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TIME MOTION ANALYSIS IN SPORTS-A REVIEW

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Abstract:-The purpose of this study was to collect the review related to Time Motion Analysis of team game. The review was collected of two decade from 1984 to 2014 using internet. Researchers used Google search engine. Most of the Time Motion Analysis studies were conducted on segmental movement. As the study is delimited to Time Motion Analysis of team game, researchers found many studies on rugby game, very few on basketball and hockey, and a study related to wheelchair sports (wheelchair basketball). Most of the time motion studies of team games were conducted in Canada. Technology is enhancing day by day. In the decade of 80's, video technology was used. In 90's computerised video analysis was used. Now-a-days modern GPS system and tracers are being used for Time Motion Analysis.

Keywords: Time Motion Analysis, team games, sports and disability.

INTRODUCTION

Time Motion Analysis (TMA) is a standard procedure to determine the time and energy invested in the activity for a period of time (Gross, 1984). Through this process the various patterns of movement in sports situations, such as speed, duration or distance are collected. Thus we obtain valuable information by the use of TMA. As the world became increasingly dependent on technology, the stage was set for the scientific advancement of work methods. This paper gives an overview of various methods used in sports for TMA from time to time. Time motion analysis and Global Positioning System (GPS) methods are receiving increasing attention from video motion analysis researchers (Aggarwal and Cai, 1999).

Frederick Winslow Taylor regularly perceived as the father of scientific management. He was born in Pennsylvania in 1856. As a young person he had the chance to go to Harvard University. In spite of the fact that he could have emulated his father's example and turn into a legal advisor, he chose to forego University. Rather, Taylor apprenticed as a patternmaker and engineer. These perceptions turned into the motivation for the Scientific Management methods that would make Taylor renowned. His Time Study method was utilized to specifically watch undertakings and record the time it took to finish them. The investigation of these perceptions was utilized to focus the best systems for performing work (Shawna, 2013).

Frank Gilbreth (Shawna, 2013) utilized one of the great emerging technologies of the time, motion pictures. He recorded over 250,000 feet of 35mm film, documenting the work methods of people in various industries. By analyzing the motions of workers, the Gilbreth sought ways to increase output and minimize fatigue by elimination motion wastes such as stooping and walking. After World War II the Japanese manufacturing industry adopted American Scientific Management

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practices in order to overcome the challenges they were faced with (Shawna, 2013).

Time Motion Analysis in Sports

Two types of motion analysis in sports are used for tracking players. These are used to know the various patterns of movement in sports situations, such as speed, duration or distance.

(a)Vision-based motion analysis in sport.

(b) Global positioning system based motion analysis in sport.

PROCEDURE OF COLLECTING REVIEW

In this study researchers study related to time motion analysis. All the literatures used in this study are from 1984 to 2014 using the internet. Researchers have using Google search engine. Researchers had used key words such as 'What is "Time Motion Analysis'? 'Time Motion Analysis'. 'Time Motion Analysis in Sports'. 'Time Motion Analysis in team sports'. 'Video motion analyses. 'Time Motion Analysis in Disability sports'.

Researchers get more studies related to segment movement. But in this paper they have taken only those studies which are team sports and which have analysed 'duration' and 'intensity' of sports in different activity.

STUDIES RELATED TO TIME MOTION ANALYSIS

Docherty, Wenger and Neary (1988) have conducted a study on 27 Rugby players volunteered to be observed by Video tape all through the game to discover the time used in diverse match play activities identified with physiological load of the game. An especially outlined computer program was utilized to follow the frequency, aggregate time, mean time and percentage of six match play activities amid video tape playback. The analyses were restricted to two playing positions in rugby i.e. centers and props. Eight players were recorded by four cameras in five minutes break for a minimum forty minutes each one diversion. Blood lactates were taken of 11 players following five minutes of game. The analysis for all the games and players demonstrated that players utilized up 47% of the entire time in low intensity movement i.e. walking and jogging, 6% in extreme action i.e. running and sprinting, 9% in non-running intense action i.e. tackling and competing for the ball and 38% standing. Investigation by position demonstrated parallel time-motion profiles aside from sprinting and non-running commanding activities. Centers sprinted for 3% of the time compared with <1% for props where as props invested 16% of the time seeking the ball compared with 3.3% for the centers. Investigation by position and level (club compared with representative) shows same profiles for position regardless of level. No movement for any position or level exceeded a mean time of 8.6 sec.

