

## **A Multidisciplinary Approach of Sport**

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### **Abstract**

*Today's available means and instruments allow a strategy of understanding sport activities considering its complexity. It's important to offer new and different approaches in Sport! A structured knowledge allowing a consistent and purposeful development is the main success factor for sport. From a functional analysis of a situation and man itself it is possible to set models that allow understanding the phenomenon and take the decisions that will improve the chances of success. From an extended research on sport activities it was possible to include all known sports in one of the six groups (Collective Sports, Combat Sports, Individual Sports, Open Spaces Sports, Environment Adaptation Sports, Direct Confrontation Sports) proposed by Fernando Almada's taxonomy, allowing to understand, explain and intervene over any sport activity. We'll present in a very simplified manner the six proposed models and give a pair of examples to illustrate how the methodology can be used.*

**Key Words:** Sport, Multidisciplinary, Complexity, Model, Soccer, Tennis

### **1. Context**

The knowledge about sport has reached a stage of development that requires a deep restructuring both in its conceptual framework and in the praxis that this framework supports.

We are facing the conditions that Kuhn (1962) defined as crisis and the need to find new answers to new problems, with another coherence, appropriate methodologies, suitable tools, and new ways of acting in the understanding and management of sport.

This crisis in knowledge about sport is not obvious because sport as an activity, as a spectacle, as an instrument of leisure and tourism, as a mean of action in health, etc., is going through a strong period with a projection facilitated by the new means of communication, by an advertising with means never previously available, by markets that explore different assets of sport, from equipment to support infrastructures, from the image to the social dynamic that sport causes, from media to acculturation phenomena that focus on sport.

But the demanded answers are urgent because, on one hand, these aspects that camouflage the crisis in knowledge create themselves new demands and solutions that can enhance the quality of sports performance and, on the other hand, because competition between activities that aim to win the "space" of sport (computer games, virtual reality, the occupation of leisure time, etc.) is ever more urgent and also because the time that is devoted to sport activities and sport events has limits that have already been reached (or exceeded) and there is no visible way of expanding the available time.

## **2. Research Problem**

The research focused on specific and punctual problems, and within well-defined subject areas and resistant to transdisciplinary or even multidisciplinary investigation, is not in favor of an efficient search for answers to problems like the ones that scientific knowledge on sport faces.

The specific market for this knowledge (managers, coaches, sportspersons, etc.), although thirsty for answers that allow to enhance the huge investment in sport (financial, effort, hours of training, etc.) that they have to manage, have, in general, some difficulty following the requirements of basic formation essential for possible solutions.

The many attempts now presented within sport structures haven't found yet a reasonable acceptance nor an implementation that could be considered alternative to the traditional settled processes.

Therefore, it's crucial to find a balance between what is possible and what is needed to overcome the existing resistance to change while presenting a framework that can answer the challenges that lie ahead.

## **3. Problem Definition**

In order to find knowledge structures that are consistent, coherent and complementary to the problems, it's required to consider the: 1- understanding and explanation sport (Systematic of Sport Activities), 2- organization and management of training (Training Methods) 3- management of sport infrastructures and logistics (Sport Management), 4- relationship coach / trainee which would allow to optimize this connection in order to exploit training processes (Sport Pedagogy).

These four areas are complementary and represent an operative whole that has to be articulated, and objective, that allows an optimization of the structure as a whole and not just in some of its specific aspects. Naturally this optimization considers the different target markets and also their support services such as staff training (mainly coaches and officials).

We believe that a structured knowledge allowing a consistent and purposeful development is the main success factor for sport.

## **4. Methodology**

In a wide manner, the followed methodology was based on the difficulties found in adapting knowledge from different disciplines recognized as assisting sport (e.g., physiology, psychology, biomechanics, etc.) to restructure the understanding and explanation of sport activities creating models able to integrate the variables dealt with in these areas, making a rupture with the technical description (predominant), in a simplified way, to be accepted by the market, but considering an evolutionary sense to more complex and efficient models.

Training based on these models enables to stop applying standard solutions and focus on sequential process with diagnosis, prescription and monitoring the development, as well as the management of sports facilities based on variables and indicators for a quantitative assessment of infrastructures and logistics. The coach / trainee articulation can also be measured regarding the achieved goals in a way not only more discriminative than the single analysis of the results, but allowing monitoring the evolution of the process. A global conjecture was gradually built up based on support knowledge about sport in its different forms (competition, leisure, health, advertising, etc.) because the change in this application fields is made on the basis of involved dosages and not on empirically based experiences.

The construction of the conjecture has gone through successive stages over more than thirty years and suffering the evaluation of three universities and, according the methodology proposed by Popper (1963), throughout their development processes faced with refutation processes that produced six doctoral thesis, more than twenty master's thesis and many papers and publications that allowed to test various aspects through the pursuit of its refutation.

