ($p<0.05$).

Table 3. Correlation Test Data of the Participants

	10m (sec)	20 m (sec)	30 m (sec)	100 m (sec)	T-test (sec)	505 (sec)	SATC (sec)	Anaerobic (W)
10 m (sec)	-	645**	587**	543**	370**	332**	399**	-356**
20 m (sec)		-	874**	803**	554**	567**	704**	-581**
30 m (sec)			-	830**	533**	614**	776**	- 654**
100 m (sec)				-	648**	728**	895**	-780**
T-test (sec)					-	727**	663**	-515**
505 (sec)						-	799**	-619**
SATC (sec)							-	-719**

According to the correlation analyses between the bio motor capabilities and SATC scores of the participants, there was a significant difference between the 505 agility test (r=799**), the 100 m (r=895**) and the 30 m (776**) speed tests, and the SATC test scores. In addition, there is a negative correlation (r=-719**) showing a positive increase which might occur in anaerobic power resulting in a SATC score decrease.

Table 4. Regression (enter) Data of SATC Relating Scores (Male)

	N	B	SD	BETA	VIF	T	P
Constant	51	-26,744	12,071	-	-	-2,2169	,032
505	51	9,663	2,737	-,055	1,452	-,475	,001
T-test	51	-,320	,674	,424	1,353	3,530	,637
10 m	51	-,655	3,026	-,026	1,439	-,216	,830
20 m	51	-3,770	3,752	-,155	2,410	-1,005	,321
30 m	51	6,139	2,274	,379	1,991	2,699	,010
100 m	51	1,958	,959	,257	1,596	2,042	,047
Anaerobic	51	,003	,001	,243	1,058	2,373	,022

R = 0, 752 R^2 = 0,573 (F = 8,258, p = 0,000)

According to multiple regression calculations, independent variables such as the 505 agility test (p=.001), the 30 meter sprint (p=.010), the 100 meter sprint (p=.047), and the anaerobic power (p=.022) affected the SATC scores of the male participants ($p<0.05$). In this regression model, the 30 meter speed test (BETA=.379), used to determine bio motor capabilities such as acceleration and continuity of speed, had the highest contribution rate.

Table 5. Regression (step wise) Data of SATC Relating Scores (Male)

	N	B	SD	BETA	VIF	T	P
Constant	51	-9,992	8,728	-	-	-	-
505	51	10,478	2,453	,459	1,061	4,271	,000
30 m	51	6,742	1,741	,417	1,061	3,872	,000

R = 0,690 R^2 = 0,476 (F = 21,833, p = 0,000)

Seven tests used to determine the bio motor capabilities (agility, speed, and anaerobic power) which are thought to have an effect on the SATC of the participants represented 57.3% of the SATC scores. Two tests, the 505 agility test and the 30 meter acceleration test, contributed to the model by representing 47.6 % of the sample group. The remaining five tests contributed to 9.7 % of the model. Approximate multiple regression calculations (ÖYSP male=-9.992 + (10.478 x 505 test) + (6.742 x 30 m) of the505 agility test and 30 meter sprint test scores enabled a possible SATC score estimation.

Table 6. Correlation (spearman) Analysis Relating SATC Data (Male)

	N	Mean	SD	Max	Min	r	P
SATC (sec)	51	45,921	4,9401	62,10	41,30		
SATC Regresyon (sec)	51	45,920	3,4096	58,75	39,60	,684**	,000

There was a significant difference between the two scores (r=0.684) as a result of correlation analysis between the SATC scores of the male participants and estimated SATC scores obtained by the regression equation.

Table 7. Regression (enter) Data of SATC Relating Scores (Female)

	N	B	SD	BETA	VIF	T	P
Constant	19	28,956	39,222	-	-	,738	,476
505	19	7,325	5,465	,353	1,945	1,340	,207
T-test	19	,679	2,488	,075	2,112	,273	,790
10 m	19	-7,465	5,638	-,336	1,807	-1,324	,212
20 m	19	15,078	9,528	,718	5,792	1,583	,142
30 m	19	-11,741	7,469	-,621	4,392	-1,572	,144
100 m	19	1,152	2,006	,156	2,083	,574	,576
Anaerobic	19	,006	,004	,344	1,189	1,674	,122

R = 0,780 R2 = 0,609 (F = 2,444, p = 0,090)

In the multiple linear regression calculations of the female participants, none of the seven tests used to measure bio motor capabilities such as agility, speed, and anaerobic power contributed significantly to the model ($p<0.05$).

4. Discussion

We perform actions that require strength, endurance, speed, or skill by using bio motor capabilities. This is why bio motor capabilities are the determinants of performance in sport. If the performance is the resulting product, this result is limited to the degree of the contribution of the components that determine the activity. Bio motor capabilities are abilities that interact with many factors such as gender, age, and training status (Smajic et al., 2018). According to the data obtained from the tests related to bio motor capabilities, it was observed that the difference between the gender was in favor of male participants. Based on this difference, a linear regression analysis of female and male participants was made by considering the gender variable.

In research conducted by Erden et al. (2005) for the Bursa Uludag University Physical Education and Sports Department on women and men, a significant relationship was found between endurance and the running scores of 10 meters and 30 meters. A significant relationship was found between the scores of 10 and 30 meters with vertical jump scores. While there was a significant relationship between endurance and vertical jump scores in women, no significant relationship was observed in men.

The success of the participants in with their SATC scores can be correlated with the use of bio motor capabilities in a coordinated manner. It was observed that bio motor capabilities such as agility, speed, and anaerobic power represented 60% in female participants and 57.3% in male participants in their SATC scores. The speed (BETA = 417) and agility (BETA = 459) tests represented 69% of male participants' success in their SATC scores. The high level of SATC scores (45.921 ± 4.940 sec) and the correlation data obtained from the regression estimation (45.920 ± 3.409 sec) of the male participants would allow the participants to measure 505 agility tests and 30 meter sprint times prior to the test to determine how near they are to the average times. It is not possible to conclude that any bio motor capability has a higher effect factor than any other for female participants. This also does not allow regression estimation calculations. Increasing the number in the sample group would be beneficial for a better estimation.

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