Ali and Farrally (1991) made an attempt to figure out appropriate routines for getting goal data on the time used by players of distinctive positions during walking, jogging, cruising, sprinting and standing still during match play activities. Computer programs and video investigations with a straightforward documentation framework based upon symbolic representations of movements have been contrived for examination of individual players' conduct. A procedure was devised and utilized with a little gathering of university players, aged 19-21 years old. The subjects were shot in many matches, and the video recordings were analyzed utilizing a microcomputer. The proportion of the time spent for the players were 56% walking, 30% jogging, 4% cruising, 3% sprinting and 7% standing still. ANOVA tells us that there are significant differences among the players for different positions on the field, for instance the time used on walking, jogging and standing still ($P < 0.05$) among attackers, defenders and midfielders. Another technique has been produced to acquire solid data about the players' movement and execution in the games. The Authors accept that there should be further studies carried out including more teams at distinctive levels of execution to substantiate these preparatory findings.

Bloxham, Bell, Bhambhani, and Steadward, (2001) investigated the time of selected wheelchair basketball players used performing distinctive game activities all through a World Cup game, measure the heart rate reaction all through such action, and clarify the physiological profile of each player participating in the game. Six male players of the Canadian World Cup wheelchair

basketball team were recorded amid the entire game to conclude the time used performing seven separate classes of movement. Time motion analysis demonstrated that players invested 8.9% of the game time sprinting, 23.5% gliding, 18.2% contesting for ball possession, 0.6% sprinting with the ball, 0.3% shooting, and 48.3% resting on the bench and floor.

Spencer et. al. (2004) studied the movement patterns of field-hockey players, particularly during first class competition. Time-motion analysis was utilized to get the movements patterns during an international field hockey game. Moreover, the movement patterns of repeated sprint action were explored, as repeated sprint capacity is thought to be an important fitness part of team sports performance.

Duthie, Pyne, and Hooper (2005) have conducted this study to quantify movements of Super 12 rugby players in competition because information on elite rugby players' movements is unavailable. Players were categorized into forwards [front (n = 16) and back row (n = 15)] and backs [inside (n = 9) and outside backs (n = 7)] and their movements analysed by video-based time motion analysis. Movements were classified as rest (standing, walking and jogging) and work (striding, sprinting, static exertion, jumping, lifting or tackling). The total time, number and duration of individual activities were assessed, with differences between groups evaluated using independent sample t-tests (unequal variances), while differences between halves were assessed with paired sample t-tests. The results indicate frequent short duration (54 s) work efforts followed by moderate duration (520 s) rest for forwards and extended (4100 s) rest duration for backs. High-intensity efforts involved static exertion for forwards (mean + standard deviation frequency = 80+17) and sprinting for backs (27+9). In conclusion, after nearly a decade since becoming professional, elite rugby union is still characterized by highly intense, intermittent movement patterns and marked differences in the competition demands of forwards and backs.

Abdelkrim, Fazaa and Ati (2006) made an attempt to evaluate the physical demands of men's basketball after the change in rules of May 2000 by surveying activity pattern, heart rate (HR) and blood lactate concentration of 38 world class under-19 basketball players all through six matches. computerized time-motion analysis were performed all through each one match on three players of different positions (n=18). Players spent (mean ± SD) 8.8 ± 1%, 5.3 ± 0.8% and 2.1 ± 0.3% of live time in high "specific movements", sprinting and jumping, respectively, while 29,9 ± 2% was spent standing still and walking. Centres spent significantly lower live time competing in high-intensity activities than guards (14.7 ± 1 % vs. 17.1 ± 1.2 %; $P < 0.01$) and forwards (16.6 ± 0.8 %; $P < 0.05$). The percent time spent in high-intensity activity by the different positional groups decreased considerably in the second and fourth quarters compared to that in the first and third quarters, respectively. The game intensity may differ according to playing position, being greatest in guards. Training programs should reflect these demands placed on players during competitive match- play.

