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A battery of physical tests for selection among school football teams

Mohammed Zeroual[1], Mustapha Ould-Hammou[2], Mouloud Kenioua[3]

[1,3] Institut des Sciences et Techniques des Activités Physiques et Sportives, Ouargla University, Algeria.
moukenioua@gmail.com
[2] Institut des Sciences et Techniques des Activités Physiques et Sportives, Boumerdes University, Algeria.
ouldhammou@gmail.com

Abstract

Objective: this study aims to build and propose a battery for physical tests according to scientific bases to be used in the selection process for school football teams in the secondary stage. **Method and material**: twelve physical tests representing the various physical characteristics of football players (endurance, strength, speed, agility, flexibility) were selected and applied to 48 players of the school football teams belonging to the State School Association of Biskra-Algeria. **Results**: the results indicated that the physical tests give statistically significant differences compared to other physical tests among the players of the school football teams in the secondary stage. **Conclusions**: the physical tests that gave statistically significant differences are the tests that will be the battery of physical tests for the players of school football teams in the secondary stage of Biskra state.

Keywords: battery of physical tests, sports selection, school football teams.

Introduction

Physical education and recreational sports practices are not enough to compensate for the decrease in physical activity in daily life (Grélot, 2016). School sports contribute to the discovery of talents among students and are considered the base for players to go to local clubs and national teams (Camiré et al., 2011). In various sports disciplines, including football, which depends on the basic formation of young talents from school to a high level, football player performance depends on the interaction between his various abilities (technical, tactical, physical and mental) (Dellal, 2017). In addition to some factors such as the climate, the quality of the floors, the heights, the means used in training, and thus improving sports performance is a complex process that requires benefiting and improving various physical abilities (Raven et al., 1976). The secondary stage is a period of crisis and sudden change, both psychological and physical aspects (Harel-Biraud, 2011). There is no doubt that football entails all physical qualities (endurance, strength, speed, agility, flexibility) and all psychological factors, technical and tactical (Vigne, 2001). To select the physically

ready players, the selection process must be carried out through tests that evaluate and measure their level (Georget, 2013). Through all the above, the current study aims to suggest a battery of physical tests for school football teams.

Materials and methods

1. Participants

Forty-eight players from the school teams belonging to the State Association of School Sports in Biskra-Algeria (age 17,54 ± 0,71 years; height 1,77 ± 0,05 meters; weight 65,63 ± 7 91 kg) represented the study sample. The sample was selected after ensuring the players' safety from injuries, reviewing their personal files in the school association, and taking the final approval of the players to participate in the study and conduct various measurements and tests.

2. Study design

To build a battery of physical tests for school football teams in the secondary stage, we identified the various physical characteristics that a football player needs at this age, and then choose the most prominent physical tests that we can use in testing and measuring the level of those physical attribute. Two physical tests have been proposed for each physical characteristic, as shown in Table 1.

Table 1. Proposed physical tests.

N°	Physical characteristics		Test
1	Endurance		Navette test 20 meter
2			Cooper test 12 minutes
3	Strength		SJ (squat jump) test
4			CMJ (counter movement jump) test
5	Speed	Transition speed	50-meter speed test
6			30-meter speed test
7		Speed reaction	Auditory reaction speed test
8			Visual reaction speed test
9	Agility		T test
10			4*10-meter test
11	Flexibility		Standing forward flexion test
12			Seated Flexion Test

Table 2. Characteristics of participants.

Variable	N	Age (year)	Height (cm)	Weight (kg)	Body mass (kg/m2)
Mean SD	48	17,54 0,71	1,77 0,050	65,63. 7,91	20,91 2,28

cm: centimetre; kg: kilogram; kg/m2: kilograms per square meter; SD: standard deviation.

Table 3. Descriptive statistics for the study variables.

Tests	Measuring unit	Mean	SD	Shapiro's test
Navette test 20 meter	Kilometer per hour(k/h)	13,7437	1,06149	0,073
Cooper test 12 minutes	Meter(m)	2,4160	0,22357	0,168
SJ (squat jump) test	Centimetre(cm)	25,3913	4,36702	0,290
CMJ (counter movement jump) test	Centimetre(cm)	29,5896	4,35021	0,347
50-meter speed test	Second(s)	4,5465	0,23261	0,061
30-meter speed test	Second(s)	7,3542	0,41461	0,065
Auditory reaction speed test	Second(s)	,423920	0,055652	0,112
Visual reaction speed test	Second(s)	,458100	0,045507	0,112
Agility T test	Second(s)	10,6915	0,67486	0,110
Agility 4*10-meter test	Second(s)	10,5248	1,09824	0,169
Standing forward flexion test	Centimetre(cm)	5,65	6,380	0,620
Seated Flexion Test	Centimetre(cm)	6,94	6,245	0,158

Table 4. Factor analysis results after oblique rotation.

