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AEROBIC ENDURANCE LEVELS AS MODEL CONTROL TOOLS FOR INDIVIDUAL PROTOTYPICAL TRAINING PROGRESS AMONG ALGERIAN SOCCER PLAYERS

Mohammed Zerf [1 ABCDEFG], **Mime Mokhtar** [1 ABCDEF], **Mohammed Hadjar Kherfane** [1 ABCDEF], **Belkadi Adel** [1 ABCDEF], **Wahib Beboucha** [1 ABCDEF]

[1] Physical Education Institute Laboratory OPAPS, University of Mostaganem, Mostaganem, Algeria

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A. Study design/planning
B. Data collection/entry
C. Data analysis/statistics
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Abstract:

Introduction. Exercise protocols applied to effectively reduce body fat among overweight individuals are required to improve aerobic fitness obligatory for any sports practice.

Aim. In this study, the impact of maximal oxygen consumption VO2max levels was assessed regarding formative recommendations as an individual control tool used in the training progress of Algerian soccer players

Materials and Methods. The study comprised 148 well-trained, first division soccer players below the age of 18. The players were evaluated using the Yo-Yo test as a valid field test to evaluate both physiological functions (aerobic and anaerobic), allied to simulate soccer-specific player performance levels. Anthropometric characteristics, such as Body mass index BMI, Body Fat Percentage BFP and weight loss were also assessed, based on bioelectrical impedance analysis (BIA) technology. This was reflected in similarities as valuable anthropometric measurements to control changes in the players' body, relative to maximal oxygen consumption during dynamic exercise with large muscle groups. Performance in this case was assessed from the formula of the Yo-Yo test to validate the hypothesis that VO2max 60 ml/kg/min is the minimum fitness challenge for male soccer players to play at a European elite level. Via soccer match analysis, it was noted that an average oxygen uptake of approximately70% of maximal oxygen uptake (VO2max) during a match for elite soccer players is required. The study groups were divided into 2 samples to carry out the research protocol (below and above the VO2max ± 60 ml/kg/min threshold).

Results and Conclusions. Based on statistics applied and the strategy used, our results revealed the VO2max of up to 60 ml/kg/min was an optimal preventive weight loss programme for the players, resulting not only from the advantageous Algerian players' physiological training status levels, but also through their athletic body and performance.

Introduction

Physical charges in soccer analysis points to top-class players enduring 150 to 250 short, vigorous actions during a game [1]. From the top players, an average of around 70% VO2max is required during a game to maintain excessive aerobic and significant anaerobic demands during the match and vigorous bouts [2].

This causes coaches to analyse data regarding the ability of players to repeatedly perform and then recover from vigorous efforts. Exercise protocols are needed for overweight players to decrease their body fat or composition to help achieve loss in body mass. This has been evaluated in similar studies by eradicating additional fat and its negative consequences on the player's capacity to carry out long-duration energy production due to high-

intensity bouts of high-intensity anaerobic energy production [3]. In studies on soccer training, the beneficial effect of speed training on the aerobic performance during a soccer season preparation has been evaluated [4].

In addition to anthropometry, body composition and physical fitness levels change during all soccer seasons and phases among young elite athletes. As stated in previous studies, differences have been recorded in body composition among with regard to body-weight loss superintendence during the alternate training periods [5]. Scientists are constantly wondering whether suitable intensity and modality of endurance training should be carried out via "resistance or intermittent" exercises. In this study, the level up to 60 ml/kg/min of VO2max intermittent applications was considered the desired fitness programme obligatory for male soccer players to play at an elite level [6].

It has been noted that specific training is more appropriate for reducing regional and specific abdominal adiposity [7]. In the present study, it was found that absolute VO2max L/min can be improved by reducing total body mass, as opposed to the effect of t moderate-intensity exercise intervention [8]. This was confirmed by the noted similarities found in the ability of traditional endurance training to improve body composition by decreasing fat mass, while resistance or intermittent high-intensity training decreases fat mass and increases total lean mass [9].

