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# Initiation to combat sports from the perspective of ecological dynamics: the Constraints-Led Approach

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**ORIGINAL PAPER**

**Resumen**

This pre-eminently theoretical article aims to lay the foundations for an introduction to combat sports based on a motor learning model known as ecological dynamics, which tries to articulate the theories of James Gibson and Nikolai Bernstein with dynamical systems. More specifically, the article criticizes the cognitivism implicit in the notion of "fighting knowledge" (developed from comprehensive approaches) and proposes instead the concepts of combat motor literacy and combat dexterity from the perspective of ecological dynamics. The article also offers a series of pedagogical recommendations for the introduction to combat sports through modified games following the constraints-led approach (CLA). Likewise, it offers a training proposal from MMA and teaching practice using modified games from judo and grappling/Brazilian jiujitsu (BJJ).

***Palabras clave:*** Martial arts; combat sports; ecological dynamics; pedagogical models; motor literacy; combat dexterity; CLA.

**La iniciación a los deportes de combate desde las dinámicas ecológicas: el Modelo de Enseñanza Basado en Constreñimientos**

**Abstract**

Este artículo de corte preeminentemente teórico tiene como objetivo principal sentar las bases para una iniciación de los deportes de combate a partir de un modelo de aprendizaje motor conocido como dinámicas ecológicas, que trata de articular las teorías de James Gibson y Nikolai Bernstein con los sistemas dinámicos. Más específicamente, el artículo realiza una crítica al cognitivismo implícito en la noción de "saber luchar" (desarrollada desde enfoques comprensivos) y propone en su lugar los conceptos de alfabetización motriz de combate y destreza combativa desde la perspectiva de las dinámicas ecológicas. El artículo ofrece además una serie de recomendaciones pedagógicas para la iniciación a los deportes de combate mediante juegos modificados a partir del modelo de enseñanza basado en constreñimientos (CLA). Así mismo, realiza una propuesta de ejemplos reales de entrenamiento en MMA y de enseñanza mediante juegos modificados en judo y grappling/jiujitsu brasileño (BJJ).

***Keywords:*** Artes marciales; deportes de combate; dinámicas ecológicas; modelos pedagógicos; alfabetización motriz; destreza combativa; CLA.

**Iniciação aos desportos de combate na perspetiva das dinâmicas ecológicas: a abordagem baseada em constrangimentos**

**Resumo**

Este artigo, de carácter eminentemente teórico, pretende lançar as bases de uma introdução aos desportos de combate a partir de um modelo de aprendizagem motora designado por dinâmica ecológica, que tenta articular as teorias de James Gibson e Nikolai Bernstein com os sistemas dinâmicos. Mais especificamente, o artigo critica o cognitivismo implícito na noção de "saber lutar" (desenvolvido a partir de abordagens abrangentes) e propõe, em vez disso, os conceitos de literacia motora de combate e destreza de combate na perspetiva da dinâmica ecológica. O artigo oferece também uma série de recomendações pedagógicas para a introdução aos desportos de combate através de jogos modificados, seguindo a abordagem baseada em constrangimentos (CLA). Além disso, apresenta uma proposta de treino de MMA e uma prática pedagógica com jogos modificados de judo e grappling/jiujitsu brasileiro (BJJ).

***Palavras-chave:*** Artes marciais; desportos de combate; dinâmicas ecológicas; modelos pedagógicos; literacia motora; habilidades combativas; CLA.

## 1. Introduction

Combat sports refer to sports disciplines that involve one-on-one physical confrontations, governed by a set of specific rules for each modality, sanctioned by regulatory bodies such as federations, leagues, or associations (Correia & Franchini, 2010). The term "combat sports" is inevitably associated with another major category of physical activities, namely, martial arts.

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Regardless of their place of origin (although there is a tendency to associate them with Eastern countries), martial arts refer to codified systems of practices related to fighting or combat. Some remain connected to self-defense applications (e.g., silat, krav maga), but many have also developed competitive versions, which are categorized as sport martial arts (e.g., judo, karate). Although the most common academic term for these practices is "martial arts" and/or "combat sports" (Pérez-Gutiérrez et al., 2011), since this article fundamentally focuses on these disciplines in a sports format (leaving aside aspects such as self-defense), we consider "combat sports" an appropriate term to refer to martial arts in their competitive aspect (e.g., judo, karate, taekwondo).