From the exhaustive search on sport activities (not only on the identity of its existence but also its functional characterization) as well as the many refutation works and restructuring conjectures and analyzes, it was possible to include all known sports in one of the six groups that Fernando Almada proposed in his taxonomy (Almada, Fernando, Lopes, Vicente & Vitória, 2008). All models allow understanding, explaining and intervening over any sport activity.

a) **Collective Sports:** Sports that focus the attention in the group dynamics.

**Most Striking Features:** Favor the labor division by different elements of a group, implying the performance of specific functions and the dynamics of their coordination's (group dynamics).

**Type of Objectives:** The objectives are agreed. On one side, withdraws its own meaning marked by thousands of years of living with real problems and imaginaries, on the other hand gives a freedom of action that results in a possibility of manipulation that can be extremely useful if ways to achieve the desired objectives are known.

**Main Variables:** I - The function to play in the group; II - The control of group dynamics.

**Simplified Reference Model:**  $\Sigma t \geq \Sigma t'$ , where  $t$  is the time for the offensive action and  $t'$  the time of the defensive action.

b) **Combat Sports:** Sports that favors confrontation with another.

**Most Striking Features:** Privilege the knowledge of the "self" when facing critical situations (the notion of death, even symbolized, is always present and in dialogue with the other).

**Type of Objectives:** Real, which implicates a set of processes and dynamics that appeal to the biological structure of men.

**Main Variables:** The knowledge of the whole "self" integrated in a group.

**Simplified Reference Model:**  $F \geq F'$ , where  $F$  is the force of one player and  $F'$  the force of the opponent.

c) **Individual Sports:** Sports that focus the attention in the self.

**Most Striking Features:** Favor the knowledge of some aspects of the sportsman, the performance is independent of the opponent's actions.

**Type of Objectives:** Agreed. Although at an early stage of several activities today considered as individual sports there was a sense of utility (the formation of the warrior who is at the origin of the word athlete) meaning that concept has blurred, and today is not integrated into the praxis of individual sports.

**Main Variables:** Knowledge of the "limits of the self" in some variables.

**Simplified Reference Model:**  $F$  or  $V$ , where  $F$  is the force and  $V$  the velocity.

d) **Open Spaces Sports:** Sports that favors the "survival instinct".

**Most Striking Features:** Emphasize the relationship between man and the environment in "open spaces".

**Type of Objectives:** Real.

**Main Variables:** The capabilities of man to relate with "large" spaces and the consequent request of adaptive capacities and perception of his integration in a universal context.

**Simplified Reference Model:**  $y = \text{fun } [x]$ . Behaviors ( $y$ ) that are a function of the problems ( $x$ ) own of a foreign context experienced autonomously and independently (open context  $]$ , solely with the characteristic limits of the context in which external help cannot be immediate, whether by distance, by the specificity of the context or other conditions).

e) **Environment Adaptation Sports:** Sports that favors the context interpretation.

**Most Striking Features:** Favor the relationship with a context different from which the sportsman has automated the domain of the integration factors.

**Type of Objectives:** Real, in the adaptation to the environment.

**Main Variables:** The adaptation to the environment - the ability to understand the dynamics of the environment / context, to be able to interpret the indicators that allow knowing what is happening and the establishment and operation of the appropriate strategies to solve the problems faced.

**Simplified Reference Model:**  $y = \text{fun } [x]$ . Behaviors ( $y$ ) that are a function of the problems ( $x$ ) own of a foreign context experienced within well-defined limits (closed context  $]$

f) **Direct Confrontation Sports:** Sports that favors the relation with the other.

**Most Striking Features:** Favor the dialogue with the opponent, usually by using an interposed object.

**Type of Objectives:** Agreed.

**Main Variables:** Means of dialogue with the opponent, in a direct opposition.

**Simplified Reference Model:**  $t \geq t'$ , where  $t$  is the time for the offensive action and  $t'$  the time of the defensive action.

### 5. Operationalization Examples

Some examples illustrate how we can act according to the proposed methodology:

#### 5.1. In Soccer

The model (very simplified):

