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AEROBIC CAPACITY AMONG THE RUGBY PLAYERS IN 2005 KENYA CUP LEAGUE

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ABSTRACT

One of the most common measurements of endurance fitness in exercise physiology is maximal oxygen uptake (VO_{2max}), which is an individual's capability for the uptake, transport and utilization of oxygen. The VO_{2max} determines an individual's capacity for work in a whole body activity such as rugby. This study investigated the aerobic capacity of Kenyan rugby players in 2005 Kenya cup league by their positions. The multi stage shuttle run test was used to predict individual players VO_{2max} of 90 players randomly selected from Impala, Harlequin and Nakuru rugby clubs at the beginning of the Kenya cup league competition and after eight weeks of training and competition. The study findings indicated that the backs had significantly higher VO_{2max} (44.4 ml/kg/min at pretest and 43.9ml/kg/min at posttest) than the forwards (40.8ml/kg/min at pretest and 40.9ml/kg/min at posttest). It is concluded that players in the two playing positions need training programme activities that are relevant to the specific role they play during the match.

INTRODUCTION

Rugby is a multi-sprint, multi-activity sport played over 80 minutes. It is classified as intermittent sprint sport because players alternate between sprinting, running, jogging, walking and standing. The game comprises of specific tasks such as rucking, mauling and scrummaging. These high intensity tasks rely on the anaerobic energy sources but the aerobic energy system is important for the replenishing of the former during the recovery period of low activities such as jogging and walking.

Like other field based team games, the physiological demands of a rugby union game are of an intermittent in nature and vary depending on positional role (McLean 1992).

It is vital to understand the physiological demands of the game in order to help players train for top performance. The fit player must have sufficient endurance to last the 80 minutes duration and recover from the frequent high intensity bursts. Besides, the players must have speed to get to the right position fast or to outrun an opposing back. Power and strength is equally necessary for scrummaging, rucks and mauls. At all levels of competition, the demands on a rugby player are great requiring a combination of thorough physical conditioning well drilled skills, tactical and well planned team strategy. Effective teamwork is equally important, as all players irrespective of the positional role must work in concert with each other if they are to experience any success.

Kenyan rugby players' performance both locally and internationally has been described as dismal by Kenya Rugby Football Union (2004). The KRFU (2004) reckons that the player base of about 600 players is too small to sustain player supply to play at various levels of competition. This means that a few players end up participating in many matches, which is detrimental to their conditioning and fitness development and maintenance. The game of rugby in Kenya is also played at amateur level and therefore players do not devote enough time in training.

This paper discusses the rugby team composition and characteristics, demands of the game, specificity of training and periodisation of training for effective fitness. The term VO_{2max} is used interchangeably with aerobic capacity, aerobic endurance/ fitness

Team composition and Characteristics

A rugby union team comprises of 15 players categorized into two broad playing positions namely, **forwards**, the ball winners and **backs**, the ball carriers. However it should be realized that the specific position demands are more complex than this broad overview.

The 15 players comprise of 8 forwards and 7 backs. (Forwards consists of a front row of two props and a hooker, and back row of two locks and two flankers and the number 8). Forwards are generally stronger and in big in size than the backs, slower and less agile though some are just as fast and adept in open play as the backs. The role of the forwards is to gain and retain the possession of the ball. They also take part in set pieces and lineout.

Backs are traditionally ball carriers and comprise of inside

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backs (scrum half and fly half), centers (inside center and outside center), two wingers and one full back. Although backs are traditionally known to be small, agile and fast, professionalism has brought in increased size and strength into the backs. The role of the backs is to support the forwards by taking the ball and make scores either by running to the try line or kicking.

Demands of the game

The game of rugby demands technical, tactical, physical and psychological factors. The focus of this paper is however the physical fitness of the player without down playing the importance of these other factors.

All rugby players require a reasonable level of the five components of general fitness (stamina, strength, speed, flexibility and skill). The higher the levels of play the greater the level of fitness required to meet the demands of the game. In addition it should be realized that there are different fitness demands on the player according to the position he plays. The roles of the different positions vary greatly; therefore it is logical to expect the players metabolically needs be different.