To conclude this terminological introduction, it is worth noting Amador's (1995, p. 351) observation on how the definition of the word "fight" or "wrestling" seems more suitable for describing these sports, as opposed to "combat," which carries more violent connotations and is therefore less appropriate for this field of knowledge. This perspective connects the analysis of combat sports to a broader social perspective, in which combat sports can be considered a form of "institutionalized violence" (Sánchez-García, 2006), whose regulation and control have paralleled the civilizing processes of the societies in which they developed. Due to the increasing pacification of these societies, combat sports can evoke negative feelings, particularly among non-participants, who are increasingly distanced from physical violence in their daily lives. As a result, these sports may be perceived as being on the fringes of "real fights" and, therefore, on the margins of what is considered acceptable in modern sports (Sánchez-García & Malcolm, 2010, p. 55). This perception varies depending on the historical period and the society in question (e.g., consider the differing views on MMA in Europe, the United States, or Japan: Sánchez-García, 2019; 2020; 2021).

Setting aside these significant terminological considerations, we can offer an initial structural/functional characterization of combat sports by categorizing them based on different criteria: (1) Tool use: Disciplines may involve weapons, be unarmed, or allow both options; (2) Fundamental interaction modes: This criterion gives rise to three subgroups or families within combat sports—grappling disciplines, striking disciplines, and mixed disciplines that permit both types of interactions; (3) Interaction situations: Competitions take place either standing or involve both standing and ground fighting, as no combat sport is conducted exclusively on the ground; and (4) Scoring methods for victory: Combat sports may determine winners based on touches/strikes, throws/takedowns, joint locks/pins or chokes (Table 1).

**Table 1.** Characterization of combat sports based on tool use, interaction modes, interaction situations, and scoring methods, with examples for each category.

| **Criteria** | **Categories** | | |
|---|---|---|---|
| Tool use | *No weapons*: judo, wrestling, boxing, taekwondo, BJJ, grappling, etc. | *Weapons:* fencing, kendo, HEMA*, etc. | *No weapons/Weapons:* aikido shodokan |
| Interaction modes | *Grappling*: judo, wrestling, BJJ, sambo, aikido, etc. | *Striking*: boxing, muay thai, savate, wushu, etc. | *Grappling/striking:* MMA, combat sambo, kudo, etc. |
| Interaction situations | *Standing*: boxing, kick boxing, fencing, taekwondo, etc. | *Standing/ground:* judo, wrestling, BJJ, MMA, sambo, etc. | |
| Scoring methods | *Touches/strikes*: boxing, karate, fencing, taekwondo, etc. | *Take-downs / Throws*: judo, kudo, sambo, wrestling, grappling, etc. | *Locks / chokes / pins*: BJJ, MMA, judo, grappling, etc. |

*Note*. *HEMA stands for Historical European Martial Arts. Source: Own elaboration.

Beyond the differences that define the possible interactions between opponents, combat sports share a set of structural and functional foundations related to actions performed with one's own body and/or instruments on the opponent's body, which becomes both the object and objective of the game itself (Figueiredo, 1997). Understanding these structural and functional foundations

helps identify the common principles across different combat sports, forming what can be called "combat motricity" (Figueiredo, 2006). This initial step is essential for developing methodological and didactic guidelines that facilitate learning through a common model, promoting the transfer of knowledge across different combat disciplines. Despite the specific features of each discipline, they all share a common technical-tactical framework that constitutes the concept of "fighting knowledge" (Avelar-Rosa et al., 2015).

From a praxeological perspective, while combat sports can generally be considered as opposition sports (Hernández, 1994), they clearly possess distinct characteristics. Although all grappling sports are opposition sports, not all opposition sports involve combat (e.g., tennis, badminton). The praxeological analysis of combat sports was developed by Castarlenas (1993), who proposed studying the internal logic of these disciplines by differentiating between three possible roles in combat action: attacking fighter, waiting fighter, and defensive fighter — roles between which participants can shift. Terrisse et al. (1995) expanded on this analysis, linking these roles and sub-roles to tactical intention, as each role involves actions directed toward specific objectives.

Gomes et al. (2010) questioned the clear distinction between attack and defense, suggesting that the "attack/defense fusion" is one of the "conditional principles of combat," perfectly embodied in the concept of the guard position. The dual functionality of the guard allows each opponent to act as both an attacker and a defender simultaneously. The guard is closely tied to both transitional actions (exploratory, manipulative, and deterrent) and offensive/counteroffensive executions (finishing/neutralizing actions). These interactions form the core of what is considered "fighting knowledge" (Avelar-Rosa et al., 2015).

Engaging with this promising line of research on the concept of "fighting knowledge" from comprehensive perspectives — particularly through the Integrated Technical-Tactical Model of López-Ros and Castejón (2005) — this article aims to offer an alternative approach by applying ecological dynamics. This approach will serve as the foundation for a pedagogical framework based on the "manipulation of constraints," commonly known as the Constraints-Led Approach (CLA).