According to these hypotheses and the general belief that overweight players have to focus on weight loss, reduction in the percentage of body fat and significant improvement in estimated VO2max is indicated [10]. It is suggested that this can be achieved by match analysis at any average maximal oxygen intake level between55 and 69 ml/kg/min [11]. Moreover, 60 ml/kg/min of VO2max is the minimal fitness requirement for male soccer players to play at an elite level. It is agreed that the advantage of a player to repeatedly perform sprints beyond the threshold aerobic performance as much as this specific training, has influence on the sustainability of weight or fat-mass loss among overweight/obese people [12].

Our analysis in the present study aimed to assess players'VO2max levels as a protocol designed to induce fat loss by adjusting the soccer players' individual profile. This research was based on different VO2max levels. Optional factors were inspected to shape a player's weight loss programme, resulted in elevated aerobic levels associated with better physiological training status functioning and body shape profile.

Materials and Methods

Design

Across-sectional design was used to compare Body Mass Index (BMI), Body Fat Percentage (BFP), Body Weight Loss, and maximal oxygen intake (VO2max). Players were selected according to their age categories: below 18 years, sex: male, senior teams, Algerian championship, division one and training experience up to 10 years. All of the players took part in the same championships for up to 2 years in the senior category.

Sample

We refer to professors of football and physiologists of exercise, OPAPS Laboratory of Physical Education, University of Mostaganem, who approved the study protocol and method. Data for the study was obtained through the Team 5 database for the 2016-2017 academic years. Player-related data was tested for 148 male soccer players, below the age of 18, addressing variables (anthropometric and physiological selected for the current study). This was agreed upon with their coaches for the first weeks before the start of the championship. All participants agreed to participate in the study.

Testing protocol

Maximal aerobic capacity:

The most widely-available tests for aerobic endurance are those performed with the minimum amount of equipment. These include, e.g. the Yo-Yo test, which allows to discriminate between the positional differences in capability to perform high-intensity runs, and between players representing different levels []. Yo-Yo IR1 test: VO2max (ml/min/kg) = IR1 distance (m) × 0.0084 + 36.4. This is maintained to be used in Italy as part of measurement and tracking of referee fitness. It has been confirmed by John Gormley et al. that field tests have a corresponded laboratory VO2 max level obtained by their formulas [13]. According to Daniel Mayorga-Vega et al., this is an accurate test with a validity of approximately90-95% [14]. This field test provides a better image of endurance of maximal aerobic capacity [15]. The obtained results can point to better health status and higher quality of life [16].

Anthropometry-fat index

Body height (m) and mass (kg) were measured in the standing position [17] to calculate body mass index BMI= weight (kg) /height (m^2) [18]. Goto Y et al. noted that VO2 peak is associated with biological status after controlling for height and weight [19]. For body fat percentage (BFP), we used the formula proposed by Deurenberg et al., body Fat = (1.2 × BMI) + (0.23 × age) - (10.8 × sex) – 5.4 [20], which is an inexpensive and convenient means for assessing our coaches and players. This was further supplemented by bioelectrical impedance analysis (BIA) technology. The Tanita body

analysis scales, developed over the last 25 years, provide a true indicator of one's health and the impact of any fitness regime or weight-loss programme.

Statistical analyses

Data analysis was performed using SPSS 22.0 for Windows (32- bit) (IBM, Armonk, NY, USA). Data collected from the tests (such as F the Levene's Test) express the homogeneity and differences in records for the total sample, based on the chosen protocol. This is presented as means ± standard deviation, Levene's test and the independent *t*-test. Correlations between the variables under study were examined using Pearson's correlation coefficient (r). Statistical significance was assumed at the level of $p<0.05$.

