

STUDY ON THE CORRELATION OF PHYSIOLOGICAL PARAMETERS AT MINI-FOOTBALL PLAYERS

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Abstract: *We tested a group of 12 athletes, mini-football players, from Romania who regularly perform in the first league. The athletes were subjected to an evaluation that aimed to determine: height, body mass, movement speed, agility, explosive power, lactic anaerobic capacity and maximum oxygen consumption. The analysis of the results led to the identification of significant correlations between the speed of movement and agility ($r^2=0.71$), leg's explosive power and reaction time of the non-dominant leg ($r^2=-0.61$), lactic anaerobic capacity and body mass ($r^2=0.60$). This study highlights the links established between the physical parameters of the mini-football players from Romania.*

Key words: *capacity, effort, physical parameters, mini-football.*

1. Introduction

The popularity of Mini-football is steadily increasing. It is well known that one of the most important features of a sports game is accessibility. Even though football remains the sport's king, the fact that it requires a relatively large pitch and an increased number of players, makes it a sporadic practice for children and amateurs.

The number of researches aimed at mini football is small, which is why the collection and interpretation of physiological data of some practitioners can provide useful information about

what it means to practice this sport. Compared to football on the regular pitch, the frequency with which the athletes get possession of the ball is higher. Players recover the ball by interceptions more often than by tackling. [11] Two features of this sport that show us the research directions are: Technical and tactical efficiency have a greater impact on the result than the physical training [3] and the teams in the lower side of the standings run a distance of 4% larger than the teams located in the upper side of the standings. [3]

Football has become more and more a technical-tactical sport in recent years. At

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the same time, the new conditions of training and competition determine new challenges for the science of sport and the evaluation of sports medicine. [14] Thus, physical training has acquired a customized form for the requirements of each particular position. Several authors highlighted the importance of sprinting and high-tempo running on the end result of the game. [6] Although many coaches have focused on training energy management in less dangerous situations during a match, some researchers have shown that improving energy conservation by significantly reducing distances at intermediate speeds does not help players to change the distances covered at high intensity, they have high, demanding values. [18]

The physical effort specific to the football game is characterized by:

- high mobility of the players on the field according to the tasks of the game, in relation to the requirements of the phase, the changes of places;
- the occurrence during the specific effort of some often violent contacts with the ground, the ball and especially with the opponents;
- aerobic and anaerobic capacity of very good effort, towards excellent;
- very good explosive capacity, towards excellent. [12]

Ideally, a professional football player should be able to maintain a high level of intensity throughout the entire game. However, some studies have shown a reduction in resistance, a lower intensity of effort, a reduction in blood sugar level and a reduction in lactic acid level in the second half, compared to the first half. [8]

Efficiency of pre-season aerobic training significantly influences the quality of the game in the second half. High maximal aerobic power (VO_{2max}) has been correlated with the work rate during a game and high aerobic capacity is vital in physical recovery during high intensity intermittent exercises, typical of football performance and training. [10]

2. Material and Method

The purpose of the research is to observe the level of correlation between the physical parameters in the mini-football players in order to be able to highlight the particularities of this sport whose theoretical basis is largely undiscovered.

We tested a group of 12 athletes, mini-football practitioners, from Romania who regularly perform their activity in the first league. Our players are 28.86 ± 5.39 years old, 181.6 ± 9.58 cm high, body weight 84.21 ± 14.07 kg, BMI 25.43 ± 2.94 kg / m² (Table 1) and practice the mini football for 3.36 ± 2.92 years. Most come from youth football, where they followed methodically the learning and consolidation process specific to this period.

The athletes were subjected to an assessment that aimed to determine: height, body mass, speed of movement, agility, explosive power of the lower limbs, anaerobic lactic capacity and maximum oxygen consumption.

Height and body mass were determined using a metal (set) square and a Bosch GLM80 rangefinder. Body mass determination was performed with an

Omron BF-511 body analyser following the classic device usage protocol. [1]

The speed of reaction of the lower limbs was assessed by the action time of the lower limbs on a foot keyboard, placed on the ground and connected to a laptop. The computer ran a software [5] that displayed two red circles on the screen: one on the right, the other on the left. At the time of the random appearance of a circle on the screen, the athlete had to press as soon as possible the corresponding key with the leg on the same side. At the end of the test, after 20 clicks, the software generates the results for each press and the average reaction time for each leg.

