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Influence of maximum heart rate predicts method on appropriate exercise intensity via Algerian soccer training programs

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Abstract

Our aim in this current study aspect the influence of predicts method in estimating exercise intensity associated with maximum heart rate assessment. In lack of beeps system tools, training analysis software as new high-tech to track intensity. While our coaches' base their loads exercise on the formula: 220 minus ages, in within their players estimate their maximum heart rate, adapts to their intensity exercise in performing this latter during the weekly exercises. In order to test these practices and judge their efficacy or inadequacy. Sixty-two male elite Algerian players, first League division one at Oran Algerian Championship teams, year (2015-2016). Participate in the present study, their homogeneous were calculated on the basis of 6 min intentional athletic exercise, as protocol used to calculate the VO2max estimate from Cooper test 6 min and RHR uses the polar watch system to compute Heart Rate. Although Max Heart zones exercise was built on formula Uth N as a procedure to calculate the intensity. Backed by differences gained, according to protocol proposed in which the energy dominant is relative to maximum heart rate corresponding to exercise intensity. We reject the measures taken by our coaches, which are not operative to esteem the maximum heart rate connected to the request VO2max and HRrest associated with exercise intensity planned. While as a recommendation, we required our coaches to use the beeps automated training system tools as polar watch beep system to establish the exercise intensity consistent with exercise maximum heart rate and energy requirements. Using our formula Max Heart zones exercise = (VO2max/15) * Heart Rate, derived from formula Uth N.

Keywords: Elite Algerians football, heart rate max, heart rate training zones.

INTRODUCTION

The primary aim of training is to provide a base of general conditioning on which further, more intense training can be undertaken. Therefore, most training takes place under conditions designed to maximize fitness of athletes and monitor changes in fitness based on the levels of body composition (Paul Gamble, 2013). However, for an appropriate intensity of exercise realized. Our trainers based on Karvonen Formula as a simply validated method. While our similar studies report that exercise intensity prescribed at a % VO_2max or % HRmax does not necessarily place individuals at an equivalent intensity above resting levels (24).

Since soccer program training is the degree of performance, improvement relative to the training time invested (13,28). Relative to training loads as the most indicators of players' fitness status progress. Interpret by similar studies in aerobic energy system as highly taxed with average and peak heart rates around 85% and 98% of maximal values, respectively, corresponding to average oxygen uptake (VO_2) around 70% of maximum oxygen uptake (VO_2max) (2). As well as the combination of the anaerobic system for sprint & explosive power and the aerobic system for endurance relative to the optimal level of athletic performance. In which it's relative to target physical demands connected to energy loads sports activity and their specificities (test- training-match). Composed in soccer game based on speed, endurance, power, strength, agility, and appearance (20,29). Which requires from the players to obtain a competitive body at a higher strength-to-weight ratio to achieve preferred optimal athletic performance (11).

The example of the aerobic exercise performance, which is disclosure depends on the indicator of maximum oxygen uptake per minute (VO_2max) and the effectiveness of active muscle

mechanisms with oxygen in the air. Associated with a competitive body weight as an energy indicator in relation to the total amount of fat, which more negatively correlates with VO_2max levels. Which in turn allows the coach to compare athletes VO_2max achieved at different distances as a report of their level performance (40). Through this theoretical background, the present study based on the influence of heart predicts method in estimating exercise intensity related to maximum heart rate assessment. Therefore, using these practical methods requested from the player to appropriate its maximum heart rate to improve the dominant energy. Referenced in similar studies as an aerobic energy system, limited by the rate at which oxygen can be delivered to the exercising muscles by the circulatory system. Although the similar subjected, that aerobic to anaerobic transition, the intensity is one of the most significant physiological variables in endurance sports. Where the player must improve his ability to withstand a high fractional use of his maximum oxygen uptake (% VO_2max) for a long time to delay metabolic acidosis.

From the above, the objective of this study was to determine the appropriate method to esteem the exercise intensity injury related player in estimating the exercise intensity related to maximum heart rate. Founded on the formula Uth N to esteem the energy dominate connected to the request VO_2max and HRrest associated with exercise intensity planned. Using our formula Max Heart zones exercise = (VO2max / 15) * Heart Rate, derived from formula Uth N. Indicate in similar studies qualifies it as an accurate tool for estimation VO_2max in well-trained men (45).

