Original Article

# Diagnoses of athletic potential for the students of Arena School: A pilot study

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**ABSTRACT**

The carries out the diagnosis of detection of sports talents of school children with *iSports* software and laboratory tests. We evaluated: 26 males and 11 females, age (13 to 18 years), lower limb strength and manual, flexibility, waist-hip ratio and body mass index. The boys did not present a correlation between the variables of the *iSports* tests with the laboratory tests, but the girls had (rp power = 0.64 p <0.05).The largest values in weight resulted in poorer performance in *software* testing. The *iSports* was able to identify athletic potential for football only in girls, corroborate with lab tests. Both tests can complement each other to enhance assessment of sporting talent detection. **Keywords:** Football; Talent; Differential diagnosis; Athletic performance.

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## INTRODUCTION

Football is the most practiced sport in the world (Jacobina, 2011). In Brazil is modality and become a national passion. It's and space in which the people express their emotions and manifest their indignations. Therefore football is called as "sport of the people" (RIVITI, 2016). From the form, the influence that the same assumes from an early age to its practice among young people is quite expressive.

However, in order to be successful in the sporting practice of this modality it is necessary that the athlete has optimized physical and technical abilities (Alex Souto Maior, Gustavo Leporace, Marcio Tannure, 2017). According to (A. M. Williams, Reilly, & Reilly, 2000) there are four main predictors for detection of potential talent in football, they are: physiological, involving variables related to aerobic and anaerobic capacities; psychological, encompassing cognitive-perceptive abilities and in relation to the personality; sociological, when referring to the context in which the individual is inserted; and finally functional physical capabilities , including all parameters related to the physical nature. According Ravagnani et al. (2013), affirm that the predominant profile of the players evaluated in their study demonstrates that the profile is of aerobic resistance.

The detection of talents is important in the context of sports excellence, since it encompasses multifactorial variables such as maturation, being able to be responsible for the ideal selection or not of future athletes (Nunomura & Oliveira, 2014). Thus the detection of sports talents goes far beyond the sporting context, as social, academic and professional developments are also part of the performance process to become future sports talent (Knop, 2014). Then several approaches to physical and statistical capabilities come up with the use of indicators to compare performance and highlight potential athletes (Louzada, Maiorano, & Ara, 2016).

Developing talented individuals is a crucial factor in achieving positive results in high-performance sports (Knop, 2014). The process of detection of sports talents corresponds to the methods used to select children and adolescents able to participate in sports programs (Folle & Ramos, 2015). In football, according to (Reilly et al., 2018), the main factors that build a successful career in this modality are related to excellence in decision making and cognitive and game skills.

They have developed an online system called *ISports* (Louzada et al., 2016), that uses statistical tools to compare individuals in the football sport. These comparisons were made from 6 tests: 1. Time (in seconds) that the individual traverses 1000 meters in the field, 2. Mor Christian pass test (in points), 3. Dribbling test of 5 cones (in seconds), 4. Cyclic speed time (in seconds), 5. Pass test (in points) and 6. Anaerobic power test (in seconds). From these tests, the authors generated four variables: general score, technical score, physical score and consistency. These variables in turn help football team coaches to measure the individual's technical and physical performance and his propensity for football.

To assist this software (Louzada et al., 2016) in the identification of sporting talents of young athletes, in this study added laboratory tests added to the technical capacity and physical performance involving variables: power, flexibility, strength and anthropometry. Then, individual analysis and correlation between the tests proposed by the iSports software and those incorporated in this study were made.

Considering that there is no reliable method of identifying sports talent, we hypothesize that the iSports tests and the tests of the Physical Fitness, Computer Science, Metabolism, Sport and Health (NAFIMES) tests can predict future talented athletes in football. This was based on the assumption of the use of indicators that indicate individuals with higher performance in a given modality and the consequent need for identification, arises from the problem of the detection of talents.

The objective of this study was to perform a diagnosis that, besides helping to detect future sports talents, serves as a basis to identify the most expressive variables among the iSports software tests and the additional ones proposed by this study, and its relationship with the sports performance of school children both sexes of the Arena School, located in Arena Pantanal stadium in Cuiabá - MT.

## MATERIALS AND METHODS

### *Characterization of the study*

This is transverse observation. For its accomplishment, it was approved by the Research Ethics Committee of the Júlio Muller-CEP / HUJM University Hospital, (CAAE: 92144218.5.0000.5541) according to resolution 466/12 of the National Health Council, and all legal representatives of the subjects of the (TCLE), while the term of free and informed consent (TALE) was signed by the students because they were minors.

### *Universe and sample*

We evaluated 37 students from a universe of (430 enrolled students) of the Governor José Fragelli Arena School of education located in the Arena Pantanal-Cuiabá-MT stadium. The collection occurred in the morning period in October of this year. The trainings were carried out during the week, in a frequency of 10 hours per week in the students who practiced the sport. The Arena School runs a project integrating the stadium-school concept, offering full-time teaching, focusing on sports training in collective sports: futsal and basketball, individual: athletics, swimming, judo, Olympic wrestling, skateboarding, table tennis, chess and sand volleyball.

### *Evaluation procedures*

The scores from 1 to 4 obtained from the sports skills tests of the *iSports* application , available at http://www.mwstat.com/isports/. Yet they were measured the following variables of interest, proposed by NAFIMES (item 5-13), represented (Table 1).