The structure of the rest of this article is as follows: After a brief methodological overview, I will explain the vision of combat sports from the perspective of the integrated technical-tactical model, followed by the ecological dynamics perspective. Next, I will introduce the concepts of combat motor literacy and combat dexterity and theoretically address the CLA model. Finally, I will propose criteria for designing modified games based on CLA and present a training/teaching framework with real-world examples currently used in combat sports.

## 2. Methodology

Given the predominantly theoretical nature of this paper, its methodological approach is based on an ad hoc review of analyses conducted on combat sports from both comprehensive and ecological dynamics perspectives. Specifically, from the comprehensive perspective, the Integrated Technical-Tactical Model (López-Ros & Castejón, 2005; López-Ros et al., 2015) and its application to martial arts/combat sports by Avelar-Rosa (2020), Avelar-Rosa and Figueiredo (2009), and Avelar-Rosa et al. (2015) is considered. From the ecological dynamics perspective, the CLA model (Renshaw et al., 2019) as it has specifically been applied in martial arts/combat sports (Kimmel & Rogler, 2018; Krabben et al., 2019; Yearby et al., 2024a) is considered.

For the selection of practical examples, a review was conducted on various training proposals in combat sports based on the CLA (Constraints-Led Approach). After searching academic databases (Web of Science and Sport Discus) on this topic, a scarcity of practical training/teaching proposals using this approach in academic publications was found — only the study by Yearby et al. (2024a) was identified. Therefore, the same search was carried out on social media platforms (X, Instagram, TikTok, Facebook) for profiles using the CLA tag linked to various combat sports: boxing, judo, Brazilian jiu-jitsu (BJJ), mixed martial arts (MMA), taekwondo, muay thai, karate, and others. English was the chosen language since the Anglo-Saxon world is currently leading the development of these pedagogical proposals. Additionally, interviews from the professional blog *Combat Learning Podcast* by Josh Peacock were reviewed, as it is becoming a key reference for an emerging community of

martial arts and combat sports coaches and practitioners connected to the ecological dynamics approach and CLA-based teaching models.

## 3. Fighting knowledge: A Comprehensive Analysis of Combat Sports

The analysis of "fighting knowledge" conducted by Avelar-Rosa et al. (2015) combines the praxeological characterization of combat sports with comprehensive sports teaching models. The comprehensive models emphasize the development of intelligence and tactical thinking (tactical intention) as a fundamental part of both performance in actual practice and the learning process (López Ros et al., 2015). Although the *Teaching Games for Understanding* (TGfU) model by Bunker & Thorpe (1982) is the most well-known within this approach, this article focuses on another comprehensive model that has been specifically applied to combat sports: the Integrated Technical-Tactical Model developed by López Ros and Castejón (1998a, 1998b, 2005). According to this model, the structure of "fighting knowledge" includes both technical and tactical elements.

The technical dimension of "fighting knowledge" differentiates between technical gestures with offensive intention for finalization (strikes, throws, pins, joint locks, and chokes); technical gestures with defensive and neutralizing intention for transition/finalization (blocking, parrying, and evading); and technical gestures with dual transition intention (gripping, contact, unbalancing, and movement) (Avelar-Rosa et al., 2015). The tactical dimension of "fighting knowledge" is related to the intelligent use of motor actions in combat and decision-making processes during the fight. According to Avelar-Rosa and Figueiredo (2009, p. 46), the concept of tactical intention in combat sports should be understood as "the capacity that allows the athlete to solve the various situations that arise during a fight, regardless of the technical execution models that characterize different disciplines and whose institutional recognition imposes certain rules."

Following Tokitsu's (1979) analysis, Avelar-Rosa et al. (2015) identify key tactical components, such as: distance management (different actions arise depending on whether the distance is short, medium, or long); rhythm and cadence (changes in rhythm create opportunities for attack); perception (reading the opponent's target areas and predicting their movements). Furthermore, taking the initiative, whether attacking, anticipating, or counterattacking, must be considered as part of tactics. Tactical action is intentional, that is to say, it is functional (oriented toward a specific goal), interactive (it involves the opponent's behavior), and should be efficient (as it requires effective management of one's own and the opponent's resources). Additionally, tactical action often seeks to disrupt the opponent's defense through deterrent actions like feints, deceptions, distractions, or inducing specific responses that align with a secondary intention.

Ultimately, "fighting knowledge" integrates the common technical-tactical knowledge and principles across various combat disciplines. It can also be broken down into more specific levels, such as knowing how to strike, throw, lock, choke, or pin. Furthermore, this knowledge can be tailored to specific disciplines like judo, wrestling, boxing, etc., each representing a subset of the broader technical-tactical framework of the entire combat sports family.