Variables	Factors			
	1	2	3	4
Visual reaction speed test	-0,914			
Auditory reaction speed test	-0,856			
CMJ test	0,683			
SJ test	0,484	0,325		
50-meter speed test		-0,861		
30-meter speed test		-0,861		
Cooper test 12 minutes	0,355	0,455		-0,400
Seated Flexion Test			0,910	
Standing forward flexion test			0,786	
Agility T test		0,327		0,805
Agility 4*10-meter test				0,766
Navette test 20 meter			0,362	-0,565

2.1 Anthropometric measurements

The age, height, weight and body mass of all players were measured to ensure the convergence of the characteristics of the sample members participating in the study, which are shown in Table 2.

2.2 Physical tests

2.2.1 Endurance tests

Cooper Test 1968: it is a 12-minute running or walking test in which the distance travelled is measured. The aim of this test is to obtain an indicator of endurance, as well as the maximum aerobic capacity and heart condition of the individual (Cooper, 1968).

Navette Test 1983: the test procedures mainly consist of running back and forth at 20m by following a recorded tape. The test ends if the player is unable to continue running and respect

the programmed rhythm (Leger et al., 1984). The goal of the test is to estimate the maximum aerobic capacity (Cazorla & Leger, 1993).

2.2.2 Strength tests: SJ (squat jump) / CMJ (counter movement jump)

SJ and CMJ are tests to measure vertical jump (Loturco et al., 2017; Nesser et al., 2008); its purpose is to measure the explosive strength of the players' lower limbs (Dellal, 2013). The vertical jump performance was measured using an Optojump device and Myotest (Chlif et al., 2010).

2.2.3 Speed tests

30-meter speed test: it is a test to measure speed and acceleration at 30 meters (Mouelhi et al., 2007) using photoelectric cells (microgate SARL Italy) placed at both the starting line (starting) and the finish line (reaching).

50-meter speed test: it is a test to determine the speed of travel over 50 meters (Thakur et al., 2017; Vanhelst et al., 2014) and the time was also measured using photoelectric cells (microgate SARL Italy) (Hongsuwan et al.,2015).

Reaction speed tests: it is a test used to measure the reaction speed, whether audio or visual (Fitzpatrick et al., 2019). This test is done by relying on an optojump device, and the results are read directly from the computer (Taylor et al., 2014).

2.2.4 Agility tests

Agility T Test: the aim of this test is to measure agility and the ability to change the movement of the body in different directions (Munro & Herrington, 2011; Sporis et al., 2010).

4 x 10 meters agility test: the aim of this test is to measure agility and speed of direction change (Secchi et al., 2014).

2.2.5 Flexibility tests

Standing forward flexion test: it aims to measure the flexibility of the trunk (De Bisschop et al., 1998).

Seated Flexion Test (arms in front): the aim of the test is to measure the degree of flexibility of the trunk (Baquet et al., 2000).

3. Statistical analysis

For the purpose of processing and statistical analysis, Excel program was used to calculate the mean and standard deviations, and SPSS program to find correlation coefficients, calculate the normal distribution of variables (Shapiro) and to perform factor analysis in order to explain the correlation coefficients between the various variables.

Results

1. Descriptive statistics

Through Table 3, the results of the (Shapiro) test show that all the variables are distributed normally; all were greater than 0.05.

2. Factor analysis (oblique rotation)

After using the oblique rotation (Oblimin) for the factor analysis, four factors were reached, the percentage of variance was (70,577%), and according to the conditions of acceptance, three factors were accepted, as shown in table 4.