Rugby players also must be physically fit due to the games fast pace, expansive size of the playing field as well as the inherently rough physical contact involved. Physical conditioning programme often include endurance training with the objective of establishing an aerobic base. This is because the aerobic system plays an important role in recovery by enabling the player to meet the energy demands needed in the later stages of the game. The active recovery (walking, jogging) by a rugby player increases the removal of lactates from the blood (Deutsch et al, 1998). A player would otherwise not manage to reproduce over the entire game time the high intensity bouts of activity required of him during the match. Getting the appropriate balance between training and rest is equally important because insufficient recovery leads to fatigue poor performance and increased chances of injury (Garraway, 1993).

Each playing position has specific fitness but all players must be able to maintain their game skills at high speeds, during contact, in pressure situations as well as when they are fatigued. It is therefore necessary for the coach/trainer to understand the key physiological demands on the players in order to assist them train for top performance. The ratio of high to low intensity activities as well as the work/rest ratio with the player position should be taken into consideration when designing training programme for specific positional role.

A study by Gabbett (2000) on time and motion analyses of forwards and backs of a New- Zealand rugby team showed that forwards complete many high intensity efforts per match than the backs with the front row forwards

performing over three times more than the outside backs. The average duration of high intensity efforts were similar for both positions but the average rest periods for the forwards were significantly shorter (35 seconds) while the backs enjoyed plenty of recovery time between high intensity efforts (88 to 135 seconds). This rest period is sufficient to replenish the phosphocreatine stores for the backs while the 35 seconds would not be sufficient to restore the same energy stores for the forwards. The forwards would thus rely more on glycolytic energy system to maintain the work rate demands but players need to be aerobically fit for this energy system to be replenished. The study also report that the type of high intensity activity also vary in the two playing position. He forwards was shown to perform fewer sprints while the backs perform more high intensity runs ad sprints. Forwards are also involved in more rucks, mauls and scrums than the backs. The study showed that the front row forwards performed an average of 75 rucks/mauls, back row forwards performed 57 while the inside and outside backs performed 11 and 7 respectively. These findings indicate that training activities should be selected to suit the players as per the demand placed on them.

Specificity and periodisation of training

The principle of specificity states that the effects of training are confined to the systems stressed during training (Foss and Keteyian, 1998). This means that training is most effective when carried out in a manner that simulates the player's sport as much as possible. In rugby, specific fitness is concerned with the demands of a certain position or activity. For example, the specific position speed required of full back is different from the speed required of a center player. This means the players in the two positions must use training activities that would enable an individual to develop the kind of fitness required of the position during play.

The mode of activity used in training also influence adaptations in the energy and neuro-muscular systems. Emphasis is made by Foss and Keteyian (1998) that athletes often- record high VO_2 max when they are tested while performing activities similar to those they perform during the actual game. To train for aerobic endurance the forwards for example can use the rowing machine while the backs can be engaged in running combination of continuous steady state running and interval workouts. For the backs, performing shuttle runs instead of straight runs may develop specific workouts. This would ensure an increase in agility running component for the backs. For the forwards, circuit exercises to develop pushing and wrestling strength would be very useful. An understanding of fitness needs of a player and demands of the game is therefore a must for a coach/trainer. Such knowledge will assist the coach in periodisation of training.

Periodisation involves planning and organizing the

competition season's general, special and specific fitness, recovery strategies and game skills and tactics throughout the different periods of the year (Corbin et al, 2002). Different fitness components are developed and maintained at different times of the competition season. For example can be emphasized when explosive speed is being maintained or vice versa. This process physical conditioning though should be done gradually and only after the needs of the players and demands of the game are known and understood. Players should develop general fitness during pre-season and then progress to more specific training as the pre-season progresses into the in-season.

METHODS

Subjects

A total of 90 players from Impala, Harlequin and Nakuru rugby clubs initially participated in the study but the number reduced to 69 at posttest. All subjects voluntarily agreed to participate in the study. The coaches/trainers of respective clubs also gave consent. A total of 51 backs and 49 forwards took the test. Each playing position was well represented.