Because the traveling at maximum speed is on short distances in mini football, we chose to determine the movement speed on 5, 10 and 15 meters. This was determined using a Tracktronix electronic timing system. The athlete was positioned at the start line, where a gate of the timing system was placed. At 5, 10 and 15 meters from this line were placed three other gates of the system. When the athlete was ready, he started sprinting, running at full speed through the last gate and recording all three times determined by the stopwatch. Each athlete took the sample twice and the best time was counted.

The agility of mini-football players is an important attribute in playing the game precisely because of the frequent changes of pace, direction and sense of movement. The tests used to assess agility were 505 and 1001. During the first test, the athlete sprinted between two lines placed 15 m apart, crossing the second line and returning, with the same speed, 5 m to the starting line. The last 5 meters, round

trip are timed. 1001 is a similar test, except that the distances differ: between the two lines we have 20 m, and the return is made on 10 m.

The explosive force of the lower limbs was expressed in cm, the values representing the height that the athletes reached during the different types of vertical jumps. Squat jump, counter movement jump and free jump were executed on the Just Jump platform. [16] The explosive power factor of the lower limbs was also evaluated following four successive jumps on the Just Jump, whose height had to be as high and contact time with the ground as small as possible.

In order to determine the mobility of the spine we used the sit and reach test, for which we used an adapted flexi meter, which measured the tilting of the trunk using a Bosch GLM80 rangefinder.

Anaerobic lactic capacity was assessed by means of the 8x10 + 10m test, in which the player runs at a maximum speed of 160, rounded on 20 m. Following the test support, the anaerobic capacity index can be extracted from intermediate times and expressed as a percentage. [17]

Maximum oxygen consumption is a physiological parameter that can be indirectly determined by field tests. VamEval is the test we use for estimating aerobic power. The athletes start in a run whose speed is controlled by sound beeps, between two parallel lines and arranged at a distance of 20 m. The starting speed is 8 km / h, and will increase by 0.5 km / h at every minute of the test. The athlete stops when he can no longer maintain the rhythm imposed by the audio system. [13]

3. Results

the statistically synthesized results in table 1.

Following the application of the evaluation protocol, the athletes obtained

Results of physical tests

Table 1

	Mean	Std. Deviation	Coefficient of variation
Height (cm)	181,60	9,59	5,28%
Weight (kg)	84,21	14,07	16,71%
BMI (kg/m ²)	25,43	2,95	11,60%
T-reaction - INF - DOM (ms)	412,40	123,50	29,96%
T-reaction - INF - NEDOM (ms)	409,40	67,27	16,43%
5 m (s)	1,10	0,08	6,94%
10 m (s)	1,85	0,09	4,77%
15 m (s)	2,52	0,11	4,16%
505 (s)	2,55	0,14	5,32%
1001 (s)	4,07	0,15	3,70%
SJ (cm)	36,89	4,09	11,08%
CMJ (cm)	38,19	2,76	7,23%
FJ (cm)	46,79	3,25	6,94%
4 sarituri (FPEP)	1,58	0,31	19,66%
Strenght of wrist flexors - Total (kg)	100,50	16,16	16,09%
Mob CV (cm)	6,08	7,68	126,31%
8x10+10m (s)	30,40	1,08	3,56%
8x10+10m (%)	6,91	2,49	36,08%
F.O.-8x10+10m	0,65	0,31	47,15%
VO ₂ max (ml/kg/min)	49,30	4,33	8,79%

From all the tests we decided to select only one part, which is statistically inter correlated in order to be able to delimit this sport physiologically.