Results:

Depending on data entry, the aim of the study and statistical processes were included in the search limitations. Regarding the players; aerobic endurance levels and their physiological training status and profile, our results in Table 1 indicate that a VO2max of up to ≥ 60 ml/kg/min is an advantageous physicalogical response to training. In the present research, it was noted lower fat or fatness levels correlate with weight loss %. This was investigated via the *t*-test for independent variables in values of BMI, BFP, Weight loss %and VO2max improvements. This is the opposite with regard to age, body mass and height. This can be seen in the correlate of weight loss % fat or fatness as a superior index of overweight players. See Table 2.

Our results are in accordance with those obtained by James J D et al., stating that additional body weight noted among overweight or obese individuals causes a decline in aerobic and anaerobic physical fitness [21]. Their levels are similarly recommended as a targeted weight loss % approach applied to achieve optimal improvement in physical fitness performance. This has been supported in studies as the difficulties related to being overweight in performing vigorous physical efforts for long periods of time [12]. In this study, it has been established

Table 1. Characteristics and differences observed in samples

	groups	N	Mean±SD	F	$p<0.05$	t	$p<0.05$
Weight (kg)	VO2max ≥ 60 ml/kg/min	72	62.89±2.14	5.49	0.02	-0.79	0.47
	VO2max ≤ 60 ml/kg/min	76	63.65±5.34				
Height (cm)	VO2max ≥ 60 ml/kg/min	72	1.75±0.06	2.31	0.13	1.27	0.21
	VO2max ≤ 56 ml/kg/min	76	1.73±0.05				
BMI (kg/m^2)	VO2max ≥ 60 ml/kg/min	72	20.09±1.58	1.17	0.28	-4.16	0.00
	VO2max ≤ 56 ml/kg/min	76	21.24±1.69				
Vo2MAX	VO2max ≥ 60 ml/kg/min	72	62.56±2.56	5.98	0.00	-6.87	0.00
	VO2max ≤ 56 ml/kg/min	76	56.93±2.02				
BFP%	VO2max ≥ 60 ml/kg/min	72	9.91±0.78	5.84	0.01	14.34	0.00
	VO2max ≤ 56 ml/kg/min	76	10.83±0.93				
weight loss %	VO2max ≥ 60 ml/kg/min	72	7.74±1.26	5.95	0.02	-6.17	0.00
	VO2max ≤ 56 ml/kg/min	76	10.22±3.56				
AGE (years and months)	VO2max ≥ 60 ml/kg/min	72	17.50±0.59	2..35	0.13	1.21	0.45
	VO2max ≤ 56 ml/kg/min	76	17.38±0.50				

Statistical significance was assumed at the level of $p<0.05$.

Table 2. Pearson's correlation coefficients for VO2max levels, body weight loss and investigated variables

Pearson's coefficient	BMI	Vo2MAX	BFP
Vo2MAX	-0.45**	1	-0.58**
Weight loss %	0.75**	-0.74**	0.88**
		$p<0.05$	
N		148	
** non-significant correlation at 0.01 (bilateral).			

than using the Yo-Yo test can help discriminate between the positional differences in the capability to perform high-intensity runs, and between players representing different levels. Records in the benefits ofVO2 max are up to 60 ml/kg/min for the aerobic levels in theexercise programme applied for inducing sustained weight or fat-mass loss in overweight/obese players [22]. Support has also been found in recent studies, noting that individual players' aerobic fitness data was in line with greater variance recorded for VO2max total endurance and physical abilities, due to the amount of anaerobic or aerobic energy supply. Our coaches were subjected to optimised training and testing procedures for controlling the exchange in their soccer players [23]. In the case of this study, upper levels were confirmed for aerobic endurance training modality and levels as adequate fat intensity exercise indicators of the desired physiological training status needed for the progress of Algerian soccer players.

- ❖ VO2max up to ≥ 60 ml/kg/min is a sufficient level of endurance training to increase maximal oxygen uptake, classified in this study as advanced physiological training responses among soccer players (Figure1).