Protocol and data collection

Each subject had his VO_2 max measured twice i.e. at the beginning of the competition and after eight weeks of training and competition. The progressive multistage shuttle run test was used. This is a valid instrument used internationally to predict the VO_2 max for players in any sport and by individuals interested in tracking their own physical fitness (Brewer et al., 1998). The test involved subjects running between two lines marked 20 meters apart. Each subject aimed at keeping up with beeps from a pre-recorded audiotape. The beeps started off slowly increasing gradually to a faster pace. Any subject who was unable to keep up with the beep twice to complete a shuttle voluntarily withdrew or was withdrawn from the test. Each subject's VO_2 max was estimated by reading the level and the number of shuttles at which he withdrew against the published VO_2 max scores (Brewer et al 1998). The subjects were taken through a five-minute session of warm up exercises before commencing the test. The test was carried out outdoors on a safe level ground during the teams' evening training session.

RESULTS AND DISCUSSION

The forwards in the three rugby clubs recorded higher

VO_{2max} values than the backs as indicated in table 1.

Table 1: Pretest and posttest mean VO_2 max by players positions

Team	Pretest	Posttest	Pretest	Posttest
	Forwards	Forwards	Backs	Backs
Impala	43.6	44.4	46.9	44.4
Harlequins	39.0	39.3	39.6	41.2
Nakuru	40.2	39.2	46.8	45.9
Overall mean	40.8	40.9	44.4	43.9

Results also indicate a slight decline of VO_2 max by Impala and Nakuru rugby club back players at posttest while that of Harlequins increased slightly. An increase of VO_2 max is observed for the forwards of Impala and Harlequins players while there was a decline in endurance by Nakuru rugby club forwards.

Analyses of variance likewise revealed a significant difference in aerobic capacity by players in the two playing positions both at pretest and posttest as shown in table 2. This is indicated by F ratios of 5.27 at pretest and 4.43 at posttest that were greater than critical value of F (3.99) at 0.05 alpha level. This agrees with results on table 1 indicating higher aerobic capacity by the backs.

Table 2: ANOVA Summary of Pre and Post test VO_2 max on Players' Positions

		Sum of Squares	Df	Mean Square	F	Sig.
	Between Groups	149.301	1	149.301	5.27*	.025
	Within Groups	1897.937	67	28.327		
	Total	2047.238	68			
	Between Groups	98.430	1	98.430	4.43*	.039
	Within Groups	1489.550	67	22.232		
	Total	1587.979	68			

Critical $F=3.99$ $p < 0.05$

High VO_2 max by backs was attributed to high work rate demands by this playing position during the match. As observed earlier backs usually cover longer distances since they are involved in a lot of running for the tries compared to the forwards who are mostly involved in scrummage and tackling. This agrees with Reilly (1990) findings of higher aerobic capacity by the backs (59.5 ml/kg/min) against (54.1 ml/kg/min) by the forwards. Similar finding are reported by Hazeldine and Holmyard (1993) where elite female rugby union backs recorded 47.3 ml/kg/min and forwards with 43.8 ml/kg/min.

The low VO_2 max by the forwards is attributed to short high intensity activities (mauls, rucks and scrums) they engage in during training and match play as opposed to backs prolonged low intensity activities (running and walking).

The general decline of VO_2 max by players in the two playing positions at posttest indicates physiological burnout and subsequent loss of fitness as noted by Anspaugh et al (1991) that, aerobic capacity needs to be attained and maintained through appropriate and relevant training to counteract the principle of reversibility. The Kenya cup rugby league players participated in a match every weekend therefore not granting players enough time to recover between competitive matches. Such intense physical engagement also increases chances of injuries rendering players of period of inactivity that is likely to lead to a loss of fitness as noted by Garraway (1993). The

forwards are mostly predisposed to injuries, as they are mostly engage in tackling and scrummage. The frequency of training by rugby Kenyan rugby players as reported by KRFU (2004) is 2 times a week. This may have been inadequate for any substantial increase in aerobic fitness. However Mauhgan and Gleeson (2004) report that training 3 or more times a week produce greater gains in aerobic endurance.