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Discussion

Through Table 4, the variables (tests) that loaded on the first factor after the oblique rotation process, with a value of 0,30 or more, amounted to five tests representing 30,620% of the total number of tests. These loadings differed between positive and negative. The variables were arranged in descending order according to absolute loadings as follows:

Visual reaction speed test (-0,914)

Auditory reaction speed test (-0,856)

CMJ strength test, lower limb strength (0,683)

SJ strength test, lower limb strength (0,484)

Test Cooper (0,355)

The first factor appears to be a complex factor, because there are tests that represent reaction speed, strength tests and endurance test. It is a polar factor due to the appearance of negative and positive loadings. Through the above, this factor can be called the neuromuscular compatibility factor. The reaction speed tests, whether visual or auditory, were the most loaded, which is considered the most important form of speed for football players.

Dellal (2020) points out that working on short-distance training (3-20 meters) in football with changing stimuli improves reaction and anticipation. As for the SJ and CMJ tests, which represent the strength (the explosive strength of the lower limbs) Strudwick & Doran (2002) indicate that a football player should undergo specialized training in various jumps and speeds that raise fitness rates. There is a correlation and loading between reaction speed tests and explosive strength tests. Kapidžić et al. (2011) confirmed that explosive strength and reaction speed are the basis of critical situations in modern football, such as shooting, violent speeds, shooting from afar, quick

interventions. Lower limbs strength is related to the ability to produce more energy in running, good jump, superiority in high balls, and change direction suddenly very quickly (Wisloff et al., 1998).

Through the above, it was found that the visual reaction speed test achieved the highest loading in the first factor with (-0,914), so it is a candidate as a (unit) test of the battery (units) tests that represent the reaction speed. The second variable candidate can be added, it seems that the CMJ test, which represents the explosive strength component of the lower limbs, achieving the highest loading with (0,683) is the most appropriate.

There are five variables (tests) that loaded on the second factor, arranged as follows:

50-meter speed test (0,861-)

30-meter speed test (-0,861)

Test Cooper (0,455)

Agility T test (0,327)

SJ strength test, lower limb strength (0,325)

This factor can be called the speed factor, because the speed tests achieved the largest loadings. The element of speed, especially for short distances (0-30 meters), is adopted as a standard and a determinant of excellence in modern football (Hamou & Zaroual, 2017). The SJ, Cooper and Agility T tests, are clearly related to the speed tests. Köklü et al. (2015) indicated that vertical jump has a positive correlation with speed. Also, endurance is related to maximum strength and speed (Pimenta et al., 2013). In addition to agility, which is an element of the success of a football player (Hoffman et al., 2004). From the above and referring to previous studies, the 30-meter speed test was chosen as one of the tests included in the proposed physical test battery for school football players.

There are three loaded tests on the third factor with a value of (0,30), representing (10,938%) of the total number of tests.

Seated Flexion Test (0,610)

Standing forward flexion test (0,786)

Navette test 20 meter (0,362)

This factor has been neglected due to the lack of required conditions. Not showing the differences between the sample members in the agility tests does not detract from its importance. Broussal & Bolliet (2012) indicated that flexibility is the reason for the wide range of motion in addition to its impact on the characteristics of good motor performance.

Loadings variables (tests) for the fourth factor amounted to four tests represented (9,807%) of the total tests, arranged as follows:

Agility T test (0,805)

Agility 4*10-meter test (0,766)

Navette test 20 meter (0,565)

Test Cooper (0,400)

Agility is the ability of an individual to change direction quickly, which has been considered a qualitative determinant of success, whether at the individual level or the team (Veale et al., 2010). The idea of modern football is a sport whose peculiarity is the repetition of speeds and positions in the form of jumps, sprints, and changes in direction (Gharbi et al., 2012; Sheppard et al., 2006). Agility, strength and speed are indispensable in youth training programs (Peñailillo et al., 2016), in addition to developing compatibility, which includes body control, movement control and various jumps (Le Guyader, 1999). Endurance is one of the determinants of physical fitness in football, it is the basis of other physical qualities (Chaouachi et al., 2010; Helgerud et al., 2011; Pourcelot, 2013). According to the accepted law for the results of the factor analysis, the endurance tests cannot be taken as one of the tests (units) of the battery of physical tests for players of school football teams in the secondary stage, and this may be due to the characteristics of the age group. About agility, the agility T test is the appropriate test.

Conclusion

Through the previous results, the general hypothesis was confirmed "there are physical tests with statistical significance compared to some other physical tests among school team players in the secondary stage". Whereas, the Visual reaction speed test, CMJ strength test, 30-meter speed test, and Agility T test, represented the following factors: neuromuscular compatibility, neuromuscular compatibility, speed, and change of direction speed, respectively.

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