Performance Analysis Challenges in Professional Football Practice

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Over recent years, the progressive bridging of the gap between sports science and applied football coaching practice has led to greater recognition of the need for and subsequent benefits of objective systematic processes for monitoring player performance in training and competition (Strudwick, 2013). The on-going assessment of performance in competition notably using performance analysis techniques such as match and time motion analyses provides opportunities for the design and prescription of evidence-based practice frameworks for optimising training and match preparation (James, 2006). Many professional clubs now formally employ performance analysts and sports scientists to provide factual and permanent records of events underpinning both individual and team technical, tactical and physical performance in competition. Innovative state-of-the-art computer software and video technologies are used to generate unprecedented masses of data to profile and benchmark match-play performance. Analysis of how teams and individuals perform in competition aids in identifying specific strengths and weakness and over a period of time can create a benchmark against which instances of future performance can be compared in order to pinpoint positive and negative trends in play (Carling and Court, 2012).

However, there are many challenges when using performance analysis. These include technological, analytical and cultural concerns as well as evaluating its actual impact on practice and most importantly on competition (Carling et al., in press). Gathering information on physical, tactical and technical components of play that is objective, reliable and accurate and can be generated on-demand are paramount. In addition to the craft skills and experience of the analyst, challenges also concern the wide range of technologies currently available and employed in professional football club settings (Carling et al., 2005). Questions on how data are acquired, stored, accessed and processed before subsequent visualisation and presentation to staff and players must be asked. Indeed, innovations in software and hardware have greatly streamlined the entire match analysis process providing accurate real-time analysis. The development of multiple camera semi-automatic tracking systems for example enables collection of a multitude of data on every player's on and off the ball movements over the course of competition (Glazier, 2010). Real-time analysis as the match unfolds is now a reality and there are possibilities to access specific information on performance at any time during or immediately after competition. Cost and quality of systems do vary however and investments need to find the balance between needs and budget to ensure a positive return on investment and subsequently make an impact in practice and competition.

Selection and definition of the different components or key indicators of performance that are to be collected and how the results are subsequently analysed, interpreted and presented are also major concerns (Mackenzie and Cushion, 2013). This process depends greatly on the craft skills and experience of the analyst. It also depends on the real world needs and willingness of coaching staff to impact on the process (Wright et al., 2012). An effective analysis process not only relies on deciding what information should be recorded and for what purpose but how it can eventually impinge on practice and improve match performance. Can data that aid understanding of how players have performed in key areas of play eventually be translated into practical applications to impact on player learning, training session prescription and performance in competition? There is a need to focus on areas of performance where results will have maximum impact and advantages can be gained both in the short and long term. An effective service also depends upon the performance analyst's ability to take into account and determine what factors might have directly impacted performance when interpreting data. Consideration should be given not only to 'how frequently' an action is performed but also 'how well' or the difficulty involved especially when comparing individual players. There is also need to account for the constant interaction between physical, technical, tactical and psycho-social factors. For example, is a team's impaired passing proficiency towards the end

Carling C..
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of games related to a drop in physical performance or is it simply due to the team frequently chasing the game and therefore taking more risks? Contextual issues such as current form, changes in coaching and playing staff, playing home or away as well as opposition quality, playing style and team formation and environmental conditions must also be accounted for (Lago, 2009).

A practical question that frequently drives the match analysis service is what are the key trends 'statistically' or the 'key performance indicators' that stand out (or not!) when winning, drawing or losing games. While use of frequencies of key performance indicators is common, analyses of 'efficiency' have more relevance from a practical viewpoint (Hughes and Bartlett, 2002). For example, a team might regularly create more scoring occasions compared to other teams in the League but the latter might have a better ratio of chances to goals scored. Another question is based on the relationship between key performance indicators and the ability of teams to recover from a losing position or maintain a winning position. For example, are more points recovered by top compared to lower ranked teams across the season after conceding a goal first and which key match events can be identified as having influenced the result (Carling et al, in press)? Data comparing performance in home versus away games or when playing against Top 6 teams or peers lower down in the table respectively are pertinent. The former point can provide useful indicators on how teams adapt according to game location especially when a different playing style or formation is employed. The latter can give an idea of a team's ability to 'raise their game' against the best teams or 'grind out' results against peers fighting relegation. It is also important not to simply concentrate statistical analyses on attacking play and neglect defensive performance. Distinguishing physical performance in relation to team possession (in other words during defensive or attacking play) in particular can be helpful in understanding differences in running distance (Bradley, Lago-Peñas, Rey et al. in press). For example, is a wide-midfielder but not a centre-forward working hard 'physically' off the ball to both create space for team mates and to close down opposition players who are in possession? Match analyses of technical performance of a potential recruit can provide clues as to how the player performs in relation to the benchmark data of the player they might replace.

Data can also be exploited to identify potential trends in performance across match periods (e.g., between halves or towards the end of games) in order to judge a team's or an individual player's ability to be 'consistent' over the course of play. Similarly, the benchmarking of progress at different milestones during the playing season is relevant (e.g. first- versus second-half of season). This work can be extended to investigate performance specifically during periods of match congestion and determine a team's ability for example, to maintain standards in domestic League matches directly after European competition. The analyst might also track intra-seasonal variations, for example, passing and crossing completion rates over the first 5 games in the present compared to the previous season.

Finally, information obtained from large-scale match and motion analysis investigations can be used to impact on the way teams generally train and prepare for games. For instance, general exercise-to-rest ratios or low- to high-intensity exercise ratios calculated using time motion analysis data are used to represent the physical demands of the game and provide objective guidelines for optimising the conditioning elements of training programmes (Reilly, 2007). In addition, when statistical analyses have enabled identification of a problematic issue, the coaching staff can subsequently prescribe adapted training drills and then reanalyse performance to determine if there is improvement in the frequency or efficiency of actions over following games (Carling and Court, 2013). For example, the effect of a modification in team formation on the number of opportunities created for wide players to cross the ball or a change in warm-up strategy to improve high-intensity work rate in substitute players immediately on entering play. Future work will no doubt move towards the development of intelligent systems to aid in the development of optimum training prescriptions and predictive modelling of ensuing performance using the intelligence gathered from analyses of performance.

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