As indicated by Trisha et al. [24], this should be carried out at any intensity above ~60% of VO2max, which is likely to increase maximal oxygen uptake that is fully correlated with improvements in exercise intensity and decreases or improvements in body composition. Deep-rooted in the importance of the endurance training modalityand its relationship with VO2max levels, the developmentsare reported as advantageous in the case of intermittent training modality via high-intensity exercise [25]. It has been pointed out by scientists that there is a beneficial amount of oxygen consumed during exercise that serves coaches as a good criterion to judge the effects of the exercise plan, guaranteeing satisfaction with the progress of soccer players' physiological

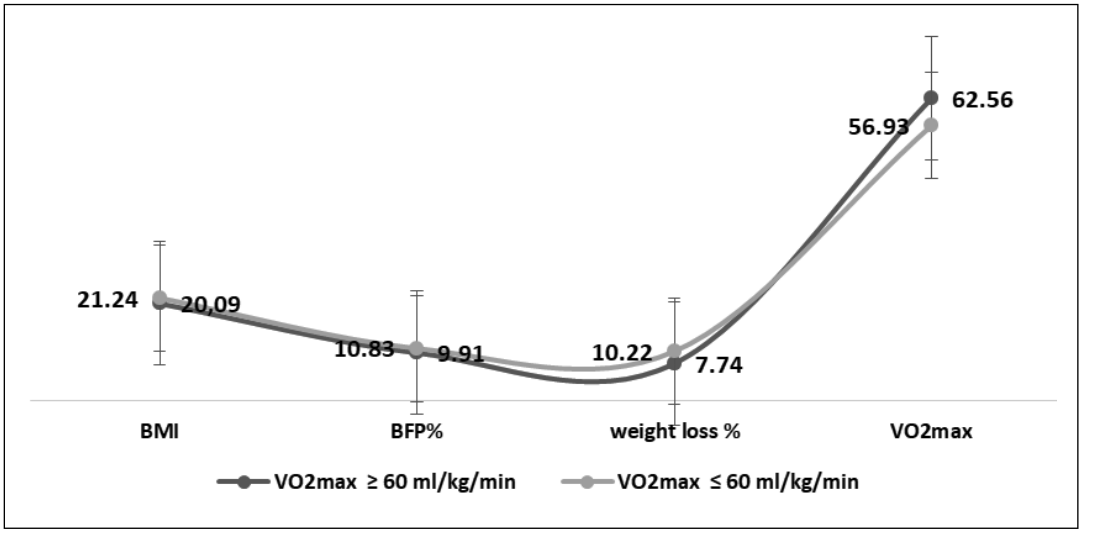

Figure 1. Differences observed in the samples 'performance and physiological responses

Discussion

Exercise protocols that can effectively reduce body fat among overweight individuals are required. The statistics noted for the fitness levels of soccer players during training or in match performance are critical modules of soccer progress for maintaining a long-term athletic career. Evidence suggests that adult male players cover approximately 10–12 km during a soccer game, demanding sustained performance at about 85% of individual peak heart rate and 75–80% of peak oxygen uptake (VO2peak).

Our results based on the study design and statistical applied allowed to confirm the following:

status-profile [26]. In the present study, an inverse correlation has been noted between VO2max and fat index or body weight loss index applied in this study. There is a high decrease in the levels of aerobic fitness capacity. Similarly, insufficient fat intensity exercise programmes planned to induce sustained weight or fat-mass loss in overweight/obese people have been noted. In previous research, advantages have been indicated of high-intensity intermittent exercises a potential exercise protocol for reducing fat level among overweight individuals by improvement in aerobic fitness based on repeated-sprint activities and the ability to recover from vigorous activities [27]. Similar adaptations were detected when performing aerobic high-intensity training with small-sided

games or speed-endurance training. This was viewed as having a positive effect on soccer-specific endurance, as shown by the marked improvements in the Yo-YoIR test (22% to 28%) and the ability to perform repeated sprints (approximately 2%), according to Iaia FM & et al. [28].

- ❖ A VO2max up to ≥ 60 ml/kg/min for a soccer player is an effective intermittent intensity of endurance training suited to manage body fat or fatness (BFP and BMI) or body loss management.