We can see that the athletes have approximately the same height, a relatively high one, and the average value of the body mass index falls a little above the upper limit of normality, and this can be justified by the fact that the subjects of the research are not professional athletes,

all work in other areas. The values of the reaction speed test on the lower limbs are substantially equal, only that the standard deviation shows that the non-dominant leg has obtained closer values. In the case of the 3 speed tests the results follow the same pattern, showing an increased level of homogeneity in this chapter. From the point of view of agility the athletes obtained similar results, and the standard deviation for both tests has a low number.

At the explosive force the values of free jump and counter jump are homogeneous, but at free jump and 4 jumps the level of homogeneity decreases, but not considerably. In the case of the force of the wrist flexors, the subjects of the research obtained inconsistent values, and the main reason is the extremes of the group. At the level of spine mobility the level of homogeneity

is low, this occurs when the standard deviation is higher than the median. The anaerobic lactic capacity and the fatigue factor have dispersed values which indicate a low level of homogeneity of the group. The last parameter tested is the aerobic capacity of effort, and in this chapter the research subjects obtained similar values showing the degree of homogeneity of the group.

Pearson correlation coefficient values

Table 2

	Weight (kg)	T-reaction - INF - NEDOM (ms)	5 m (s)	10 m (s)	15 m (s)	1001 (s)	8x10+10 m (s)	8x10+10 m (%)
Weight (kg)		0,300	-0,370	-0,324	-0,301	-0,282	0,112	0,605
5 m (s)	-0,370	0,454		0,812	0,756	0,707	0,587	-0,235
10 m (s)	-0,324	0,585	0,812		0,992	0,715	0,598	-0,238
15 m (s)	-0,301	0,585	0,756	0,992		0,717	0,592	-0,251
1001 (s)	-0,282	0,610	0,707	0,715	0,717		0,796	-0,402
4 Jumps (FPEP)	-0,033	-0,612	-0,264	-0,580	-0,614	-0,713	-0,593	0,262
8x10+10m (s)	0,112	0,691	0,587	0,598	0,592	0,796		0,233
8x10+10m (%)	0,605	0,001	-0,235	-0,238	-0,251	-0,402	0,233	
F.O.- 8x10+10m	0,754	0,246	-0,139	-0,153	-0,150	-0,181	0,408	0,897
VO2max (ml/kg/min)	0,229	-0,494	-0,612	-0,545	-0,548	-0,576	-0,761	-0,160

On the body mass column there is a statistically significant correlation between this and the players' anaerobic lactic capacity plus the fatigue factor. The reaction speed of the non-dominant lower limb influenced the explosive strength of the subjects, as well as the anaerobic lactic capacity. Given the nature of the sport practiced by the research subjects, the correlation between the results of the 3 speed tests is not surprising. In the case of explosive force, the situation is

interesting, and the recorded results may be the basis for further research. This is statistically correlated with the results of the speed test on 10 and 15 meters, but not with that on 5 meters. In the same situation is the agility, correlating with the speed test values on 10 and 15 m, but not that on 5 m. The fatigue factor of the anaerobic lactic effort capacity is statistically correlated with the maximum aerobic effort capacity.

4. Discussions

The results presented above do not outline an overview of the physical particularities of the mini-football players. Although certain correlations are obvious and the results attest this statistically, future research directions can only be accessed by analysing the parameters where statistical correlations do not exist. One case may be the association of Counter Movement Jump test results and speed, and this was highlighted by Arrieta [2] and Haycraft. [7]

A statistical correlation was highlighted between the results of the 30-meter speed test and the agility, as a predetermined movement (CODS- change of direction speed) or as a spontaneous movement (RA- reactive agility) measured in the semicircle where $r = 0.62$, $r = 0.60$, and laterally $r = 0.54$, respectively $r=0.58$. [4]

In another study, using the Pearson correlation with two variables, the link between the anaerobic power and the vertical jump was also discovered and the link between the anaerobic power and the local force as well. [15]

5. Conclusions

Knowing all the parameters and a level of correlation between them can help the coach to organize better and more efficient training, offering a more special possibility.

The theoretical part of this sport can be developed, from a technical-tactical perspective and also from the individual training perspective, which is focused on

improving the physical qualities of the players.

The training of the basic motor skill, movement speed must be complemented with the training of the agility, which can be in prearranged setup, or spontaneous.

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