### *Body mass and height*

Body mass (MC) in kilograms (kg) and height (E) in meters (m) were measured using the Welmy © W110H platform type scale, with a maximum capacity of 200 kg and a precision of 100 g and calculated the body mass index (BMI kg / m $^2$) (Andrade, 2012).

### *Flexibility test: Wells bench*

The man sat on the mattress with his feet flat on the side of the box beneath the seat. The valet's arms were extended in front of the body with one hand placed over the other (palms down). He was instructed to flex the trunk over the hip and push the ruler over the box, which has a millimetre tape measure, without flexing the knees and without taking the feet out of contact with the box. This procedure was performed twice and the mean of the two trials was analysed.

### *Manual force test (Handgrip)*

The force was measured with a manual Grip Saehanmedical®, model SH5001 Hydraulic Hand Dynamometer, with scale from 0 to 90 kg. The test taker performed the test with his dominant hand, and it should be placed along the body with the arm extended. Two trials were allowed and the best performance of the two trials (Andrade, 2012).

Table 1. Designation of iSports components and physical capacity tests

| ITEM | ANALYZED VARIABLES | SPECIFICITIES |
|---|---|---|
| 1 | General Score | *iSports Software* |
| 2 | Technical Score | *iSports Software* |
| 3 | Physical Score | *iSports Software* |
| 4 | Consistency | *iSports Software* |
| 5 | Student Height | cm |
| 6 | Student body mass | kg |
| 7 | Student Body Mass Index (BMI) | kg/m² |
| 8 | Mean of Wells Bank | cm |
| 9 | WHR: Wais-hip ratio | Waist Circumference / Hip Circumference |
| 10 | Handgrip | kgf |
| 11 | Vertical Impulse Test: Mean of jump flight | cm |
| 12 | Vertical Impulse Test: Mean of contact | time |
| 13 | Vertical Impulse Test: Mean of jump height | cm |
| 14 | Vertical Impulse Test: Mean of jump power | Hertz |

*Note: The tests were divided into 4 predictors, variables analysed by iSports (1 to 4), variables related to BMI (5 to 7), manual force variables, flexibility and waist and hip ratio (8 to 10) and power variables (11 to 13).*

***Relation waist and hip (WHR)***

They were measured in orthostatic position on the waist and hip circumferences, using inextensible flexible metal tape of Cescorf © brand with 2 m in length and accuracy of 0,01 cm (Andrade, 2012). For measurement: 1. Waist circumference, measured in the narrowest part of the abdomen or in the region between the last rib and the navel; 2. Hip circumference measured at the widest part of the buttocks. The WHR calculation was divided by waist circumference values by the hip. The normative values of WHR at a maximum of 0.80 for women and 0.90 for men (Akram et al., 2000).

***Vertical Drive Test (Jumping Mat)***

The test was performed on the platform of the EMG System do Brasil® brand, model Biomec 400 analysed by the Multisprint Full software, obeying the following instructions: the volunteer stood with his hands on his waist and jumped vertically as high as possible with his knees extended . The value of three measurements was recorded, and the mean of the attempts for analysis was calculated.

***Analysis and Statistics***

In the descriptive analysis, means, standard deviations and lower and higher confidence indices were calculated. Pearson's correlation with p-value significance (<0.05) with 95% confidence. The criterion of (Kaiser 1958) to select the main components (CPs) that explain most of the data variation, which obtain CPs with eigenvalues larger than the unit (> 1). Principal component analysis (ACP) is a multivariate statistical technique whose function is to transform the set of original variables into another set of variables without interfering with their size (Hongyu 2015). Initially correlated with each other, in a substantially smaller set of uncorrelated variables containing most of the information from the original set (Hongyu 2015). Statistical analysis was performed using statistical software version 3.5.

## RESULTS

The sample consisted of 37 students of both sexes, 26 (70.27% of the sample) boys (14.34 ± 1.29 years) and 11 (29, 73%) girls (14.36 ± 1.68 years ). The boys measured greater body mass than the girls, but both sexes were classified as eutrophic. The WHR corresponded to normality for health status, flexibility was higher for girls. But the handgrip was bigger for the boys. The jump mat test used to measure power capacity measured higher values for boys than for girls (Table 2).

Table 2. Descriptive analysis of anthropometric characteristics and physical capacity in both male and female genders of adolescents practicing sports

| Variables | BOYS (n=26) | | | | GIRLS (n=11) | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean | SD | CI inf. | CI sup. | Mean | SD | CI inf. | CI sup. |
| Weight (kg) | 56,30 | 10,24 | 37,90 | 86,20 | 52,53 | 14,9 | 30,20 | 84,90 |
| Height (cm) | 1,67* | 0,06 | 1,48 | 1,75 | 1,56* | 0,09 | 1,44 | 1,72 |
| BMI | 20,07 | 2,73 | 16,25 | 28,44 | 21,19 | 4,07 | 14,56 | 28,60 |
| WHR (cm) | 0,80 | 0,02 | 0,76 | 0,84 | 0,76 | 0,05 | 0,69 | 0,87 |
| Wells Bank (cm) | 25,42* | 7,95 | 9,00 | 45,50 | 33,07* | 5,75 | 23,50 | 45,25 |
| *Hand-grip* (kgf) | 30,61 | 8,68 | 14,00 | 53,00 | 21,32 | 5,91 | 12,00 | 31,00 |
| Power (hertz) | 314,40 | 80,91 | 75,00 | 478,00 | 263,00 | 75,33 | 161,30 | 439,30 |

*** p<0,01 and *p≤0,05. Confidence Interval 95%.*

*Sample normality test by Shapiro Wilk. Test-t student to compare parametric and Wilcoxon Mann-Whitnney test (BMI) for non-parametric.*

For interpretation were classified into three constructs being (iSports variables, anthropometric variables and vertical jump carpet variables), which generated the sample correlation matrix.