For proposing 62 adult elite male players with average age 23.02 ± 2.45, representing some teams from division one league Oran, for the year 2015-2016 in Algeria championship. Distributed in two homogenous groups based on speciality, age, chronological and training. Control in an intentional athletic exercise 6 min running. Where we calculate HRmax from the formula VO_2 max = 15 x (HRmax / HRrest) as a protocol. While to estimate the influence of heart predicts method in estimation exercise intensity related to maximum heart rate assessment, we integrate the energy requirements associated with competitive body weight as the minimum body fat (21) by as control of VO_2max consumption. Since the energy supplies are correlated to VO2max and relative to body weight, according to (38).

MATERIALS & METHODS

All the selected players ranged in normal category (BMI) weight record between 21 to 24,99% (kg/m^2), accommodated by the National Research Council (USA) as an acceptable reference for the aged 19–25 years (43). However, as protocol, we classified our sample into homogeneous groups; based on their HRmax resulting from the formula Uth N (45) calculate from VO_2max resultant from formula test Cooper, as well as RHR evaluated by the polar watch in intentional athletic exercise. As a protocol to decipher the training zones adopted by our players in this aerobic exercise. Agreeing to protocol used, the participants in this study perform their exercise into groups (group1≈ Threshold Zone: 80% - 90% of Max HR & group2≈ Aerobic Zone: 70% - 80% of Max HR). While inspecting this protocol, we choose the laboratory, OPAPS "Institute of Physical Education of our university" who approve it by the professors of physiological training effort.

Sample

The data used throughout this study were obtained from the database team 5 Physical Education Institute Laboratory OPAPS for the academic year 2015-2016. In terms of sample-related data, 62 male adult elite players, representing some teams from the league Oran year 2015- 2016. Were examined by the Research Team 5 Laboratory OPAPS in parameters (anthropometric and physiological) during the transition phase of the championship sees Table 1.

Measures

The Polar Fitness Test is an easy, safe and quick way to estimate your aerobic (cardiovascular) fitness at rest. The result, Polar Own Index, is comparable to maximal oxygen uptake (VO_2max), which is commonly used to evaluate aerobic fitness. Developed by the Polar Electro Company and named the Polar Fitness Test as a new method for estimating VO_2max from HR variability at rest (27). While to calculate HRmax we use formula VO_2max = 15 x (HRmax ÷ HRrest) well VO_2max was calculated using copper test 12 min (Distance covered in meters - 504.9) ÷ 44.73) (30,31). To estimate the Heart Rate Training Zones, we use the zones described by (19). Well to classify our sample, we agree the Five heart rate zones described by Polar site (Zone 1: 50–60% of HRmax- Zone 2: 60–70% of HRmax - Zone 3: 70–80% of HRmax - Zone 4: 80–90%of HRmax - 90–100% of HRmax) (36).

Table 1. Present baseline characteristic of the participants based on HRmax estimated based on the protocol used in the present study.

HRmax calculate from formula Uth N		BMI	BFP	VO_2max	RHR	HMR	HRTZ
Aerobic Zone: 70% - 80% of RHM (n = 39)	Mean	23.03	16.71	46.08	53.74	152.92	76.61
	SD	1.37	1.85	1.13	1.39	3.71	1.55
	Min	21.29	13.00	42.00	50.00	141.00	74.00
	Max	24.10	19.87	48.08	56.00	159.00	79.50
	Variance	1.90	3.458	1.279	1.933	13.757	2.43
Threshold Zone: 80% - 90% of RHM (n = 23)	Mean	20,64	13,68	54.18	51.39	167.52	83.54
	SD	0.74	0.69	2.55	1.92	5.20	2.57
	Mini	20.79	12.33	48.00	49.00	160.00	80.00
	Max	22.47	14.96	58.00	57.00	176.00	88.00
	Variance	0.54	0.47	6.51	3.70	27.08	6.61
Total (n = 62)	Mean	22.15	15.59	49.09	52.87	158.34	79.19
	SD	1.67	2.13	4.32	1.96	8.29	3.91
	Mini	18.79	12.33	42.00	49.00	141.00	74.00
	Max	24.10	19.87	58.00	57.00	176.00	88.00
	Variance	2.75	4.52	18.66	3.85	68.88	15.28

Table 2. The homogeneity and the differences between participants based on the protocol used in the present study.

