

Assessment of officiating demands on selected variables among state level soccer referees

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Received : 19.01.2012; Revised : 05.01.2012; Accepted : 23.02.2012

■ ABSTRACT

The purpose of the study was to analysis of officiating demands on selected physiological and biochemical parameters among with state level referees (n=10) with mean age (38.90±3.24) officiated West Zone inter university football tournaments. Global positioning technology (GPS) and heart rate monitoring devices were used to provide information relating to the time, speed, distance, position and heart rate during matches. The descriptive statistic of physiological variable showed that pre-match respiratory rate was (21.6±3.09) breath/min, half time respiratory rate (37.0±5.48) breath/min and post -matches respiratory rate (41.7±3.52) breath/min, respectively. Pre- match heart rate was (91.1.4±7.29) beat/min, half time heart rate (140.9±16.36) beat/min and post match heart rate (157.60±18.75) beat/min. Distance covered in first and second half were 2.71±0.38 km and 2.67±0.55 km, respectively with total distance of 5.38±0.71 km. Maximum speed achieved in first half was 12.93± 0.88 km/hour and in second half 13.54±1.50 km/hour. Pre- match and post- match blood glucose was 110.90±11.74 mg/dL and 123.90±15.93 mg/dL, respectively Pre- match blood lactate was 14.1±15 mmol/L and post- match blood lactate was 23.07±3.74 mmol/L, respectively.

■ **Key Words** : Global positioning technology, Blood glucose, Blood lactate

■ **How to cite this paper** : Pawar, Vinay and Bhukar, J.P. (2012). Assessment of officiating demands on selected variables among state level soccer referees. *Internat. J. Phy. Edu.*, 5 (1) : 42-44.

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Given the enormous importance of football referees reflected in the almost universal tendency for die-hard fans to displace frustrations with the team onto their hapless shoulders – it is surprising that sports scientists have paid so little attention to their physical and biochemical status and performance (Abt, 2002). Soccer referees are being considered the 23rd player of a soccer game, and their importance is in ensuring that players uphold the laws of the game. Every competitive soccer match must be regulated by a referee, two assistant referees and a side-line official (fourth official). It has been estimated that each week of a complete season, 1.3 million referees take to the football pitch with the aim of regulating the behaviour of the players and enforcing the rules of the game (Gamble *et al.*, 2001). Given the low frequency of scoring in soccer match (approximately 2.7 goals

per- match), the decisions of a referee can have profound implications on the outcome of the game. With the introduction of the three points for a win rule and the increasing number of professional soccer teams being listed on the stock exchange, it is easy to understand the importance of winning or losing in modern professional soccer. Consequently, soccer referees are progressively embracing full time status (Helson and Bultynck, 2004).

■ METHODOLOGY

Ten Gujarat state referees with the mean age of 38.±3.24, officiated during the West Zone inter university football tournament held in 2009 at Gujarat, were selected as the subjects for this study. The selected physiological and biochemical variables for measuring officiating demand during

a match were distance covered with heart rate, respiratory rate, blood glucose and lactate acid. GPS technology was used to measure distance covered with heart rate in different segments of time. Respirator rate was measured by manual palpitation and it was taken before, after the end of first half and second half. Blood glucose and lactate acid were measured by glucose and lactate acid analyzer and it was taken before the match and after the end second half.

■ OBSERVATIONS AND DISCUSSION

All the selected physiological and biochemical variables. *i.e.* distance covered with heart rate, respiratory rate, blood glucose, and lactate acid were collected. An appropriate statistical procedure was used for to analysis and observation is presented in descriptive form in Table 1 and also in Fig. 1-6.