Based on this conceptualization of "fighting knowledge," Avelar-Rosa (2020) developed a didactic proposal in which the objectives for introducing martial arts and combat sports must be linked to the integrated development of technique and tactics — with the development of tactical intentionality being the fundamental element. These objectives serve as tactical indicators (both defensive and offensive) of technical actions and are grouped into three possible situations:

- *Transition:* (1) Using changes in rhythm and deterrent actions through an active guard to provoke openings or imbalances in the opponent; (2) Using a guard that protects against potential attacks from the opponent; and (3) Creating optimal distance/position to execute finishing or neutralizing actions.

- *Finalization:* (1) Striving for efficiency in executing the appropriate finishing action; and (2) Performing the finishing action while maintaining positional and postural control.

- *Neutralization:* (1) Seeking effective execution of opponent-neutralizing actions while enabling counterattacks or transition processes.

To help organize teaching proposals aimed at developing these general and specific objectives, Avelar-Rosa (2020) emphasizes the importance of three didactic principles: managing initiative (anticipation or counterattack), balancing opposition (between cooperation and competition), and incorporating unpredictability (which should be practiced in both open and controlled situations).

The learning process of this "fighting knowledge" concept unfolds in three phases, with the last two being repeated cyclically, generating a spiral advancement pattern as the complexity of the learning increases (López-Ros et al., 2015):

(1) *Development of basic skills:* This phase focuses on developing the fundamental skills of martial arts/combat sports — the most basic form of the technical-tactical actions that make up the "fighting knowledge" structure. These actions consist of the basic gestures forming the specific technical and tactical repertoire for beginners. These skills can be cultivated through combat games, understood as open or semi-open cooperative tasks. These tasks don't always need to involve pairs and can include groups or entire classes. The goal of the task doesn't necessarily have to be targeting the opponent's body — it could also involve acquiring an object or territory. The principle of problem-solving should be at the core of all tasks. Therefore, the design of these tasks should allow the development and operationalization of relevant actions for success with minimal technical or tactical restrictions. In this phase, games like *kabaddi*[1] would be particularly useful, as they foster the development of basic skills in disciplines where grappling is the primary form of interaction.

(2) *Integration of technical and tactical skills:* This phase is characterized by the integration of the technical and tactical dimensions. Depending on the task structure, there may be more or less emphasis on one of these dimensions, but maintaining a balance between them should always be a priority. This balance promotes teaching techniques with some tactical elements and vice versa. In both cases, the goal is to develop specific and explicit technical-tactical skills in relation to the combat situation at hand. For this reason, task organization mainly focuses on forming practice pairs. This phase largely consists of semi-open cooperative tasks, developed through guided discovery, encouraging the use and consideration of various tools. For example, a game could involve pairs where the objective is simply to touch a specific part of the partner's body (like shoulders, knees, or stomach) while avoiding being touched. This would promote the management of offensive and defensive distancing in striking-based combat sports.

(3) *Application of Technical-Tactical Skills to Game Situations Similar to the Specific Sport:* This phase represents the moment when technical-tactical skills are applied to combat situations as they occur in competition. At this stage, most of the tasks are open and dual in nature. For example, a paired game could be proposed where both participants start by holding each other around the waist and must attempt to lift their opponent off the ground. A successful lift would be defined as both of the opponent's feet being simultaneously off the ground. This kind of exercise helps develop technical-tactical skills for sports where grappling is the primary form of interaction.

## 4. Combat Sports Viewed Through the Lens of Ecological Dynamics

Ecological dynamics (Vilar et al., 2012; Button et al., 2021) propose an approach that seeks to integrate James Jerome Gibson's ecological psychology (1966, 1986) with the mathematical models of dynamic systems. This approach takes the individual-environment relationship as the unit of analysis for studying human cognition during sports and physical activities. As a research program,

[1] In kabaddi, two teams meet on their respective rectangular fields separated by a line. Taking turns, an offensive player from one team enters the opposing team's half of the court and must tag as many defenders as possible and return to their own half within 30 seconds. If they successfully return, each defender tagged gives the attacking team a point, but if the opposing team restrains (grabs, blocks, or holds) the attacker in their half before he/she crosses the return line, the defending team scores a point and the attacker is out of the game until their team wins a point offensively or defensively.

it has been applied to the field of physical education (Rudd et al., 2021) and a wide variety of sports such as basketball (Araújo et al., 2004), boxing (Hristovski et al., 2006), climbing (Seifert et al., 2022), soccer (Espósito et al., 2024), American football (Yearby et al., 2024b), futsal (Vilar et al., 2014), sailing (Araújo et al., 2015), and rugby (Passos et al., 2008).

Ecological dynamics avoid both the structuralism of praxeology and the methodological individualism of the comprehensive approach. Both the praxeological and comprehensive proposals rely on a duality between mind (thought, decision-making, tactics) and body (execution, technique), which stems from the so-called cognitive or information-processing paradigm. This paradigm has been predominant in the field of motor learning and performance (Summer, 2004)[2] but clashes with the principles supported by ecological dynamics.

