

RELIABILITY OF FIELD TEST "3X50 M SHUTTLE" TO DETERMINE ANAEROBIC POWER WITH FOOTBALL PLAYERS AGED 13-14

Original scientific paper

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Abstract

In football theory and in the sport theory in general, a special attention is given to determining the level of anaerobic power for the achievement of high sports results. It is done using a number of field and laboratory tests and indicators. The complex requirements for their realization, however, make some of them quite inconvenient for application. In this respect our research aims to test the reliability of an easily applicable field test, widely used in sport practice, to determine the level of speed endurance – the “3x50 m Shuttle” test. The test was done by the end of the preparation period. The subjects of our research were 23 football players born in 2002, from the junior team of “Levski” Football Club, Sofia. Its reliability and informative scope are proved by the interrelation of the field test and the most informative laboratory test so far - “Wingate”. The strong negative interrelation between the running test and the average power indicator of the “Wingate” test give us serious reasons to claim that the field running test in our research allows for a reliable and informative evaluation of the level of speed endurance of football players aged 13-14.

Key words: junior football, motor abilities, speed endurance, “Wingate” laboratory test, sport pedagogical tests, exercise bike, chronometer analysis of variance, correlation analysis, field test “3X50m Shuttle”

INTRODUCTION

The level of motor activity in anaerobic mode is of crucial importance for football players and for junior players in particular (Bangsbo, Mohr & Krstrup, 2006; Buchvarov Dimitrov & Gigov (Бъчваров, Димитров & Гигов), 2008; Nikolaidis, 2011). In this respect, the age period in our study corresponds with the period of great qualitative and quantitative changes typical for young players aged 13-14 (Stratton, Reilly, Williams & Richardson, 2004). A number of research works show that the greatest absolute increase of anaerobic power is observed exactly in this age period

(Shishkov, Dimitrov, Madanski & Genchev (Шишков, Димитров, Мадански & Генчев), 1985; Shishkov, Stoianov, Genchev, Madanski & Simov (Шишков, Стоянов, Генчев, Мадански & Симов), 1992; Armstrong, Welsman & Chia, 2001; Nikolaidis, 2002; van Praagh, Dore 2002; Antipov, Guba & Tulenkov 20028; Nikolaidis, 2011; Gadev (Гъдев), 2013; Peev & Ivanova (Пеев & Иванова), 2015). Various field tests are used to establish the level of anaerobic power and methodological literature offers a number of similar tests with various characteristics (Table 1.).

Table 1. Types of field tests to determine the level of speed endurance (data from Haugen & Seiler, 2015)

Research	Year	Test	Total sprint Distance	Recovery (s)
Krstrup et.al	2010	3x30 m	90	25
Gabbett et.al	2010	6x20 m	120	< 15
Aziz et.al	2007	6x20 m	120	20
Aziz et.al	2008	8x20 m	160	20
Mujika et.al	2009	6x30 m	180	30
Dellal et.al	2013	10x20 m	200	25
Dupont et.al	2010	7x30 m	210	20
Chaouachi et.al	2010	7x30 m	210	25
Meckel et.al	2009	6x40 m	240	~25
Meckel et.al	2009	12x20 m	240	~17
Impellizzeri et.al	2008	6x20+20 m	240	20
Bangsbo et.al	1994	7x34,2 m	240	20-25
Wong et.al	2010	9x30 m	270	25

We presume that "shuttle" running without interruptions is much more informative and objective for the evaluation of work capacity. In confirmation of our view point, the research of Bishop (2012) shows that the main reason for the decrease of speed during shuttle running is the restriction of energy provision.

In unison with these views we have used field test "3X50m Shuttle" to determine the speed endurance. It was suggested and used for the first time by Gadev (Гъдев) (2013), additional research on the interrelation of the test with speed abilities was also done by Peev (Пеев) (2014). Data from these research studies show direct proportion and strong relations between the speed abilities (maximum speed and start acceleration), i.e. $r=0,817$ and $r=0,745$. In order to confirm the reliability of this test, we decided to check its interrelation with the indexes of the "Wingate" laboratory test, widely used and very popular in recent years with proven reliability and validity in determining the anaerobic power (Inbar, Bar-Or, Skinner, 1996; Mackenzie, 2015).