Deutsch, Kearney, & Rehrer (2007) the aim of this study was to measure the movement patterns of different playing positions during elite Rugby union match-play, such that the relative significance of aerobic and anaerobic energy pathways to execution could be assessed. Video analysis was led of individual players (n=29) from the Otago Highlanders during six "Super 12" Representative fixtures. Every movement was coded as one of six speed of locomotion (standing still, walking, jogging, cruising, sprinting, and utility), three states of non-running intensive effort (rucking/mauling, tackling, and scrummaging), and three discrete activities (kicking, jumping, passing). The results showed significant demands on all energy system in all playing positions, yet intimated a more noteworthy dependence on anaerobic glycolytic metabolism system in forwards, because of their consistent contribution in non-running intense activities, for example, rucking, mulling, scrummaging, and tackling. Positional group correlations demonstrated that while the best difference existed between forwards and backs, every positional group had its own particular remarkable requests. Front column forwars were basically involved in activities including gaining/resting positions; back line forward had a tendency to play to a greater extent a pseudo back-line role, performing less rucking/mauling than front row forward, yet being more included in parts of broken play, for example, sprinting and tackling. While outside backs had a tendency to work in the running parts of play, inside backs had a tendency to show more noteworthy contribution in confrontational parts of play, for example, rucking/ muling and tackling. These results recommend

that rugby training and fitness testing ought to be customized particularly to positional groups as opposed to just separating between forwards and backs.
Holmes (2011) expressed that to-date no vast scale studies have been published that have utilized player tracking innovation to research continuous time-motion analysis in the modern period of Women's field hockey during Elite level International game to examine positional differences and inform fitness training and testing. Another computerized time-motion analysis technique, track Performance was utilized to breaks down individual player movement (n=54) from 18 International Women's hockey matches (18 defenders, 18 midfielders, 18 forwards). General investigation recognized distance covered 9.1 ± 1.6 km, of which 74.7 ± 9.0% was covered in low intensity movement of stationary, walking and jogging, 3.9 ± 2.4% match time was used stationary. Mean sprint distance of 12.7 ± 1.7 m, with an average of 26.7 ± 11.5 s between each sprint. Positional differences were distinguished for the mean percentage of time used; distance covered in locomotion activity, the mean duration of rest between sprint sessions, the frequency of sprints and work to rest proportions. The majority of contrasts in movement characteristics happen between the defensive players and other outfield positions. Study of repeated-sprint capability revealed forwards commence a significantly greater amount of 16 ± 9. Modern hockey dispels traditional positional roles with tactics and the more fluid nature of attacking plays requiring an additional multitalented player. Fitness evaluation and training should therefore look like the irregular nature of the game with sprint recovery periods reflecting the different positional demands.

CONCLUSION

After reviewing all the preceded studies, the researchers concluded that video tape was used 1988 for TMA and covered two playing positions in Rugby i.e. Centres and Props. One study in 1991 found the duration of different movement patterns by using video film and analysing them. The only study researchers found on internet in last two decade is related to wheelchair sports. The study on basketball in 2006 had investigated activity patterns, live time and specific movements by computerised time motion analysis. The last study which was found within the set limit of time was on women's field hockey where the author investigated positional differences and their intensity by computerised time motion analysis. Now a day studies attempt to use GPS devices to obtain TMA. The use of portable GPS devices has become a well-liked and suitable technique to compute movement patterns in sport (Wisbey, Montgomery, Pyne and Rattray, 2010).

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