This was asserted by the results presented in Tables 1, 2 and Figure 1, which are in conformism with those achieved by N Koutlianos et al. [29]. They demonstrated that the intensity of physical activity has a notable association with metabolic syndrome risk factors. This was inspected through the impact of body fat composition in terms overweightness, experiencing a significant decrease in physiological capacity. It was judged those overweight have low VO2max values. In recent studies, this was considered as low self-efficacy, poor mood status, and familiarisation with the high-intensity workout [9]. Laxmi CC confirmed [30] that these trends affect fatincrease compared to muscle mass and their outcomes on cardiorespiratory fitness in sports-related case studies and the distribution of adiposity [31]. Although based on the strong negative correlation between VO2max, BFP and BMI or loss, we agree that an increase in BMI of 1 kg can increase the aerobic demand of exercise by 1 to 14%. A significant, negative correlation was also noted between BMI and VO2max (ml/kg/min), signifying the possibility of the body fat effect on cardiorespiratory function [32] as well as higher-intensity exercise decreases.

From the above, we agree that VO2max levels are an effective training stimulus to determine an individual's training intensity needed to optimise management of losses in body fat. In this study, the Yo-Yo test was used a discriminator. It allows to differentiate between players' game positions in their capability to perform high-intensity runs, and between players representing different levels. Any intensity applied between 60–80% of maximal workload was advantageous for athletes, with values close to 70 ml/kg mi. Further studied were soccer-related studies interested in top teams compared to those occupying the lowest place among the super Europeans elite leagues [4]. This can be interpreted as the body's adaptation to [25], with regard to body composition management [33]. In this study, the levels of aerobic capacity were estimated relative to changes in body fat or fatness, connected with body loss management [17]. The significance of high-intensity, intermittent modality endurance training up to 60% VO2max, allowing a player to improve maximal oxygen uptake associated with elective morpho-functional levels, showed that these players became more adapted to performing repeated sprints (approximately 2%) and had marked improvement in the Yo-YoIR test (22% to 28%) [28]. The application of any intensity from 60 to 80% of the maximal workload was advantageous for athletes with values +60 ml/kg min and these were accepted as the most significant aerobic levels allowing to manage body mass or composition [34].

In this study, we recommend high-intensity intermittent exercise when striving to achieve ideal body mass or composition. A systematic method applied to individual loads helps improve soccer training inspected and manage players' body composition [35]. The use of Yo-Yo test protocol to estimate soccer players' physiological adaptation profile was built on the analysis of body composition and based on VO2max levels [36]. In the current study, we claim that associations between body fat and fatness or loss indicated by VO2max levels, as a controlled system to determine elective physiological profile, lead to effective training interventions.

Conclusion

We must admit the protocol used to assess training response in soccer players requires the use of more accurate systems, allowing to evaluate such correlations as body fat, fatness or loss in indices associated with corresponding VO2maxlevels. This is needto estimate body mass losses, and consequently, physiological adaptations occurring throughout the applied, individual training programme (methods and intensity). VO2max levels above ≥ 60 ml/kg/min were considered in this study as beneficial aerobicfitness requirements to enhance talent identification and development programmes in soccer populations. The advantages of high levels noted in the intermittent endurance modality training programme, or individual performance capacity reported as reference values. are considered beneficial for training Algerian soccer players. The Yo-Yo test applied in this study to assess the difficulties of overweight Algerian players in performing high-intensity exercises was considered a valid tool. Supervision of endurance indices (aerobic and anaerobic) and body weight loss meant better performance.

Institutional Review Board Statement

The study protocol and method has been approved by the professors of football and physiologists of exercise, OPAPS Laboratory of Physical Education, University of Mostaganem.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Ethics Committee

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Author for correspondence

Mohammed Zerf
Affiliation: Physical Education Institute Laboratory OPAPS, University of Mostaganem, Mostaganem, Algeria
ORCID: 0000-0001-5013-5446
Email: biomeca.zerf@outlook.com