These observations lead us to the aim of our research. It is to establish the reliability and informative scope of the field test "3X50m Shuttle" for determining the anaerobic power of junior football players aged 13-14.

In order to achieve our aim the following tasks were set:

1. To study the variability of indicators of the "Wingate" test and the "3x50 m Shuttle" test;
2. To reveal the interrelations between the indicators of the two tests.

METHODS

To realize our objectives we used the following research methods: sport pedagogical tests, exercise bike, chronometer and statistical analysis (variation and correlation analysis). For convenience we have used some abbreviations of the test indicators in Table 2. below.

We used the sport pedagogical running test "3 x 50 m Shuttle" (Table 2., test № 1) to determine the players' potential in speed endurance. The test is done after a distance of 50 m is measured and marked by two cones placed at the beginning and at the end of it. After a starting signal is given, the distance is covered three times without interruption. Methodological instructions require running at maximum speed, and touching the cone at the end of each length with an upper limb before turning back and running again in the opposite direction. The test was done on a playing field with artificial grass cover. The time was measured up to 0,01 s, by means of a chronometer Q&Q.

The "Wingate" laboratory test was done by means of a veloergometer (894E, Monark Exercise AB, Sweden) and specialized software attached to it. It involves pedaling for 30s at maximum power and at 0.075 resistance per kilogram of body mass. The subjects of the research were instructed in advance to perform pedaling at maximum speed and they also received encouragement and instructions during the entire test period. The indexes we received are presented in Table 2. – indicators 2 to 12. The weight and height of the football players were measured in advance by means of an electronic balance (DB II, Cas Co., USA) and an antropometer (Seca-213, SECA, Leicester, UK).

The test was done by the end of the preparation period. The subjects of our research were 23 football players born in 2002, from the junior team of "Levski" Football Club, Sofia.

Table 2. Names, abbreviations and measuring units of indicators in the research used in the text

№	Indicator	Abbreviation	Measuring unit
1.	Running time "3x50 m Shuttle "	3x50 m	Seconds
2.	Peak power	PP	Watts
3.	Relative peak power	RPP	watts/kg
4.	Time for attainment peak power	TPP	Ms
5.	Average power	AP	Watts
6.	Relative average power	RAP	watts/kg
7.	Minimal power	MP	Watts
8.	Relative minimal power	RMP	watts/kg
9.	Power decrement	PD	Watts
10.	Relative power decrement	RPD	watts/kg
11.	Fatigue index	FI	percent
12.	Time for attainment maximal velocity	TAMV	Ms

RESULTS AND DISCUSSION

All data from the variation analysis of the test indicators are summarized and presented in Table 3.

The variation coefficient shows that with reference to the indicators of the 3x50 m running test and the indicators of the "Wingate" test – relative peak power (RPP), relative average power (RAP), and relative minimal power (RMP), statistical data are highly homogeneous (4,6 % to 11,54 %). Together with indicators peak power (PP), average power (AP), minimal power (MP) and fatigue index (FI) the statistical data are sufficiently homogeneous (from 20 % to

25,2 %). These results allow us to make a conclusion that our data are statistically reliable.

On the other hand, the results of indicators' time for attainment peak power (TPP), power decrement (PD), relative power decrement (RPD) and the time for attainment maximal velocity (TAMV) are not homogeneous, i.e. they will not be discussed.

All the data from the correlation analysis are summarized and presented in Table 4.

From the correlation analysis (Table 2.) it is obvious that the running test 3x50 m has statistically significant and

CONCLUSIONS

As a result from the data of the variation and correlation analyses, we could state with confidence that the field test in our research is very suitable to use when checking the level of anaerobic power with football players of this age group. On this ground we can make the following conclusions:

1. The simple organization procedures and the short time the field test "3 X 50m Shuttle makes it very convenient for practical application.
2. The strong interrelation we have discovered it has with the main indicator - average power (AP) of the "Wingate" test, gives us reasons to state that this field test allows for a reliable and highly informative evaluation of anaerobic power and speed endurance as a whole.
3. Higher values of indicators peak power and minimal power of the "Wingate" test are a prerequisite for higher values in the level of speed endurance.

This article presents part of the results from the research on the contract of scientific project № GD 197/15.04.2015. National Sports Academy "Vasil Levski" Sofia, Bulgaria

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