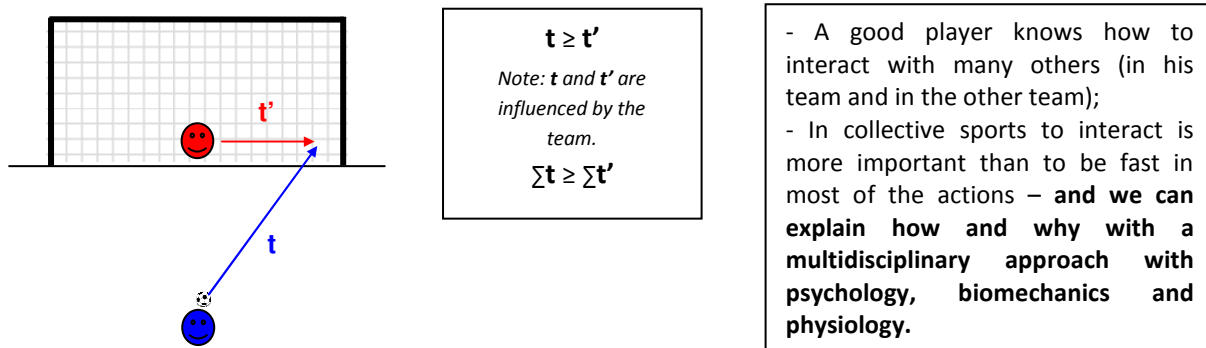


Figure 1. Model Representation in Soccer

#### Some Lessons that can be taken:

- In a team sport all elements of the two teams can influence the times of many opponents, while in tennis (direct confrontation) only the opponent counts (you must disregard the public, of course);
- Times are influenced by the players in the play and also by those who may also intervene. We play not only with the ball, we play also with the influence of others, many others.

#### Links with other scientific areas:

The dynamics of the group (measured by time) shows the interactions, the relationship between the players. Improving the team is not only function of physiological factors and from individual technique. Improving the team implies reducing the articulation time of the group members.

#### 5.2. In Tennis

The model (very simplified):

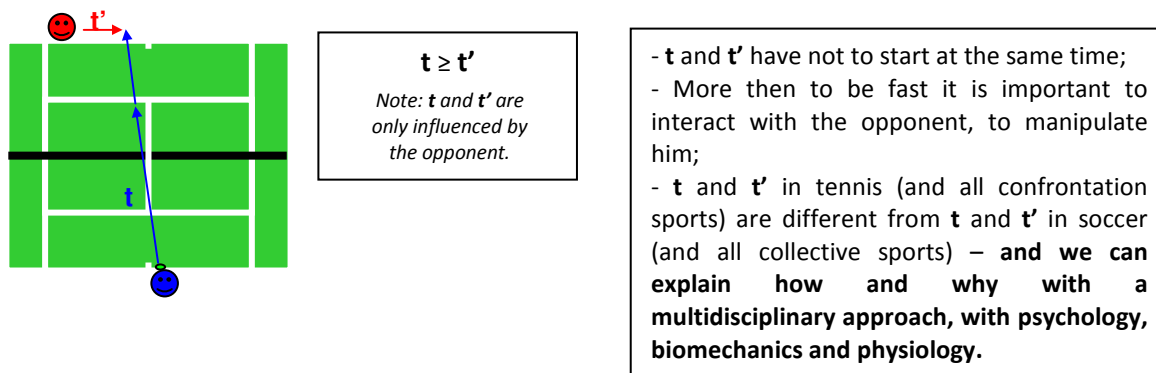


Figure 2. Model Representation in Tennis

**Some Lessons that can be taken:**

- Performing well below the personal limits allows playing with the ball. As we approach our limits we need to "read the opponent", to interact with him (the dialogue with the other) or our times are not competitive;
- A novice has much time to look at the ball, but at a medium / high level the ball is an ultimate reference. Playing with the ball at 60 km/h or at 180km/h are two different processes since the stimuli that was served up to the strategies used are different. It's not just a matter of strength;
- Strength may not be very important if we have big acceleration trajectories, what counts is the kinetic energy of the racket. A high level player takes more time accelerating the racket than a novice player.

**Links with other scientific areas:**

A tennis player is a sum of physiological factors, psychological, cultural, etc.. It's possible to quantify each of these types of factors measuring the action time of a player. So we can monitor the evolution of these factors by training, to assess the quality of training and understanding how the knowledge from these areas can be important.

**6. Conclusions**

We conclude that a sportsperson is not a set of mechanical factors that should be increased to improve performance. For high performance you need to act (or wait for a change by accident) on all sorts of factors.

The rupture that we propose in the structure of knowledge about sport allows understanding sport in a way that facilitates its management because it identifies and tackles the most significant variables and the use of indicators to monitor the situation (any situation) and its development. The integration of scientific knowledge from different disciplines can be made gradually allowing an evolutionary process that will undoubtedly enrich the efficiency of all processes related to sport, providing more sustained effectiveness to its management and training.

Staff training (coaches, officials, etc.) can also be made beyond personal experiences and the management of professional careers becomes less limited because, as it happens for example in engineering, professionals can enter new fields with a relatively short preparation by functionally understanding the phenomena.

It's important to offer new and different approaches in Sport!

**7. References**

Almada, F., Fernando, A., Lopes, H., Vicente, A. & Vitória, M. (2008). *A Rotura: A Sistemática das Actividades Desportivas*. Torres Novas: VML.

Kuhn, Thomas (1962). *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.

Popper, K. (1963) *Conjectures and Refutations: The Growth of Scientific Knowledge*. London: Routledge.

**Ethical Standarts**

All data used in this work is from public domain and was collected from the Portuguese public television services. All work was carried out according to the current Portuguese laws.

**Conflict of Interest**

All authors declare that they have no conflict of interest.