Variables such as general score, power and BMI present smaller constructs that compose them. In the evaluation of the general score, the average of the technical, physical and consistency scores of the iSports tests was considered, while for the power variable, the means of height, flight and contact that complemented them, and for the BMI, was calculated using the values of weight and height. Thus, these smaller constructs were expected to correlate.

The girls' general score, on the other hand, showed a correlation with height (rp = 0.60), BMI (rp = 0.68), WHR (rp = 0.62), Hand-grip (rp = 0.92) , mean flight (rp = 0.60) and mean power (rp = 0.64). The technical score correlated with weight (rp = 0.64), height (rp = 0.62), BMI (rp = 0.73), WHR (rp = 0.69), Hand-grip (rp = 0 , 92), flight average (rp = 0.71) and mean power (rp = 0.58). The physical score did not correlate with the other variables. (Rp = 0.87), BMI (rp = 0,82), WHR (rp = 0.87), and the mean values of the weights (rp = 0.87) (Rp = 0.87), mean of contact (rp = 0.57), mean of flight (rp = 0,82) and average height of vertical jump on the carpet (rp = 0.97) (Table 3).

The aim of ACP is to reduce complexity by identifying factors that justify the correlations between variables. Analysing the slope plots, screen plot, we see that 5 components have eigenvalues greater than 1 while in the girls' group they are 3 components (Figure 1).

To better explain the interpretation of these components was possible to reduce the number of tests to make explanation of 87.25% and 82.85% of the results in boys and girls, respectively (Table 4).

Even when it reduced to only three tests also in the boys, an explanation of 66.85% of the variance was maintained. To better understand the importance of each variable in the construction of the components for each group, the correlation between the original variables and the main components was calculated (Table 5).

Table 3. Correlation matrix among all iSports variables and physical abilities in both males and females of adolescents practicing sports

| | GS | TS | PS | C | W | H | BMI | WHR | MWB | HG | MC | MF | MH | MP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GS | - | 0.65** | 0.88** | 0.78** | -0.22 | 0.06 | -0.30 | 0.02 | 0.02 | 0.23 | -0.10 | -0.01 | 0.06 | -0.18 |
| TS | 0.89** | - | 0.37 | 0.53** | -0.39 | -0.30 | -0.36 | 0.35 | 0.18 | -0.28 | -0.04 | 0.12 | 0.13 | -0.20 |
| PS | 0.55 | 0.14 | - | 0.61** | -0.23 | 0.13 | -0.35 | -0.12 | -0.15 | 0.38 | -0.09 | 0.05 | 0.16 | -0.13 |
| C | -0.34 | -0,39 | -0.04 | - | -0.14 | 0.10 | -0.22 | 0.11 | 0.03 | 0.03 | -0.18 | 0.03 | 0.03 | -0.08 |
| W | 0,72 | 0,74** | 0.13 | -0,78** | - | 0.69** | 0.93** | 0.24 | 0.26 | 0.54** | -0.16 | -0.20 | -0.21 | 0.56** |
| H | -0,60* | -0,62* | -0.18 | 0.94** | -0,91** | - | 0.36 | -0.05 | 0.04 | 0.74** | -0.40 | -0.14 | -0.07 | 0.38 |
| BMI | 0,68* | 0.73* | 0.07 | -0,82** | 0.99** | -0,93** | - | 0.31 | 0.30 | 0.32 | 0.00 | -0.18 | -0.22 | 0.52* |
| WHR | -0,62* | -0.69* | -0.04 | 0.87** | -0.97** | 0.96** | -0,99** | - | 0.24 | -0.13 | -0.25 | 0.02 | -0.03 | 0.17 |
| MWB | 0,20 | 0.25 | -0.21 | -0.30 | 0.53 | -0.38 | 0.54 | -0.51 | - | 0.07 | 0.21 | -0.25 | -0.25 | -0.05 |
| HG | 0,92** | 0,92** | 0.31 | -0.60* | 0.92** | -0.81** | 0.89 | -0.85** | 0,34 | - | -0.02 | -0.21 | -0.08 | 0.21 |
| MC | 0,31 | 0,36 | -0.03 | -0.57* | 0.57 | -0.61* | 0,62* | -0.64* | -0.45 | -0.23 | - | -0.24 | -0.17 | -0.33 |
| MF | -0.60* | -0,71* | 0,07 | 0.82** | -0.96** | 0.91** | -0.98** | 0.98** | -0.57 | -0.84** | -0.63* | - | 0.98** | 0.70** |
| MH | -0.51 | -0,56 | -0.14 | 0.97** | -0.85** | 0.97** | -0.86** | 0.91** | -0.26 | -0.74** | -0.56* | 0. 85** | - | 0.67** |
| MP | 0.64* | 0.58* | 0.18 | 0.22 | 0.43 | -0.07 | 0.38 | -0.25 | 0,40 | 0.57* | 0,08 | -0,31 | 0,09 | - |

