

# A constraints-led approach to skill enhancement in Tennis.

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## ABSTRACT

We propose a methodological approach that addresses game-based teaching to enhance skills in tennis. This is based on a diagnostic of decisional behaviour on performance contexts, intervention results from manipulation of key constraints either at task, performer or environment level. The purpose is to guide players' attention to relevant informational sources based on their own actions. In this way, intervention helps players to detect better information to guide more effective actions. Learning occurs based on situations that allow players to autonomously detect and use better information highlighted in the task, and that allows them to discover unique solutions, based on each player's unique characteristics.

**Key words:** Constraints; Learning; Tennis performance; Ecology; Dynamics; Decision-making.

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## INTRODUCTION

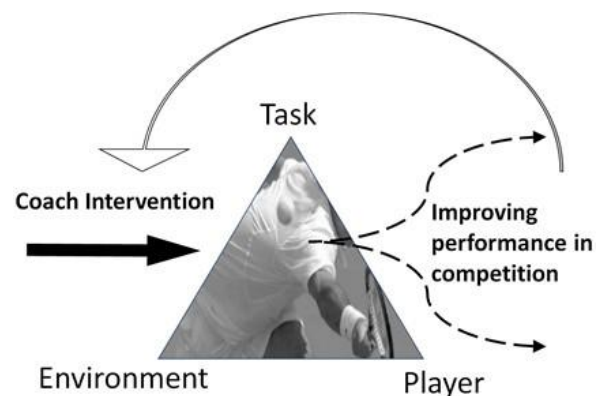
The constantly changing game conditions imply that decision-making and action be defined in a moment-to-moment basis. The perception of key informational sources reflects the existing adjustment between the unique player's characteristics and the properties of the task (Davids, Araújo, Hristovski, Passos, & Chow, 2012). During a rally, the opportunities to act offered by the context emerge from the continuous relation between the player and his/her opponent.

A player must be perceptually attuned to the match characteristics that inform how and when to act to achieve a goal. He/she does not passively receive information but actively obtains it. Improving the ability to act successfully results essentially from increasing the perceptual attunement to relevant properties of the environment that guide action to achieve a goal.

## TRAINING: A PROCESS OF MANIPULATING RELEVANT CONSTRAINTS

Training, in our view, is a process centered on the manipulation of the key constraints that amplifies information sources that help guide players to achieve their goals (Carvalho, Araújo, García-González, & Iglesias, 2011). The term "constraints" refers to the demands that are placed on action that can be of a very diverse nature: instructions and augmented feedback given by

the coach, displacements of the players, type of ball or racquet that is used or the movement amplitude of a certain joint. These constraints, that simultaneously interact to channel behaviour, are conceptually organized in three main categories: 1) the task, 2) the player, and 3) the environment (Figure 1).



**Figure 1 – Constraint categories that influence performance and training.**

Task constraints are related with the characteristics of the task such as goals, rules, and implements. The way players explore the action possibilities available in the context will differ if, for instance, the task goal is to create "rupture" situations based on the lateral displacement of the opponent (i.e., angle opening) or by means of an amortie. The way of attaining a

given goal is constrained by the conditions in which the task is performed. Players' behaviour is also influenced if, for instance, he/she is asked to maintain five "neutral" balls from the baseline of the court before forcing a "rupture" situation, or if he/she can only score when the "rupture" is created with the forehand.

Therefore the coach can use different strategies (manipulations) to emphasize task constraints, knowing that all the categories of constraints are always interacting. For example: i) Amplifying the information sources: change the dimensions and the court format, rise the net, outline zones in the court, or the arm with the racquet of the player that serves so that the receiver focuses his/her attention on it (this would aid to better anticipate the direction of the ball);ii) Performing gestures and non-verbal actions when the player is playing: signals combined with the players and the coach to indicate which side of the opponent to explore, the height or the depth that might be placed on the ball or if he/she might move in or out of the court.

