

## An Eco-Dynamic approach for training individual decision making in teams

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**Abstract:** Complex environments require effective individual/team decision making and adaptation to environmental changes. Salas et al. (2007) consider that this process implies the development of Team Cognition. The aim of this presentation is to advocate an Eco-Dynamic approach for developing decision making in teams. Following this approach we considered team behaviour as an emergent process brought by the interaction between the individuals, environmental and task constraints rather than being controlled by individual minds. This means that team cognition should be developed as the capacity of different players to become perceptually attuned to the relevant information of the environment. Relevant means that this information specifies goal achievement. To illustrate our perspective we present an example for training the development of emergent team decision making processes.

**Key-words:** Eco-dynamic approach; Decision making; Team cognition; Team sports.

### Introduction

The complexity in work, sport and education environments requires effective individual/team decision making and adaptation to environmental changes (Rousse, Cannon-Bowers, & Salas, 1992). Salas, Rosen, Burke, Nicholson, and Howse (2007) consider that this process implies the development of Team Cognition.

In Cognitive Science team cognition is defined by the standard knowledge, developed by team members, and it is the result of the sum of the individuals' knowledge in a specific environment (Salas et al, 2007). This definition assumes that the individuals act as programmed machines that have a common pre-existing internal structure to control their actions. Moreover team coordination is measured by the analysis of

communication processes between players, and not by the how functional these processes are for the team to achieve a goal. However, changes in complex performance environments are frequent and often require constant adaptations in the individuals' interactions to achieve performance.

The aim of this paper is to argue for an Eco-Dynamic approach in the development of decision making in teams. Following this approach we consider team behavior as an emergent process brought by the interaction between the individuals, environmental and task constraints (Araújo, Davids, & Hristovski, 2006).

### An Eco-Dynamical proposal

From an ecological perspective, adaptive behavior rather than being controlled by mental representations, emerges from the confluence of the team and individual conditions under the boundary condition of a particularly task goal (Gibson, 1979).

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To improve the decision making in teams we need to develop team cognition in a sense different from that described by Salas et al. (2007). This means that team cognition should be developed as the capacity of different players to become perceptually attuned to the invariants of the context (Jacobs and Michaels, 2007; Araújo et al, 2006; Warren, 2006). In this sense perception is intimately linked with action, i.e. one perceives in order to act, and one acts in order to perceive (Gibson, 1979). Perceptual attunement is constrained by the action capabilities of individuals and teams as well by team strategy. For that, more than increase individual knowledge about the world, there is a need to develop the individuals' and consequently team attunement to relevant information that specifies high-order properties of environment-actor system (Jacobs and Michaels, 2007). Relevant means that this information specifies goal achievement. In order to develop decision making, the first step should be to act in order to explore the context. Once the information that specifies goal achievement is detected, members of the group must use it, act upon it towards a desired state. To act upon this information implies that the individuals in the team must be coordinated to do so. It implies a functional adaptation to the changes of the environment, considering

their own capabilities and team strategy to achieve defined goals.

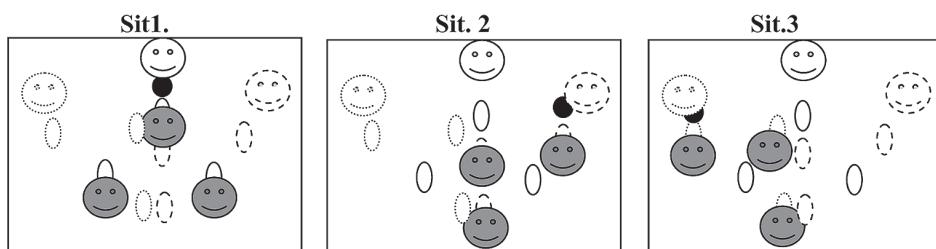
### Training decision making processes

To develop functionally decision-making, the sports coach need to design representative tasks of the contexts toward which one intends to generalize the training (Davids, Araújo, Button, & Renshaw, 2007) For that the coach may manipulate the interaction between the individual/team, environmental, and task constraints in order to make and the team adapt to unexpected conditions of environment for the development of better perception-action couplings (Davids et al., 2007).