Correlation of boys Correlation of girls

** Significant correlation for0,01 ≤ p ≤ 0,05, ** Significant correlation for p<0,01*

***Note 1:*** *iSports variables: GS= General Score; TS = Technical Score; PS = Physical Score; C = Consistency. Other variables: W = Weight (kg); H = Height (cm); MBW = Mean Wells Bank (cm); HG = Hand-grip (kg / f); MC: Mean of Contact (Test of vertical impulse); MF = Mean of Flight (Vertical Impulse Test); MH = Mean of Height (Vertical Impulse Test); MP = Mean of Power (Vertical Impulse Test).*
***Note 2:*** *Pearson correlation test. If the p-value found is less than 0.05 we have a correlation.*

Table 4. Analysis of the main components: Eigenvalues,% of explained and accumulated variance explained by each main component with eigenvalue greater than 1

| Main Components | Boys | | | Girls | | |
|---|---|---|---|---|---|---|
| | Eigenvalues | % Variance | % Accumulated | Eigenvalues | % Variance | % Accumulated |
| 1 | 3.77 | 26.96 | 26.96 | 7.12 | 50.86 | 50.86 |
| 2 | 2.87 | 20.53 | 47.49 | 3.15 | 22.49 | 73.35 |
| 3 | 2.71 | 19.37 | 66.86 | 1.33 | 9.50 | 82.85 |
| 4 | 1.77 | 12.68 | 79.54 | - | - | - |
| 5 | 1.08 | 7.71 | 87.25 | - | - | - |

Table 5. Matrix of correlations of each main component with each variable by group: boys and girls

| **Variables** | **Boys** | | | | | **Girls** | | |
|---|---|---|---|---|---|---|---|---|
| | MC1 | MC2 | MC3 | MC4 | MC5 | MC1 | MC2 | MC3 |
| General Score | **-0.62** | 0.58 | 0.46 | 0.03 | 0.10 | **0.92** | -0.29 | -0.17 |
| Technical Score | **-0.67** | 0.24 | 0.15 | 0.53 | 0.06 | **0.81** | -0.14 | -0.28 |
| Physical Score | -0.55 | **0.60** | 0.36 | -0.27 | 0.12 | 0.46 | **-0.59** | 0.07 |
| Consistency | -0.52 | **0.54** | 0.37 | 0.18 | -0.05 | **0.92** | -0.30 | -0.16 |
| Weight | **0.88** | 0.33 | 0.25 | 0.13 | 0.03 | 0.64 | **0.73** | 0.21 |
| Height | 0.56 | **0.57** | 0.30 | -0.31 | -0.15 | **0.73** | 0.44 | 0.07 |
| Body Mass Index | **0.84** | 0.14 | 0.15 | 0.30 | 0.14 | 0.43 | **0.83** | 0.21 |
| Waist-hip ratio | 0.16 | 0.16 | 0.09 | **0.82** | -0.23 | 0.34 | -0.02 | **0.81** |
| Mean of Wells Bank | 0.20 | -0.09 | 0.37 | **0.54** | 0.46 | -0.29 | **0.55** | -0.40 |
| Hand grip | 0.41 | **0.50** | 0.44 | -0.44 | 0.22 | **0.92** | 0.11 | -0.10 |
| Mean of contact | -0.08 | -0.51 | 0.15 | -0.10 | **0.76** | -0.20 | **-0.61** | 0.51 |
| Mean of flight | -0.16 | 0.45 | **-0.86** | 0.07 | 0.17 | **0.88** | -0.38 | -0.06 |
| Mean of height | -0.19 | 0.51 | **-0.79** | -0.02 | 0.26 | **0.89** | -0.37 | -0.06 |
| Mean of power | 0.51 | **0.62** | -0.55 | 0.14 | 0.14 | **0.87** | 0.46 | 0.13 |

***Note: Boys***
*MC1: General score, Technical score, Weight and BMI.*
*MC2: Physical score, Consistency, Height, Hand-grip and Mean of Power.*
*MC3: Mean of flight and Mean of height.*
*MC4: Waist-hip ratio and Mean of Wells Bank.*
*MC5: Mean of Contact*
***Girls***
*CP1: General score, technical score, consistency, height, hand-grip, Mean of Flight, Mean of Height and Mean of Power.*
*CP2: Physical score, Weight, BMI, Mean of Wells Bank, Mean of Contact.*
*CP3: Waist-hip ratio*