According to the information-processing model, the perceptual data we obtain through our senses must be processed through mental models or schemas located somewhere in the mind to be organized as usable information. Once processed, this information accesses stored memories to determine a set of pre-established motor programs that can be modified and executed in response to the processed data. This model is based on a theory of indirect information, where there is a delay between the sensory organs detecting environmental data and the moment when those data become actionable information. The sensory organs first perceive raw, impoverished (sometimes even flawed) data, which the brain must then process through a series of models or schemas to convert into usable information.

In contrast, ecological dynamics consider perception, decision-making, and action execution as an integrated process from the very beginning — part of the constant interaction between the individual and their environment.[3] Decision-making is not linked to what happens inside the brain (understood as a computer processing information) but instead emerges from the continuous interaction between an individual with specific capabilities and an environment providing certain informational energy flows (both variable and invariant). These flows are perceived by the individual as opportunities for action, known as affordances.[4]

In this way, ecological dynamics avoids conceiving combat skills as a type of (tactical) knowledge of technical actions that exists in the minds of the performers. To "know how to fight" viewed from the perspective of embodied cognition[5] advocated by ecological dynamics (Araújo & Davids, 2004), would be understood as effective behaviors that emerge within specific contexts of regulated combat. Therefore, the acquisition of combat skills ("to know how to fight") should not be understood as an internalization of declarative and procedural knowledge but rather as the acquisition (or adaptation) of a more functional (better coordinated and more efficient) relationship with the environment (combat sports) (Renshaw et al., 2019, p. 30). Since combat sports always

[2] For example, the proposal by Avelar-Rosa et al. (2015) considers tactical intentionality (the core of "fighting knowledge") in the same way that López Ros (2011) defines tactical thinking, namely: "a type of operational thinking, demonstrated in practice, formed by technical-tactical knowledge (…) that allows tactical behavior to be guided in the resolution of specific sports problems" (p. 78).

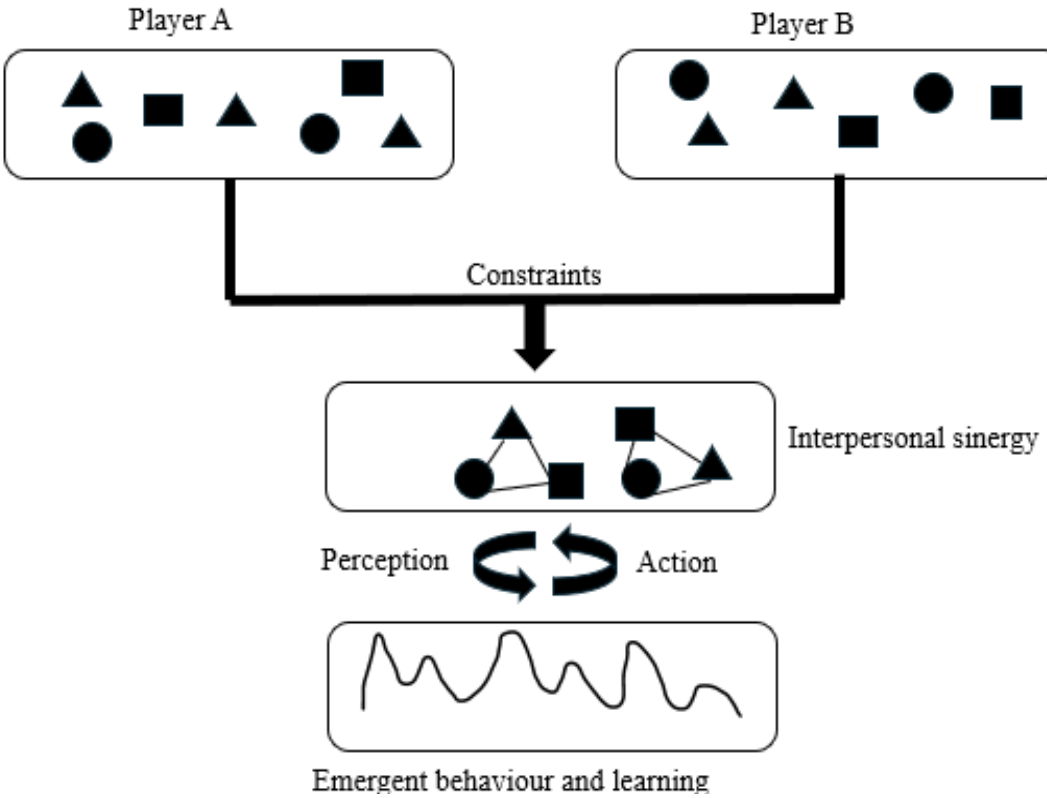
[3] "…the plan cannot be separated from execution. Perception, action, and cognition are so closely linked that trying to draw a line between them is futile." (Thelen, 1998, p. 285).