The effect of manipulating the different task constraints changes according to the skill level of the players. The constraints of the player concerns mainly those that are: 1) structural, that is, those that are relatively constant over time: the morphology, the body composition or, even, the skill level in a given task; and those that are 2) functional, referring to the thoughts, emotions, motivation, fatigue, speed, concentration, etc. Structural constraints cannot be manipulated, but can be attended when choosing training opponents. Considering these constraints, practice situations can be designed to potentiate or limit the fact of a player being taller, stronger, being more tired, or having a lower level of performance. For example, ask a taller player with an effective serve to play only with one serve, or practice situations under fatigue or under "emotional pressure" (e.g., call out one ball when that ball is in, going against the player's will, and helping the player to regulate psychologically).

Environmental constraints are both physical and social. The training climate that is built by the coach influences players' development. The coach can set two different types of social environment: ego or task oriented training (Roberts, Treasure, & Conroy, 2007).

The first, addresses the potentiation of the competitiveness, and leads the player to compare his/her performance with others' performance. The task oriented training environment, appeals to the intrinsic motivation of the player and incentives to improve his/her performance, having the reference of what he/she previously did. Other factors exist in the environment that may be considered when designing the training tasks. For instance, the presence or behaviour of the audience, the presence of family, the conditions of the court (e.g., to play in a slow paving or in conditions of high humidity increases the demands in terms of opponents' displacement when preparing

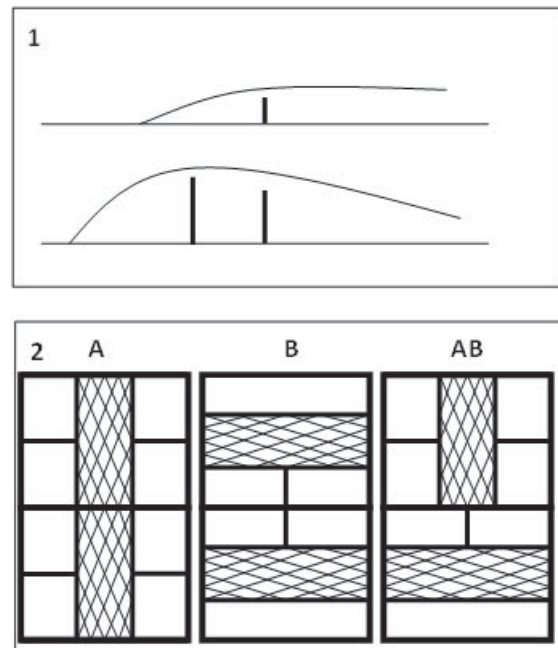
"rupture" situations, requiring higher "patience" and resistance), or also the level of the opponent.

**INTERVENTION EXAMPLES**

These categories of constraints are useful both for the diagnostic of what is relevant for training, as well as how it can be trained. The intervention happens when coaches know which key constraints influence players' performance, according to their own characteristics and skill level. Therefore, the manipulation of such constraints should be done in a way that improves player's performance.

The use of different tennis balls, racquets and court dimensions, should be based on the action capabilities of the players and their action goals. When, for instance, the court depth increases, this potentiates the amplitude of movement and the speed that is placed on the ball. Conversely, if the depth of the court is decreased, more accuracy is demanded for placing the ball. If the goal is to invite a player to explore the approach to the net the coach may decrease it in wide, or define court zones where the ball cannot bounce in order to promote exploration of angle opening, the displacement of the opponent in depth or the variation in ball speed.

If a coach wants to influence the player to position appropriately behind the ball and perform the forwardswing from the bottom to the top and to the front, instead of straight forward, the coach may raise the net and establish an area on the court, near the baseline, in which the ball should bounce (see examples on figure 2).



**Figure 2. Examples of handling the constraints of the task:**  
**1. Raising the net promotes the exploration of a ball trajectory rising up to the net, the effect of top-spin and a bounce closer to the bottom line of the court.**

**2. Defining forbidden bouncing zones in the court that promote exploration of different solutions: A - opening angles. B - play longer. C – combination of both.**



## CONCLUSIONS

Different sources of constraints interact to simultaneously influence behaviour. Instead of controlling all the sources of influence on behaviour, the constraints-led approach advocates that players should learn how to perform in face of internal and external variability. The manipulation of constraints intervention is based on the induction of functional variability (not any type of variability) in key constraints to performance. This approach promotes, not the development of better ready-made solutions made in advance, but the development of better perceptual attunement to the on-going match characteristics that inform the player, given his/her characteristics and circumstances, how to achieve a certain goal.

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