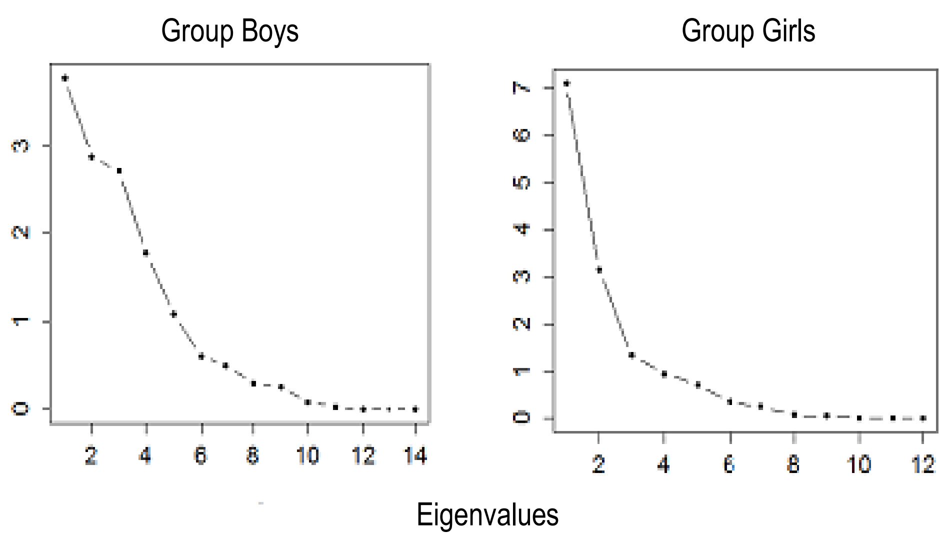


Figure 1. Screen Plot of eigenvalues and number of components for each group

## DISCUSSION

As the main findings in our study, we diagnosed that the girls evaluated were more likely to become athletic potentials, these were emphasized in the power levels, relating to iSports indexes. However, for boys this variable did not correlate with the other variables, considering that for football practice power is extremely important, it can be inferred that these athletes were not able to practice sports and become talented in the modality of football.

The anthropometric differences in both types of sports practitioners were observed in Table 2 corroborating with the other studies that these capacities differ between genders, so the intervention should be prescribed specifically according to gender and modality (Brandão et al., 2016). Among the data related to the healthy zone profile proposed by Brazil Sport Program (PROESP-BR) (Gaya & Gaya, 2016) the normative values for BMI are in line with those found in our study.

The correlation matrix observed in Table 3, statistically significant with the iSports software tests with the tests proposed by NAFIMES. In this way, it was verified that for the boys' group, the iSports test variables did not present correlation between the constructs. Thus, the independent variables did not correlate with each other, suggesting that the boys did not present a favourable profile for development as an athlete, since important variables in the football athlete's formation did not correlate with the iSports tests, such as power and flexibility by example highlighted in other studies (Da Silva et al., 2012); (Del Rio et al., 2015); (Komi, 2000). However, the cause and effect relationship cannot be verified in this transversal observation (Bastos & Duquia, 2013) and other factors must be considered to result in talented athlete (Unnithan et al., 2017); (Tribolet, Bennett, Watsford, & Fransen, 2018).

The girls' general score correlated with anthropometric and laboratory tests. Therefore, technical score correlated with weight, height, BMI, WHR, handgrip, mean of flight and mean power. The values found in this study were similar to the normative values proposed by PROESP-BR (Gaya & Gaya, 2016), but flexibility in the female gender was higher in our study. The physical score did not correlate with the other variables. The consistency, still referring to *iSports* software *tests*, *correlated* with weight, height, BMI, RCQ, *handgrip*, mean contact, mean flight and mean height of vertical jump on the carpet for the female gender.

The analysing anthropometric and fitness measures in young handball athletes, (Mohamed et al., 2009) identified that elite and non-elite handball players differed in morphological parameters and measures of motor performance, however maturation should be considered as important covariate. The authors state that specific anthropometric measures such as these motor performances are recommended, but suggested the use of a non-invasive measure of maturation to identify talents in handball. Thus, for the effectiveness of the talent approach (Mohamed et al., 2009), the multidisciplinary team recommends morphological, physical, technical, tactical and psychological aspects. Some studies have described that height and body mass are important variables for the performance of football players in the successive sprints performed during football matches (Unnithan et al., 2017); (Tribolet et al., 2018); (Mathisen & Pettersen, 2015).

The flexibility not presented correlation with the variables for both the boys as for the girls. However, the authors (Del Rio et al., 2015) states that the in general flexibility is an important factor for sports training. Since that the higher the elasticity and flexibility joint mobility suggests that can promote the increase of muscle strength. Therefore it is necessary to assiduously attend athletic training of athletes to improve flexibility, preventing injury of the hamstring consequently improving technical and physical abilities in football (J. G. Williams, Gard, Gregory, Gibson, & Austin, 2018).

 

Only the girls showed relationship in the mean flight and mean height constructs, representing the power variable, correlated with the iSports test scores indicating that the power is important for the profile of future athletes, as highlighted in the literature. High intensity exercise required in football depends on the high level of muscular power, including in this way the ability of neural recruitment, use of the elongation-shortening cycle and the rate of energy release via anaerobic metabolism (Komi, 2000). It's emphasizes that football players of different positions should possess similar levels of muscular power, despite the distinct tasks in the game (Da Silva et al., 2012).

In our study we observed a correlation between the hand-grip test and the overall scores, technical score and the consistency of the iSports variables. Although our sample does not show uniformity in the practice of football, some schoolchildren were enrolled in sports such as volleyball and basketball for example, it is suggested that this test based on positive correlation be applied for the evaluation of individuals practicing football. These authors (Castro-Pinero et al., 2010) examined the association between different measures of muscular strength in the lower and upper parts of young people aged between 6 and 17 years with strong association between the horizontal jump test and upper limbs strength tests, denoting the muscular fitness index in adolescents. In this study, we performed the same relation inversely, where we obtained a strong correlation of upper limb strength associated with the general muscular aptitude of the evaluated students, reinforcing the hand-grip test as a predictor of this physical valence for the evaluation of future athletes.