HRmax calculate from formula Uth N		n	Levene's Statistic		t	p
			F	p		
BMI	Threshold Zone: 80% - 90% of MaxHr	23	1.14	0.29	7.70	0.00
	Aerobic Zone: 70% - 80% of MaxHr	39				
VO_2max	Threshold Zone: 80% - 90% of MaxHr	23	98.218	0.00	-17.20	0.00
	Aerobic Zone: 70% - 80% of MaxHr	39				
BFP	Threshold Zone: 80% - 90% of MaxHr	23	6.78	0.01	7.53	0.00
	Aerobic Zone: 70% - 80% of MaxHr	39				
RHR	Threshold Zone: 80% - 90% of MaxHr	23	1.32	0.26	5.57	0.00
	Aerobic Zone: 70% - 80% of MaxHr	39				
HMR	Threshold Zone: 80% - 90% of MaxHr	23	6.87	0.01	-12.86	0.00
	Aerobic Zone: 70% - 80% of MaxHr	39				

Weight and Height; the tests included height (Stadiometer Measure in 0.1 cm), weight (scales 0.1 kg (100 mg)) to calculate BMI is simple, quick, and inexpensive (BMI = weight in kg/height in m^2) (6). Where Mc Shane confirms that they gave the players some tests of aerobic and anaerobic fitness, speed, agility, and power (10).

Body mass index (BMI) was calculated as body mass (kg) divided by height (m) squared. The subjects' adiposity was classified according to WHO standards: Underweight was defined as BMI < 18.5, normal weight as BMI ≥ 18.5 and <25, overweight as BMI ≥ 25 to BMI <30, and obesity as a BMI ≥30 (7,46).

Body fat percent; the calculation of percent body fat equals the fat weight divided by the total body weight with the result of this fraction multiplied by 100 (% body fat = (fat weight / total body weight) x

100). Male Athletes Lean 7%; <12% <7% acceptable; > 15% overweight, according to Thompson (44).

Analysis of Data

Data analysis was performed using SPSS 22.0 for Windows (32BIT). Data obtained from the tests were presented as a mean ± standard deviation, independent T-test, Levene's test. Where the relationship between the independent variable and dependent variables were analyzed by Pearson correlations (r).

RESULTS

The characteristics of the total study sample are shown in Table 1 and 2. BMI and HRR accept the homogeneity in the opposite of VO_2 max and heartbeats calculated. Confirmed as a significant difference in the independent t-test, which is on the benefits of the threshold zone in all the comparison practiced. See Table 2 based on our formula Max Heart zones exercise = (VO_2max/15) * Heart Rate.

Through the Table 3, the Pearson correlations are strongly negatively between HRmax, BMI and BFP in the opposite of VO_2max, which is strongly positive with Herat Rate Training Zones (HRTZ). While the present results confirm that HRTZ method, requests the appropriate exercise intensity correlated to maximum heart rate method assessment. Contained in this study as an error in from the player to estimate HRmax correlate to the work intensity achieved. Based on energy dominance, the case of our protocol, which breaks between the intensity of exercise realized. Approved by (5) as a feedback of our work within a given suggested heart rate monitor zone (17) to protect against training injury (8). The case of this study where our players operate in two different areas. Due to the maximum heart rate estimate by his / her last ones, which is not adequate to their exercise intensity in the performance of their load in the proposed exercise.

DISCUSSION

Based on the data results and statistics applied, we confirmed:

Our players operate in two separate zones: Aerobic Zone v's Threshold Zone. Through this result, we confirm that the protocol used contributes to predicting the corresponding HRmax connect to exercise intensity. Record in VO2max values differences between the two zones. In our group 2 ranges between 42 to 48, as fair and average categories, according to the norms adopted by Astrand (12). While these levels are not at the top of the values VO_2max report in similar studies as norms for a soccer player. Appreciated by HRmax and Herat Rate Training Zones (HRTZ), which are strongly negatively correlated with BFP, BMI (31,34) and RHR in the opposite of VO_2max. Assessment these results, we agree the judgment provided by Dunford & Doyle (10): to understand the errors of techniques measurement in the case of sportsmen, we must first analyses the physiological demands of the sport (35). The case of the current study, which shows that VO_2max is the best accurate tool in predicting the HRmax. Founded on the protocol used, we confirmed that misunderstanding is linked to the excess of body fat and composition (6,37) and it's absolute highly values consumption as the energy cost of exercise in any realized performance. Record in the case of this study in the benefit of the group 1 with less fat connected with increases in aerobic fitness (3,42) allied to the lower resting heart rate as a more efficient heart, and stronger circulatory system (22). The case group 1, which performs their loads in Threshold Zone: 80% - 90% of Max HR. Admit by the protocol in the values of VO_2 max improvement. At a high fraction for a long time as a more important factor related to body composition and competitive success. In the opposite of the players, which perfection its exercise in the aerobic heart zone training. Quoted by Day & Carpenter (9) as accurate tools to estimate the athlete's capabilities in relation to the requirements of sports demands. Confirmed by the similar study as challenges for an accurate assessment to predict the most appropriate profiles and conditions to realize optimal performance (25). The case of VO_2max values recommends for the soccer player, which is above 85% VO_2max for the athlete and 60% VO_2max for the non-athletic, according to (1). While its lower has consequences on Athletic Performance as physical demands (16). Due to excess BMI and BFP (29) related to the speed heart rate relationship and high fractional utilisation of the VO_2 max for a long time delay the metabolic acidosis (15).

