# A scientific approach to building training with particular reference to basketball - match analysis

## Riccardo Izzo[1]

## Abstract

Modern sports rely more and more on match analysis for a better understanding of the atheletes interactions as different systems – as individuals, or teams. Not long ago, the data registration was accomplished manualy, empiricaly, through direct observation of the game; today, the possibility of filming the game and through a software to analyse step by step – evend during the action, provides a lot of extra information usefull both the coach and the athletes. The present study tries to present these positive aspects of modern game (match) analysi; it must be seen as a useful support for the coach, able to help him to develop his work more rapidly and with greater professional precision. In our opinion, match analysis should be considered more as a philosophy contained in a method that, while certainly comprising several elements, should nevertheless be analysed on a deeper and more professional level.

*Key words*: match, analysis, data registration, software

## Rezumat

Sportul modern se bazează din ce în ce mai mult pe analiza meciurilor, pentru o mai bună înţelegere a interacţiunilor dintre sportivi, consideraţi ca sisteme diferite – atât ca indivizi, cât şi ca echipe. Dacă până nu demult, înregistrările meciurilor se făceau empiric, prin observare directă şi notarea manuală a elementelor de joc, astăzi, filmarea jocului şi analiza cadru cu cadru, chiar în timpul jocului, oferă mult mai multe informaţii utile, atât antrenorului, cât şi sportivilor. Studiul de faţă încearcă să prezinte aspectele pozitive ale sistemelor moderne de analiză a jocului (meciului) sportiv. Acesta poate fi un ajutor pentru antrenor, în ideea de a-l ajuta să-şi dezvolte rapiditatea şi profesionalismul în luarea deciziilor. În opinia noastră, analiza meciului poate fi considerată mai mult ca o filozofie conţinută într-o metodă care, conţinând diverse elemente, poate fi bineînţeles analizatăla un nivel profund şi profesional.

*Cuvinte-cheie*: meci, analiză, înregistrare de date, software

---

[1] Professor PhD, Urbino University "Carlo Bo" Faculty of Motor, Sport and Health Science, Italy

## Introduction

The world of sport is going through a transformation and it probably owes this to its more and more marked propensity towards the use of technologies and advanced methodologies of various types connected with it, both computer and other technologies [1]. Match Analysis in particular represents, especially for situational sports, one of the most significant ways of using these technologies available to those employed in the field, instructors, trainers and others.

Match Analysis is an integral part of analysing the performance of one or more athletes or systems that interact with each other and that interact with another system of athletes.

It came into existence because of the need for coaches to note down actions performed in a match and to study them afterwards, in order to make any necessary modifications to the training program or to the work plan. For a long time situational sports analysis was based, in the best cases, on simple sheets completed by any spectator - rarely a coach - during the competition (superficial notational analysis).

But the urgent need of trainers was to have different and especially more complete data that would correspond more closely to those items that characterise sporting performance, not forgetting the possibility of having data that were immediately obtainable and usable so that, if necessary, direct action could be taken during the match and thus the progress of the match could be inverted or varied where this was required or useful [2].

To make these operations easier we moved on to reinforcing the pre-existing techniques of video filming with manual analysis of data and then to filming with the possibility of automatically evaluating the various problems by using dedicated software, and we finally arrived at today's sophisticated technology [3].

So, with the evolution of the hardware and software, we have now arrived at advanced methods of analysis and automatic data collection even on large surfaces.

In this development from what is known as "notational analysis" - still nonetheless widely in use in a large part of the sporting world, even among professionals - to automatic, computerized analysis, the sports that have benefited most have been team sports.

The information supplied by these - substantially software - systems can be used to obtain various data that give trainers extremely useful information such as the one mentioned above: an immediate feedback on the actions that happen during the match, the possibility of developing a database of the actions or of salient factors, technical and tactical information etc.

They can also make it easier to carry out a lot of different evaluations of various items considered important for research, for improving both performance and method and also the instruction given in coaching practice. It is important to remember that these fascinating benefits and perspectives that are obtainable thanks to the help of scientific technology applied to work are extremely useful not just for top-level professional sport but for all levels including work at the "basic" level, where a positive result – victory - must be considered as the chance for anyone to express his or her own potential whatever this may be.

## Methods

The most commonly used analysis and data collection systems focus on identifying athletes' movement and on detecting their interaction with their team mates, opponents and the ball. Having highlighted these constituent elements we can define the primary objectives of Match Analysis.

The first consists of automatically identifying direct or indirect information about the physiological exertion of athletes in competition and using this information for the physiological conditioning phase (First level training).

The second involves obtaining information relating to the identification of "competition variants" – a set of elements and situations that must be replicated in the coaching phase in order to have the athletes acquire the capacity to easily control these situations, which are repeated with a certain frequency in each match (Second level training) [5].

The third is to obtain, by automatic tracking of trajectories, information about the "local situational tactics" (attack, defence etc.) and complex data about the team's overall movements in relation to the opposing team's tactics, deriving from the playing methods adopted (modules).