To illustrate this perspective, we present an example of the training of the coordination of a group of futsal players in a defensive task.

In a traditional approach, it is needed to define the position of different players in different situations, based on a rigorous illustration of the different possibilities of playing in the game. The aim is to increase the player's knowledge on these situations. The methods to achieve this knowledge are formal games and analytical situations. Right and wrong decisions are defined and players need to comply with what was normatively defined (Figure 1).

**Fig. 1 - Example of an exercise in the traditional perspective. When the ball is in the white bold line player (sit. 1) the defensive team needs to occupy the bold line points. The defensive team varies field occupation according with the player that has the ball and the position defined by the line points**



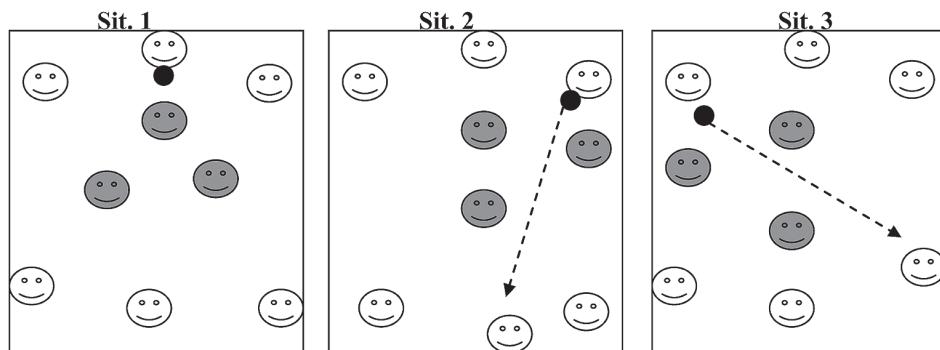
On the other hand, from an Eco-Dynamic perspective the aim is to increase the team coordination and self-organization in a set of possibilities offered by the context. According to the characteristics of a defensive situation and the level of expertise of the players a task goal should be defined. This is an important aspect that organizes the intentional and explorative processes for discovering different solutions for different players, considering their own capabilities.

Considering a beginner level of expertise, an exercise of three teams (A, B, C) could be performed, with three players in a field of 10x10m. The task goal is for Team A to try to pass the ball to team B by diagonal and central passes. Team C tries to avoid the pass from team A to team B or from

that define on a momentary basis their decision possibilities. If we vary the size of the field, the fatigue of players, or the level of stress we can analyze the level of adaption of each player and the team coordination to this task.

As we can see is not enough to define specific movements or player's position in the field to increase coordination. This process requires the necessity to understand the team strategy but also what is the information each player needs to perceive in order to act, and to increase team performance in each situation. As we saw, the position of the players with ball, the receivers, and the distances between defensive players and their velocities are variables that players need to perceive over time.

**Fig. 2 - Example of an exercise based on an Eco-Dynamic proposal. In first situation the defensive team closes all line passes between team A and team B. However in the second and the third situations, the other team players move their position. The defensive team didn't adjust their players' position to those changes, and as consequence the ball passes to the other team**



team B to team A. With this goal, each player needs to become attuned to the possibilities of action of the opponent team in relation with his own position and the colleague's position. The players need to establish intra and inter team couplings that relate with the team strategy and with their own possibilities. These are the constraints

### Final considerations

We argued that the development of decision-making is not solely located in the individuals' minds. To develop decision-making skills, attunement to relevant sources of information is central. In line with this, training should focus on

the functional aspects of the game by the manipulation of the task, environmental and individual constraints that allow an oriented exploration, discovery, and exploitation of relevant information-action couplings between players and environment. These considerations will be assumed for other situations as the education process, training of soldiers or fight fighters, or training team dynamics in companies

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