Table 3. Shows the correlations between HRmax calculate using our protocol and other variables based on the protocol used in the present study.

R	BMI	VO_2max	BFP	RHR	HMR	HRmax	HRTZ
HRmax calculate from formula Uth N	-0.73**	0.85**	-0.69**	-0.71**	0.98**	0.86**	1
N=62 /P values sit at 0,05							

Heart Rate Training Zones are benefited method when it permitted the enhancement of training energy demands. Our findings are in conformity with the indication that soccer game is intermittent exercise requiring the use of mixed anaerobic-aerobic energy systems (4) to enhance the recovery period with the oxidation of metabolic waste and replacement of energy stores and prevents throughout the workout (26). At an intensity close to an anaerobic threshold or 80–90% of the maximal heart during soccer-specific (18).

Our coaches must use the beeps system to control the heart variability to account exercise intensity or the protocol proposed (formula Uth N) to the account the dominant energy relative to maximum heart rate correlates to exercise intensity. Our finding confirms that Heart Rate Training Zones are benefited method when they permitted the enhancement of training energy demands. Associated with the appropriate exercise intensity calculated in accordance with the maximum heart rate levels using the proposed protocol, which based on the levels of the exercise intensity correlate to the energy demands and the realize performance. Confirmed in the present study by the high fractional maximal oxygen uptake used for a long time, which is required from the player to develop its aerobic capacity, based on the Threshold Zone. Which in turn requires the right transition between aerobic to anaerobic intensity. Considered in the similar study as one of the most significant physiological variables in endurance sports (15). Related to the optimal competitive body and their composition as a body weight loss control to achieve the best athletic performance (41). Although our results line with the principle that heart rate during intermittent exercise may present non-uniform responses. The case of the actual study, where our players proceed in two different zone heart training. Due to the coach's dependency on Karvonen Formula as well as the player to determine the intensity of the charge during its realization to the exercise.

Depending on its results, relying on the player in estimating the intensity of the load, is not a suitable method to esteem and control the exercise intensity in the opposite of formula Uth N, which is correlated to VO_2max levels and the realize HRmax connected to energy demands. Established in the current study by the separate zones in within our player operate, in which the impact of exercise depend on levels of the amounts of weight fat (33) BMI & BFP (23). As much as the require VO_2max recommended in similar studies (above 85% with HRmax respective). Whereas to appropriate the use of this method, we recommend our players and coaches to use the electronic beeps system tools, which include the training analysis software and new high-tech intensity measuring devices, for precise training that practically guarantees the progression of athlete evaluation (32) or our protocol, Which depends on energy demands. Though limitations of this study, we agree that further studies are needed to enhance knowledge of performance determinant (39).

Supported by differences acquired by the protocol proposed. Where our players operate in two different zones: Aerobic Zone v's Threshold Zone. Our results are in conformity with diagnostic, which agree that the appropriate method to esteem the exercise intensity relative to maximum heart rate realised, must meet the exercise intensity as practical training loads relative to the energy demands. In which the exercise plan was realized. As that we recommended, our players and coaches the use of the protocol proposed to estimate the dominant energy corresponding to HRmax. In the lack of the beeps system tools, training analysis software as new high-tech to control intensity, correlate to heart variability related to the resultant heart zone planned by the coach (Before, during and at the end) in exercise séance, the case of this study which based their assessment on energy demands associated with exercise intensity relative to norms esteem in football modern.

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