In table three and four, boys in the first major component (CP1) denoted: difference in signal indicates that the higher the student's weight and BMI the lower his or her performance in the technical and general scores. The authors (García-Hermoso, Saavedra, Ramírez-Vélez, Ekelund, & del Pozo-Cruz, 2017) investigated the evidences of the effects of the reallocation of the time spent in sedentary behaviours in different intensities of activity in the juvenile adiposity and came to the conclusion that the physical activity of moderate to high intensity is of paramount importance, since it can improve the phenotypes of body composition in young people. The authors (Gaddad, Kumar, Basu, Dhankar, & Rajendran, 2018) also emphasize that relation physical activity with body image, self-esteem, body mass index (BMI), physical inactivity and dietary habits should be considered in any assessment of the clinical condition in adolescents.

For CP2 variables that were most prominent obtained: and physical score (0.60), and consistency (0.54), height (0.57), the handgrip (0.50) and mean potency (0.62). In this component there was no contrast indicating that the students who obtained good results in the physical score and consistency of *iSports* also had positive results in mean power, *handgrip* and height (Table 5). But in their study (Unnithan et al., 2017), they concluded that success in youth football depends on several factors that interact with one another and that anthropometric and physiological factors can be used during adolescence, with approximate validity of the game. Still was considered maturation as an important factor since early individuals despite the possibility of presenting better scores in certain tests do not exclude the talent of adolescents with late maturation (Malina, Rogol, Cumming, Coelho, & Figueiredo, 2015).

For the CP3, the variables that were highlighted were flight averages (-0.86) and mean height (-0.79). By the negative sign of the correlations of the variables with CP3, we see that the worse the average flight, the worse the average height and vice versa. Result found that these variables depend on each other to obtain the average power. For CP4, the variables that stood out were WHR (0.82) and Wells' mean bank (0.54). This result indicates that the WHR is directly related to the athlete's score in the Wells bank, the better the WHR scores the better the flexibility scores. It was observed that age, waist circumference and height were the strongest independent predictors of flexibility in adolescents, denoting WHR as a significant predictor of flexibility (Mckay et al., 2016).

In the CP5 only the mean contact variable (0.76) was highlighted, as the CPs were not correlated with each other, so the mean contact variable did not present a strong correlation with the other variables by the analysis of main components (Table 4). To perform maximum jump, great power is required, for this to occur it is necessary to increase the strength of the lower limb and decrease the time of contact with the ground (Farris, Lichtwark, Brown, & Cresswell, 2016). This corroborates with our study that we showed that the time of permanence in the carpet, not correlating with the other variables, we argued that the permanence of contact with the soil harms the increase of power (Farris et al., 2016).

For the girls' group, the reduction of the size of 14 original variables to 3 is quite reasonable, while for boys it is summarized in five main components. In the first major component (CP1) the variables with high positive correlations were: General Score (0.92), Technical Score (0.81), Consistency (0.92), Height (0.73), handgrip (0.92), flight averages (0.88), height (0.89) and power (0.87) were all positively correlated. Interpreting the grouping of these variables explains that the overall iSports test score is directly related to upper and lower limb strength (power). This finding reinforces the correlation of the test and the importance of force in football (Castro-Pinero et al., 2010).

For CP2, the following variables were observed: physical score (-0.59), BMI (0.73), Weight (0.83), Wells bench mean (0.55) and mean contact (-0, 61). In this component we had a contrast, that is, the higher the weight, BMI and mean in the Wells bank, the worse the result in the physical score and the mean contact. So the girls' physical performance was inversely correlated with BMI and flexibility. Some authors point out that the importance of the levels of physical activity positively correlated with the variables related to health, in which higher levels of physical activity represent positive health factors and are effective in the prevention of diseases associated with lifestyle (Chung & Park, 2017).

At CP3 the variable WHR (0.81) was highlighted, so it did not present a strong correlation with the other variables (Table 4). The WHR is quite expressive in the most diverse studies (Fett, WC Fett, & Marchini, 2009) and may complement BMI by identifying individuals at risk for obesity-related morbidity. Predictors of blood pressure, body mass index, waist-hip ratio, and blood glucose are important because they evaluate cardiometabolic disorders, including other disorders such as glucose regulation, obesity, dyslipidaemia and hypertension, which can later progress to diseases cardiovascular and diabetes related to general health. Thus WHR is a predictor for risk screening for cardiovascular diseases, related to the increased risk of diabetes and hypertension in the most different ethnic groups (Joseph-Shehu & Ncama, 2018).

Other extrinsic and intrinsic motivational factors may be predictors of future talented athletes. The combinations of technical, tactical, physiological and psychological attributes were previously described on their ability to evaluate football performance. Thus, the physiological profile varies according to the position they are in and the role they play when they are football athletes (Ravagnani et al., 2013).

The complex interaction between these characteristics makes it difficult to measure football performance and makes the modality multifactorial approach. It is known that physical attributes have been highly correlated with performance in the modality by relating to the effort made during games such as speed and power in determining successful players on a professional level. However, its relationship with the technical performance is not well evidenced. In general, the performance tests are limited to be able to predict the technical level of the football player in a game situation. Football is multifactorial sport in identifying talents, and club testing should focus more on selecting skills that match the technical needs of the football match (Rowat, Fenner, & Unnithan, 2017).