The descriptive statistical analysis has evidently showed that there was an increase in respiratory rate mean (41.741.7±3.52) and heart rate mean (157.60±18.75) of football referees as the match progression took place in at the end of play. The mean values of blood lactate (23.07±3.74) and blood glucose (123.90±15.93) also showed that there was increase in blood lactate and blood glucose value after the end of second half of match in comparison with before the first half of match (14.1±1.15) and (110.90±11.74), respectively. However, in term of maximum speed km/hour referees showed more paces in second half of the match 13.54±1.50 in comparison to first half of the match (12.93±0.88). And the distance covered in

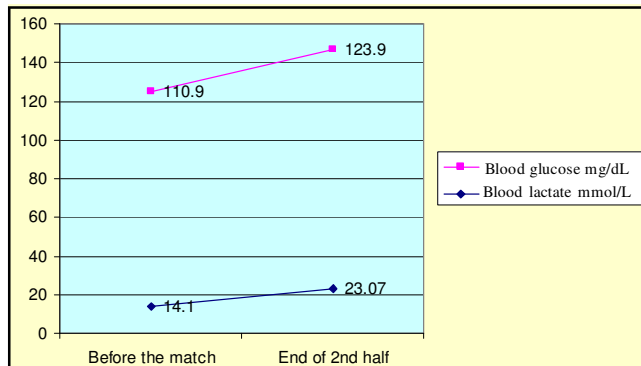


Fig. 2 : Blood glucose and blood lactate before and after the match

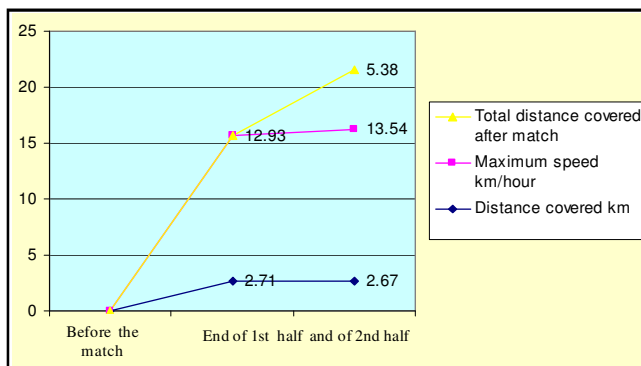


Fig. 3 : Distance covered km/ maximum speed km/hour/ total distance covered

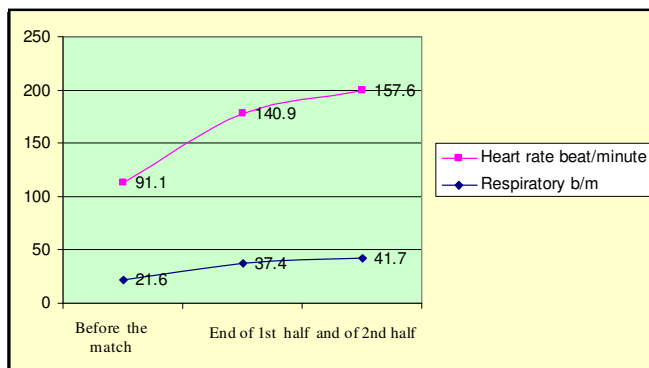


Fig. 1: Heart rate beat/min and respiratory breath/min

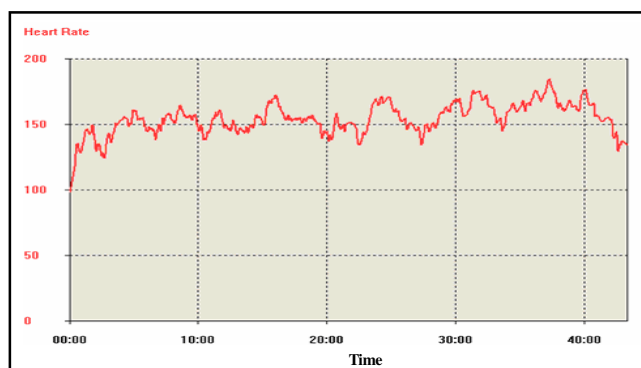


Fig. 4 : Heart rate by GPS system

Table 1 : Selected physiological and biochemical variables			
Variables	Before the match	End of 1 st half	End of 2 nd half
Respiratory (b/m)	21.6±3.09	37.40±5.48	41.7±3.52
Heart rate (beat/minute)	91.1±7.29	140.9±16.36	157.60±18.75
Blood lactate (mmol/L)	14.1±1.15		23.07±3.74
Blood glucose (mg/dL)	110.90±11.74		123.90±15.93
Distance covered (km)		2.71±0.38	2.67±0.55
Maximum speed (km/hour)		12.93±0.88	13.54±1.50
Total distance covered after match			5.38±0.71

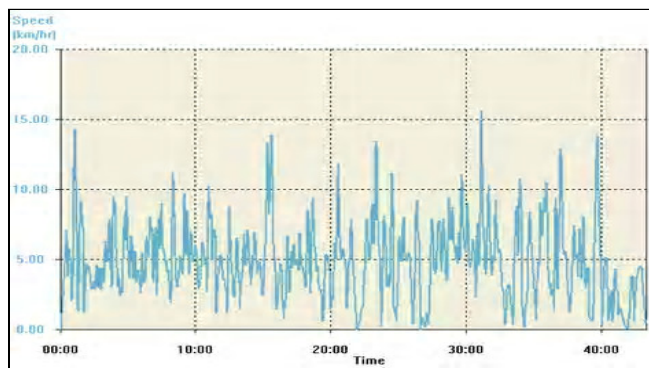


Fig. 5 : Speed given by GPS system

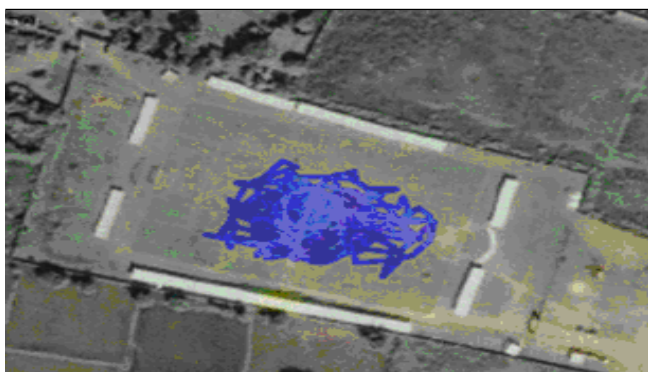


Fig. 6 : Satellite view of referee movement