[4] The term affordance is a neologism coined by Gibson (1986) in his attempt to demonstrate the differentiating approach of his ecological psychology. Gibson criticized the notion of indirect perception defended by information processing models and instead defended the notion of direct perception of the elements of the environment by an organism evolutionarily coupled to it. For Gibson, an affordance does not belong exclusively to an organism or to the environment, but to both at the same time. That is, affordance appears as an opportunity for action for an organism with certain characteristics when it interacts with a specific environment (Heras-Escribano et al., 2022). For example, the same steps that for an adult would offer the possibility of going up the stairs in an ordinary way (using only the feet), for a very young child would offer the possibility of climbing the stairs with hands and feet.

[5] Embodied cognition seeks to dissolve the radical separation between body and mind. From this perspective, cognition is not exclusively identified with mental processes that occur solely within an organism's brain, but rather, cognition (what is considered mental processes) essentially involves the motor (action), sensory (perception), and affective (emotion) interactions of the entire organism (including its entire body, not just the brain) with the environment in which it is immersed (Capuccio, 2019).

involve individual duels, what "know how to fight" entails is the ability to carry out appropriate combat interactions, always considering the system composed of the individual(s) and the environment as the unit of analysis (Button et al., 2021), coupled in a nonlinear manner (Araújo et al., 2019). As Krabben et al. (2019) indicate, in combat sports, the two combatants self-organize, forming an interpersonal synergy where the actions and perceptions of both are coupled and interdependent (Figure 1). That is, each individual's perception is as closely linked to their partner's actions as it is to their own, and each individual's action alters their partner's perception just as it alters their own (Marsh et al., 2006).[6]

**Figure 1.** Each competitor contains a series of physiological, neurological, and other characteristics (visually expressed in the different geometric forms) but together they constitute a single dynamic system, whose global behavior (and longer-term learning) emerges from the local interactions generated interdependently by both through the coupling of their actions and perceptions (adapted from Krabben et al., 2019).

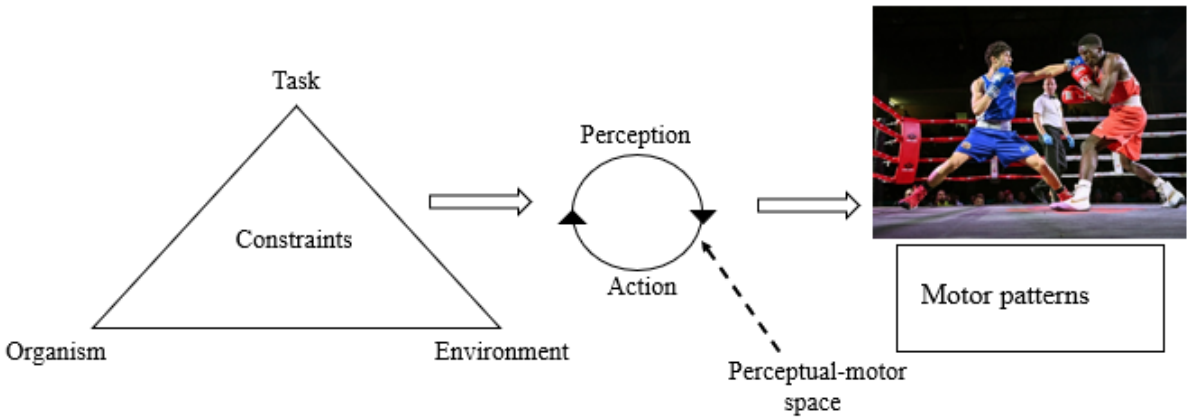



This dynamic system constituted by both combatants is influenced by a series of constraints, understood as frame conditions or characteristics of the individual's organism, the environment, or the task (Newell, 1986) that affect the emergence of certain action patterns during combat (Figure 2). Organismic constraints are divided into structural (body weight, height, shape) and functional (development of synaptic connections). Task and environmental constraints differ only in their specificity, with environmental constraints being more global and general than task constraints. Environmental constraints include gravity, temperature, and light, although also issues linked to the social environment such as public pressure, family support, or peer relationships (Button et al., 2021). Task constraints include goals, rules, and tools, implements or machines. In addition to these constraints linked to the organism, task, and environment, there are others situated midway between them (Sánchez-García, 2023); for example, the information that the coach can provide during or after actions, which Newell and Ranganathan (2010) call "augmented information," which acts as a constraint between the task and the environment. Differentiating the different types of constraints

[6] From ethnomethodological perspectives, the two opponents are also considered as the unit of analysis in relation to each other, expressed in a type of martial intercorporeality (Lefebvre, 2023) that varies throughout the action. Although not the objective of this work, from an ethnomethodological perspective, certain deficiencies in the social analysis of ecological dynamics have been pointed out that should be remediated (Sánchez-García et al., 2018).