 

Although the girls obtained satisfactory results, our sample was not totally homogeneous, because the number of women evaluated was lower than the male, and the students practiced different sports modalities. Cross-sectional observation studies do not allow explaining cause Bastos & Duquia (2013), next longitudinal studies should be performed to answer this hypothesis. However, the evaluations carried out generated a diagnosis of the students, providing a panorama to foster future studies on football talent detection.

## CONCLUSION

The iSports tests proved to be useful for evaluating schoolchildren with the purpose of recruiting information about potential future football players. However, the lack of linear consistency with other classical measures of physical performance suggests that further studies with this instrument are necessary, using a larger sample and with professional talents previously diagnosed for validation.

ISports indexes were not statistically significant in correlation with the NAFIMES test in males. Thus, he concludes that based on this study, these adolescents did not present enough indexes for football athletic potential. However, the girls achieved satisfactory levels when correlating power with the iSports tests, presenting better indexes when compared with the boys. Thus the correlation of ACP with iSports tests and laboratory tests can complement each other by improving the detection of sporting talents in football.

This study can foster other work on talent detection in football mode, using different statistical analysis methods. Another point to be highlighted is that the tests proposed are easy to apply and can be adopted by football schools and clubs.

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## INTEREST CONFLICTS

The authors declare that there is no conflict of interest.

## REFERENCES

Akram, D. S., Astrup, A. V., Atinmo, T., Boissin, J. L., Bray, G. A., Carroll, K. K., … Zimmet, P. (2000). Obesity: Preventing and managing the global epidemic. World Health Organization - Technical Report Series, (894).

Alex Souto Maior, Gustavo Leporace, Marcio Tannure, M. M. (2017). Profile of infrared thermography in elite soccer players. Revista Motriz, 23, 1–6. https://doi.org/10.1590/s1980-6574201700020013

Andrade, R. silva R. C. M. D. S. A. de M. C. A. F. (2012). Memórias do estudo da fragilidade em idosos brasileiros da cidade de Cuiabá. (KCM, Ed.). Cuiabá.

Bastos, J. L. D., & Duquia, R. P. (2013). Erratum para: Um dos delineamentos mais empregados em epidemiologia: Estudo transversal [volume 17, número 4]. Scientia Medica, 23(2), 229–232.

Brandão, C. F., De Queiróz Fontes, J. H., Zavala, A. A. Z., Fett, W. C. R., Dos Santos, R. J., & Fett, C. A. (2016). Reference index and reduction in physical fitness tests proposed by PROESP-BR. Motriz. Revista de Educacao Fisica, 22(1), 48–53. https://doi.org/10.1590/s1980-65742016000100007

Castro-Pinero, J., Ortega, F. B., Artero, E. G., Girela-Rejon, M. J., Mora, J., Sjostrom, M., & Ruiz, J. R. (2010). Assessing muscular strength in youth: usefulness of standing long jump as a general index os muscular fitness. Journal of Strength and Conditioning Research, 24. https://doi.org/10.1519/jsc.0b013e3181ddb03d

Chung, N., & Park, H. P. M. (2017). Association of daily physical activity level with health-related factors by gender and age-specific differences among Korean adults based on the sixth ( 2014-2015 ) Korea National Health and Nutrition Examination Survey. Journal of Exercise Nutrition & Biochemistry, 21(2), 30–38. https://doi.org/10.20463/jenb.2017.0026

Da Silva, J. F., Detanico, D., Floriano, L. T., Dittrich, N., Nascimento, P. C., Dos Santos, S. G., & Guglielmo, L. G. A. (2012). Níveis de potência muscular em atletas de futebol e futsal em diferentes categorias e posições. Motricidade, 8(1), 14–22. https://doi.org/10.6063/motricidade.8(1).233

Del Rio, J., Flores Moreno, P. J., González, J. B., Barajas Pineda, L. T., Medina Valencia, R. T., & Gómez Gómez, E. (2015). Efectos de un programa de flexbilidad en el desarrollo de la fuerza muscular en jugadoras de futbol femenil. Educación Física y Ciencia, 17(2), 00–00. https://doi.org/10.18004/ucsa/2409-8752/2016.003(02)003-004

Farris, D. J., Lichtwark, G. A., Brown, N. A. T., & Cresswell, A. G. (2016). The role of human ankle plantar flexor muscle-tendon interaction and architecture in maximal vertical jumping examined in vivo. Journal of Experimental Biology, 219(4), 528–534. https://doi.org/10.1242/jeb.126854

Fett, carlos alexandre, WC Fett, & Marchini, J. S. (2009). Exercício resistido vs jogging em fatores de risco metabólicos de mulheres com sobrepeso / obesas, 519–525. https://doi.org/10.1590/s0066-782x2009001100013

Folle, A., & Ramos, V. (2015). RBCDH athletes in training, (October), 672–682.

