This lecture will include:

- Defining Time Motion Analysis
- Investigating why time motion analysis is important when analysing performance
- Critically analysing examples from literature.
- Investigating the accuracy of motion analysis systems in different sports.
What is Time Motion Analysis?

**Definition**

Time motion analysis can be defined as ‘the progressive changes of position and speed over a period of time’ (Hamill and Knutzen, 1996).

In practical terms, the movement of an athlete over a period of match play and the speeds that they travel at during the performance.

Time motion analysis provides an objective yet non-invasive method for quantifying work rate during field-based sports and is the most effective method of assessing the physiological demands placed on players at an elite level. (Bangsbo, 1994).

Other methods which exist with the aim of quantifying work rate have the disadvantage of being invasive and often impractical or inaccurate during competitive match play.

Why is Time Motion Analysis Useful?

Provides coaches and players alike with feedback on performance (Hughes, 1996).

Provides information regarding an individual players performance throughout a game or training session (Hughes, 1996).

Can be used to monitor seasonal variations in player performances/work rate (Bompa, 1999).

Can aid coaches in team and tactical selections or styles of play utilised (Hughes, 1996).

Benefits of Time Motion Analysis:

- Blood lactate concentration
- Heart rate
- Oxygen uptake during match play
- Rate of perceived exertion

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Why is Accuracy Important?

**Accuracy**

Time motion analysis data that is collected must be as accurate and detailed as possible. This is because inaccurate, invalid or unreliable data may provide coaches and athletes with incorrect information regarding work rate, exercise intensity, distances travelled and movement patterns during performance.

How can motion analysis data be used?

- By finding the total distance covered in a game the energy expenditure can be calculated (Reilly and Thomas, 1979).
- Data can be used to give a true reflection on the physiological demands of the game.
- Allows work-rest ratios and physiological requirements of the sports to be analysed and used to develop training programmes (Vallis, 1998).

Methods of Time Motion Analysis?

- Pro Zone
- Global Positioning Systems (GPS)
- Video/Computer Software
- Hand Notational Methods
- Trak Performance

Image by digitarne
PROPERTIES
Allow user to leave interaction: After viewing all the steps
Show 'Next Slide' Button: Show upon completion
Completion Button Label: Next Slide
Automatic Tracking Systems

What systems are Available?
With developments in technology a range of automatic tracking systems are available, however they are still expensive to purchase and maintain. Examples of these systems include:

- Pro Zone
- Venatrace
- A-Eye System

The systems are commonly used within elite level sport due to the financial costs of the systems. Each system has detailed features and the opportunity for in depth analysis and feedback.

The systems all use specifically placed cameras around the playing area to calculate via trigonometry the distance s and speeds athletes are travelling at.
Hand Notational/Video Analysis

Time motion analysis performed via hand notational/video methods have the significant advantage of being cheap and very cost effective compared to other more expensive software. However the time consuming nature means that it can take up to 8 hours from trained analysts to analyse one 80 minute game of rugby union for one specific player (Roberts et al. 2006). With this in mind the time to analyse more than one player could be significantly more and may have an impact on the timing of feedback to the players/team.

In regards to accuracy it has been suggested that hand notational systems have a high degree of validity (approx 2% error) for calculating the total distance travelled by an athlete issues concerning time spent working in high intensity speed zones seem to evident with overestimations of high intensity work performed (Roberts et al. 2006).

Computerised Systems

Limited research exists in regards to manual computerised tracking systems such as Trak Performance®. Roberts et al. (2006) did suggest that such systems greatly over estimate high intensity work due to the nature of the software, suggesting overestimating by 27.5% more that what was actually performed.
What is the Difference?
Clock time refers to the time the ball is in play during the game. Match time on the other hand is the total duration of the match/event including stoppages and points where the ball is out of play. Sports such as Australian Rules Football and Rugby League are based around clock timings. These factors have not been discussed in a range of time motion analysis studies (King and O’Donoghue, 2003 and Castagna et al. 2004).

Influence of Match vs. Clock Time
Döagramacı and Watsford (2008) investigated the influence of clock time and match time on time motion analysis data collected during futsal match play.

When comparing the data collected during the game for clock time and game time there was greater was a 16% greater total overall distance covered, a 6.9% increase in the time spent in low-intensity activities, and a change in activity every 4.00 s vs. 3.28 s, respectively. There was little change in the high-intensity activities from clock-time to match-time comparison.

The results of the study suggest that clock time only may misrepresent the movement patterns in a game situation so a standard method of analysis focusing upon game time should be used. A range of published studies do not indicate which method they utilised within the analysis process, this could be seen as a limitation of the studies.

How Can Time Motion Analysis Data Be Used?

Development of Sport Specific Protocols
Time motion analysis data allows coaches to develop fitness testing protocols which mirror the actual and specific demands of the sports match play. This is beneficial as results collected in such tests have a direct reflection on match play performance. A range of tests have been developed including:

- The Loughborough Intermittent Shuttle Test (LIST) for football
- The Netball Specific Fitness Test (NSFT)
- The Yo-Yo Intermittent Recovery Test
- The Badminton Specific Fitness Test (BSFT)

The specific fitness tests are beneficial as they mirror the demands of match play and have greater worth in regards to athlete monitoring and fitness testing than the multi stage fitness test.
Time motion analysis is concerned with the movement of an athlete over a period of match play and the speeds that they travel at during the performance.

- True
- False
References