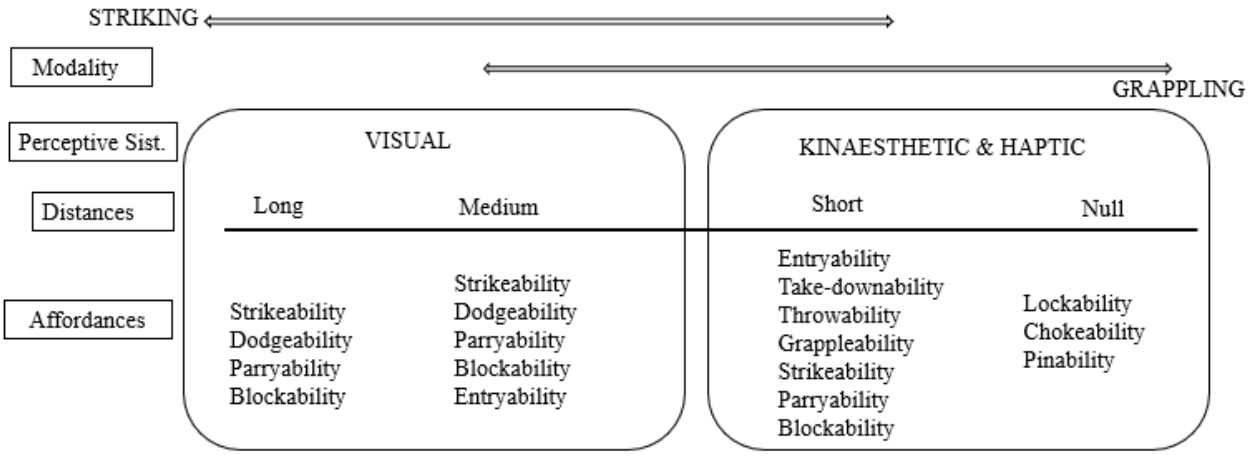
and how they affect the development of the activity will be key to using the manipulation of such constraints as influential variables in the teaching/learning process of combat sports (see CLA Didactic Principles below).

**Figure 2.** According to the ecological dynamics model, solutions (motor patterns) during combat emerge channelled by the constraints of the organism, task, and environment. Source: Own elaboration.




Both competitors take advantage of the system's (in)stability by generating perturbations through actions that involve a certain risk-taking, since such perturbations can be used against oneself (e.g., an attack always creates openings in one's own guard). In dynamic interactions with other people, as occurs in combat sports, combat affordances (both offensive and defensive) constantly appear and disappear. For such combat affordances (strikeability, takedownability, lockability, pinability, etc.) to appear, the other person's body must be in a certain position, distance, height, and speed relative to my own (Figure 3).

**Figure 3.** Relationship between combat modalities (striking or grappling), predominant perceptual systems (visual or kinaesthetic and haptic), distances (long (weapons and leg strikes); medium (punch, elbow, knee strikes); short (throws, takedowns, clinch); null (finishing actions through grappling) and key affordances (action opportunities). Note how, although striking modalities are linked to the optical information flow, they sometimes need kinaesthetic and haptic information that specify strikeability, blockability or parryability affordances (e.g., in the clinch); in turn, although grappling modalities depend largely on kinaesthetic and haptic information, there are times when they need visual information to detect entryability, blockability and dodgeability affordances, linked to the entry/defense actions of medium-distance entry to grab single or double leg. Source: own elaboration.




Furthermore, each opponent can generate deceptive behaviors (e.g., feints) that offer "false affordances" (Kimmel & Rogler, 2018) and serve to take advantage of the opponent's reaction (Sánchez-García et al., 2016). Returning to the question of interpersonal synergy, in confrontations that are equally matched in terms of the participants' capabilities, local combat interactions will tend

to compensate each other and, in many cases, result in overall stability within the system. Each combatant will therefore seek to generate instabilities (break the symmetry) in the system that lead to more advantageous states for themselves. That is, actions that seek to generate instability (break the symmetry) in the system could be considered offensive, and those that seek to maintain or restore stability (symmetry) within the system could be considered defensive actions (Krabben et al., 2019, p. 1828). Counterattack actions would be those that, instead of seeking to stabilize the system, would exploit the disruption caused by the other's attack for their own benefit. That is, they would embrace destabilization to move the system toward a state more advantageous to their interests. In fact, as Kimmel and Rogler (2018) assert, mastery in combat sports consists precisely in knowing how to navigate those limiting points of metastability in the system, where it can transition toward various possible states. The authors call this characteristic brinkmanship, which consists of knowing and acting within the limits of our capabilities.