Gaddad, P., Kumar, P. H., Basu, S., Dhankar, M., & Rajendran, S. (2018). Relationship of physical activity with body image, self esteem sedentary lifestyle, body mass index and eating attitude in adolescents: A cross-sectional observational study. Journal of Family Medicine and Primary Care, 6(2), 169–170. https://doi.org/10.4103/jfmpc.jfmpc_114_18

García-Hermoso, A., Saavedra, J. M., Ramírez-Vélez, R., Ekelund, U., & del Pozo-Cruz, B. (2017). Reallocating sedentary time to moderate-to-vigorous physical activity but not to light-intensity physical activity is effective to reduce adiposity among youths: a systematic review and meta-analysis. Obesity Reviews, 18(9), 1088–1095. https://doi.org/10.1111/obr.12552

Gaya, A., & Gaya, A. (2016). PROESP-Br Manual de testes e avaliação. Https://Www.Ufrgs.Br/Proesp/Arquivos/Manual-Proesp-Br-2016.Pdf

Jacobina, A. T. (2011). André Teixeira Jacobina Futebol : o esporte bretão que se abrasileirou. Revista Eletrônica Cadernos de História, 9.

Joseph-Shehu, E. M., & Ncama, B. P. (2018). Evaluation of health status and its predictor among university staff in Nigeria. BMC Cardiovascular Disorders, 18(1), 183. https://doi.org/10.1186/s12872-018-0918-x

Knop, D. E. (2014). Viabilidade de aplicação de um instrumento para a avaliação da qualidade dos processos de detecção e seleção de talentos, 527–537. https://doi.org/10.4025/reveducfis.v25i4.23363

Komi, P. V. (2000). Stretch-shortening cycle: A powerful model to study normal and fatigued muscle. Journal of Biomechanics, 33(10), 1197–1206. https://doi.org/10.1016/s0021-9290(00)00064-6

Louzada, F., Maiorano, A. C., & Ara, A. (2016). ISports: A web-oriented expert system for talent identification in soccer. Expert Systems with Applications, 44(2000), 400–412. https://doi.org/10.1016/j.eswa.2015.09.007

 

Malina, R. M., Rogol, A. D., Cumming, S. P., Coelho, M. J., & Figueiredo, A. J. (2015). Biological maturation of youth athletes : assessment and implications. Br J Sports Med., 852–859. https://doi.org/10.1136/bjsports-2015-094623

Mathisen, G., & Pettersen, S. A. (2015). Anthropometric factors related to sprint and agility performance in young male soccer players. Open Access Journal of Sports Medicine, 6, 337–342. https://doi.org/10.2147/oajsm.s91689

Mckay, M. J., Baldwin, J. N., Ferreira, P., Simic, M., Vanicek, N., & Burns, J. (2016). Normative reference values for strength and flexibility of 1 , 000 children and adults. Neurology, 88, 36–43. https://doi.org/10.1212/wnl.0000000000003466

Mohamed, H., Vaeyens, R., Matthys, S., Multael, M., Lefevre, J., Lenoir, M., & Philppaerts, R. (2009). Anthropometric and performance measures for the development of a talent detection and identification model in youth handball. Journal of Sports Sciences, 27(3), 257–266. https://doi.org/10.1080/02640410802482417

Nunomura, M., & Oliveira, M. S. (2014). Detecção e seleção de talentos na ginástica artística feminina: a perspectiva dos técnicos brasileiros. Revista Brasileira de Ciencias Do Esporte, 36(2), 311–325. https://doi.org/10.1590/s0101-32892014000200003

Ravagnani, F. C. P., Brandão, C. F. C. C. M., Paz, W. B., R. Filho, A. D., Fett, C. A., & Ravagnani, C. F. C. (2013). Perfil Físico das Diferentes Posições de Jogadores de Futebol. Revista Brasileira de Ciência e Movimento, 21(2), 11–18. https://doi.org/10.18511/0103-1716/rbcm.v21n2p11-18

Reilly, T., Bangsbo, J., Franks, A., Reilly, T., Bangsbo, J., & Franks, A. (2018). Anthropometric and physiological predispositions for elite soccer Anthropometric and physiological predispositions for elite soccer, 0414(January). https://doi.org/10.1080/02640410050120050

Riviti, T. G. (2016). Futebol brasileiro na atualidade: história, cultura e profissionalização ASSIS 2016.

Rowat, O., Fenner, J., & Unnithan, V. (2017). Technical and physical determinants of soccer match-play performance in elite youth soccer players. The Journal of Sports Medicine and Physical Fitness, 57(4), 369–379. https://doi.org/10.23736/s0022-4707.18.08194-x

Tribolet, R., Bennett, K. J. M., Watsford, M. L., & Fransen, J. (2018). A multidimensional approach to talent identification and selection in high-level youth Australian Football players. Journal of Sports Sciences, 36(22), 2537–2543. https://doi.org/10.1080/02640414.2018.1468301

Unnithan, V., White, J., Georgiou, A., Iga, J., Unnithan, V., White, J., … Drust, B. (2017). Talent identification in youth soccer Talent identification in youth soccer. Journal of Sports Sciences, 0414(November). https://doi.org/10.1080/02640414.2012.731515

Williams, A. M., Reilly, & T., & Reilly, T. (2000). Talent identification and development in soccer Talent identi® cation and development in soccer. Journal of Sports Sciences, 18(March 2013), 657–667. https://doi.org/10.1080/02640410050120041

Williams, J. G., Gard, H. I., Gregory, J. M., Gibson, A., & Austin, J. (2018). The Effects of Cupping on Hamstring Flexibility in Collegiate Soccer Players. Journal of Sport Rehabilitation, 1–18. https://doi.org/10.1123/jsr.2017-0199