first half of the match was (2.71 ± 0.38) more in comparison to second half of the match (2.67 ± 0.55). Numbers of research studies have been conducted in the past several years which revealed great exhaustion of match demand on football referees (Castagna *et al.*, 2002). HR monitoring has been extensively used in soccer refereeing studies with the aim to estimate exercise intensity and aerobic involvement during competition. A study conducted by (Krustrup, 2001) to examine the activity profile and physiological demands of top-class, 27 referees during 43 competitive matches in the two top Danish league found mean heart rate was 162 ± 2 beats \cdot min⁻¹ ($85 \pm 1\%$ of maximal heart rate). Similar result were obtained by (Krustrup, 2001) on 12 referees during 4 Champions League, 4 UEFA Cup and 4 national games.

Abt (2002) conducted study on blood lactate concentration during a football match found that when blood

lactate thresholds were assessed under field conditions during a progressive multistage protocol. Running velocities attained at selected blood lactate concentrations [2 and 4 mmol \times L⁻¹), V_2 and V_4 , respectively], similar results were reported by Natal (2003) and Krustrup (2001). The soccer competitions are highly intense, and for officiating a soccer match effectively, a referee will also require physiological and biochemical conditions at par with soccer players. It is further concluded that while comparing with the international referees Indian referees, required more physical fitness to officiate at international matches, as the selected physiological and biochemical variables mean values were far better than Indian referees.

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