As far a second level training is concerned, Match Analysis enables us to have automatic information about the biomechanics linked to the specific technique of an individual athlete, perhaps in relation to the hypothetical "perfected technique", together with data based on statistics and frequencies that, as highlighted previously, allow us to identify in the match a series of situations, the "competition invariants", which are then repeated with a certain frequency and are always similar [6].

By analysing technique in slow-motion shots (performance analysis) one can easily obtain information about the state of athletes' technical preparation and therefore provide for putting

corrective actions in place aimed at improving this, which is extremely important in the youth sector but equally so with older athletes.

As regards team technique and group coordination, Match Analysis enables us to evaluate, during coaching practice, the team's learning of group strategies, also through small sections of matches that make for easier observation [1].

The improvement of individual dynamic technique, or the real match speed of the individual, allows us to evaluate in training the capacities of the athletes concerned and to optimize them where needed, speed them up and specialize them still further according to the roles played in the team.

It is useful also to consider the structure of the match, since it is divided into predefined effective playing times and fixed recovery times (break between halves, time-outs etc.), and others that are less precisely determined (free throws, referee whistles, player substitution, etc.) and presupposes, from the physical and physiological point of view, as already highlighted, a continuous alternation of metabolic and muscular exertion that cannot always be predicted and therefore cannot be easily structured from the training point of view. It is certainly very interesting to analyse carefully the nature of the intermittency of the sport being studied, which in the case of team sports – in basketball, for example – lies in the great number of different movements and the frequency of change in these (often every 2"-3"), with a reduction and increase in the phases of speed. Periods of high intensity effort are also more frequent, apparently on average every 20"-25", although these are very short-lasting (averaging around 2"). In general, high intensity activity is in any case quantitatively a very small element (15-20% of the whole duration of the match) but it is qualitatively decisive (it comprises the actions of play that aim at the final conclusion of

the action and therefore, for example, the scoring of a basket or, on the other hand, the prevention of one, and therefore requires accelerations, decelerations, changes in rhythm and direction, fairly short but very fast sprints, and jockeying for position) [7]. All this basic information derives from carefully applying M.A. techniques and this, as we can easily see, leads to useful corrective actions in coaching, in our opinion. The performance capacity of a basketball player is probably tested to the limits during these phases of play that involve the repetition of very brief, high intensity actions, but actions that sometimes have incomplete recovery times. It is therefore these variations in the match structure that must be studied and checked more fully, since they doubtlessly have an effect on physiological effort and probably also on technical exertion. Asking for an action or a technical gesture

to be performed with a reduction in the time available does not, indeed, constitute a banal modification and has some important effects on approaches to training and on programming coaching practice [1]. Finally, third level training is aimed at teaching complex strategies that can be associated with all situational sports. It is the preparation phase that concerns the study of tactics. A tactic can be defined as "a plan that specifies what choices the player must make, for each possible piece of updated information that he/she may possess, at a fixed moment. We can therefore understand the valuable help that these systems give the coach and this is highlighted by the fact that advanced Match Analysis systems are also able to supply valuable tactical information even as the competition itself is in progress.

## Conclusions

In conclusion, systems like the M.A. described above, must be seen as a useful support for the coach, able to help him to develop his work more rapidly and with greater professional precision; it can allow him to modulate, where the field should require it, the general work plan that will necessarily contain elements of perspective theory while being dedicated to the group in question, but that can naturally not predict elements that must be evaluated in the individual and in the group along the way. Substantially, we would stress here our modest interpretation of the indispensable concept of training, which is that of "optimizing the work as it evolves". I am obliged to make a personal reflection here and it is one that leads me to voice the now commonly-held idea that M.A. is a simple statistical statement arising from the collection of data. In our opinion M.A. should be considered more as a philosophy contained in a method that, while

certainly comprising several elements, should nevertheless be analysed on a deeper and more professional level.

## References

1. Borrie A., Jonsonn K. (2002) *Temporal pattern analysis and is applicabylity in sport*, J.Sport Sci., p.20;
2. Appleby B., Dawson B. (2002) *Video analysis of selected game activities in Australian rules of football*, J Sci Med Sport, Jun;5(2):129-42.
3. Hughes M., Franks I. (2004) *Notational Analysis of Sport*, Ed.Routledge; International Journal of Performance Analysis in Sport 3(1), 40-49;
4. Kormelink H., Seeverens T. (1999) *Match Analysis and Game Preparation*, Ed. Reedswain; pp.66-70;
5. Farin D., Han J. (2005) *Fast camera calibration for the analysis of sport sequences*, Proceedings of International Conference of Multimedia Expo; p. 482-485;
6. Sacripanti A. (2007) *La Match Analysis,* Rivista di cultura sportiva SdS n.72; XXVI, pp. 23-30;
7. Lobietti R. (2007) *Match Analysis to understand volleyball: a proposal for high school and club coaches*, AVCA annual convention, Dec., p.12-15.