IMPLICATIONS

It is suggested that coaches/trainers compartmentalize training programme to suit individual players as per the positional role in order to target the physiological demands of and physical conditioning. Players should be encouraged to regularly monitor their physical fitness in order to take necessary measure to avert any regression in fitness.

Coaches are advised to ensure there is periodisation of training so those players develop aerobic capacity during the off-season and early pre-season. This way players will reach peak performance at the right time and prevent loss/decline in aerobic fitness in the middle of the competition season.

Players frequency of training should be increased from 2 to 3 or more times a week. Mauhgan and Gleeson (2004) recommend 3 to 5 days per week as the best frequency to produce greater gains in aerobic fitness.

REFERENCES

- Anspaugh, D. J, Hamrick, M. H and Rosato, D. F. (1991). Concepts and Applications: Wellness. St Louis: Mosby Year Book.
- Astrand, O. P and Rodahl, K. (2003). Text Book of Work Physiology: Physiological Basis of Exercise. Champaign: Human kinetics.
- Brewer, J. E, Ramsbottom, R. and William, C. (1998). A Progressive Multistage Fitness Test: Shuttle Run Test for the Prediction of Maximum Oxygen Uptake. Leeds National Coaching Manual.
- Brewer, J. E, Ramsbottom, R. and William, C. (1998). A Progressive Multistage Fitness Test: Shuttle Run Test for the Prediction of Maximum Oxygen Uptake. Leeds National Coaching Manual.
- Corbin, B. C, Corbin, R. C, Welk, J. G and Lindsey, R. (2002). Concepts of Fitness and Wellness: A Comprehensive Lifestyle Approach. Boston: McGraw Hill.
- Foss, M. L. and Keteyian, S. J. (1998). Physiological Basis for Exercise and Sport. Boston: McGraw Hill.
- Gabbett T. J. (2000). Physiological and Anthropometric Characteristics of Amateur Rugby League Players: British Journal of Sports Medicine; 34: 303-307.
- Garraway, W. M. (1993) Epidemiology of Rugby Football Injuries: Intermittent High Intensity Exercise In D.A D Macleod, R.J Maughan, C. Williams, C.R Madeley, J.C.M Sharp and R.N Nutton (Eds). Intermittent High Intensity Exercise: Preparation Stress and Damage Limitation. New York. E & FN Spon.
- Garraway, W. M. (1993) Epidemiology of Rugby Football Injuries: Intermittent High Intensity Exercise In D.A D Macleod, R.J Maughan, C. Williams, C.R Madeley, J.C.M Sharp and R.N Nutton (Eds). Intermittent High Intensity Exercise: Preparation Stress and Damage Limitation. New York. E & FN Spon.
- Hazeldine, J. R and Holmyard, S. D (1993). Seasonal Variations in the Anthropometric and Physiological Characteristics of International Rugby Union players In T. Reilly, J. Clarys and A. Stibbe. (Eds). Science and Football II. London: E & F.N. Spon.
- Kaiser, T. (2005). Fitness of an Amateur Football Team: High Resolution Melt Genotyping. In www.corbettlifescience.com
- Kenya Rugby Football Union. (2004). An Overview of Rugby in Kenya. In <http://www.kenyapage.net/rugby.html>.
- Maughan, R and Gleeson, M. (2004). The Biochemical Basis of Sports Performance. New York: Oxford University Press.
- McClean, D. A. (1992). Analyses of the physical demands of international rugby union. Journal of sports sciences 10:285-296.
- Reilly, T. (1990). Football. In T. Reilly, N. Secher, P. Snell and C. Williams (Eds) Physiology of Sports. London: E & FN. Spon.
- Seiler, S. (2005). The Meaning and Measurement of Maximum Oxygen Consumption. In http://www.Krs.hia.no/~stephens/VO2_max.ht