Various studies on striking combat sports (Hristovski et al., 2006 in boxing; Okumura et al., 2012, 2017, and Yamamoto et al., 2016 in kendo; Maloney et al., 2021 in taekwondo) have shown the existence of two distances (long and short) that represent stable system states: these distances are safer for fighters but also offer fewer opportunities for action. In contrast, an intermediate distance represents a state of meta-stability — a zone of greater uncertainty where there is both more risk and a greater chance of executing successful actions. Since each athlete's reach varies based on their morphology, the key is to steer the fight toward a distance that is favorable to oneself and less favorable (or at least less optimal) for the opponent.

However, while interpersonal distance plays a key role in altering system states for striking disciplines, this parameter does not serve the same function in stand-up grappling sports (e.g., judo, wrestling). In these disciplines, the relative body orientation and center of gravity position become more important factors (Krabben et al., 2019).

## 5. Combat Motor Literacy, Combat Dexterity, and the CLA Model

From the perspective of ecological dynamics, teaching combat sports through a fixed list of basic techniques tied to specific modalities — where students are treated as mere executors and collectors of techniques — makes little sense. Instead, a more active role for students should be encouraged, promoting a broad exploration of the entire range of combat sports activities. This approach would help develop a combat motor literacy, laying the foundation for combat dexterity — a concept in ecological dynamics comparable to what comprehensive models describe as "fighting knowledge" (Avelar-Rosa et al., 2015). Combat dexterity involves the ability to generate effective, inventive, and adaptive combat solutions tailored to the specific context of each encounter.

### *5.1. Combat Motor Literacy and Combat Dexterity*

The concept of physical literacy has been widely debated over the past few decades in relation to pedagogical approaches in physical education (Young et al., 2020). Margaret Whitehead (2001, 2010), who popularized the term in the 1990s, emphasized the importance of meaningful movement experiences for individuals. Physical literacy, in this sense, refers to the motivation, confidence, physical competence, knowledge, and understanding that individuals develop in order to sustain lifelong physical activity. Physical literacy encompasses: Cognitive components (content knowledge, reasoning, tactical-strategic understanding, and rules); physical components (technical execution and physical capabilities); psychological components (confidence, motivation, self-regulation, and self-perception); and social components (relationships, cooperation, and ethical behavior). Rudd et al. (2020) criticized the narrow interpretation of physical literacy that ties it to measurable standards through capacity-based tests. A broader vision of physical literacy should recognize that beyond developing a wide base of motor skills, each individual can explore specific areas of movement that interest them most — aligning with individualized learning principles.

Instead of physical literacy, I propose using motor literacy because the latter emphasizes the dynamic dimension of a person; it refers to a person in action. The concept of motor literacy aligns with the ideas of Nikolai Bernstein, a key figure in the development of motor control as a scientific discipline and one of the theoretical pillars of ecological dynamics. Addressing the issue of motor learning, Bernstein (1996) rejected the Pavlovian assumption of repeatedly practicing a technique (a

fixed sequence of movements) to establish a neural pattern in the brain, which would later become automated for future use.

Bernstein's early research on efficiency in factory work observed the movement patterns of expert blacksmiths when striking with a hammer. Despite the blacksmiths' ability to consistently strike the same point with great precision, Bernstein discovered variability in the movements used to achieve the same result. Bernstein concluded that the blacksmiths were not repeating identical movements but rather consistent actions — goal-oriented movements required to achieve specific objectives (like hitting a precise spot). In other words, the path to mastery involved repeatedly solving the same type of motor problem rather than merely repeating the same movement patterns. Learning toward mastery was not about repeating the same movements but rather about repeatedly solving the same type of motor problem, thereby acquiring increasingly greater dexterity. This dexterity, according to Bernstein's (1996, p. 228) definition, consists of:

> The ability to find a motor solution to any external situation, that is, to adequately solve any emerging motor problem correctly (i.e., appropriately and accurately), quickly (with respect to both decision-making and achieving a correct result), rationally (i.e., conveniently and economically), and ingeniously (i.e., with ingenuity and initiative).

The notion of dexterity always implies a subject-environment interaction for the resolution of a problem in a specific context. Skillful problem-solving often includes flexible adaptation to novel and/or unexpected changing circumstances in the environment (Bernstein 1996, p. 23), as is the case, for example, in any combat sports. Bernstein (1996) captured this process of motor learning toward dexterity with the elegant expression "repetition without repetition."

If we try to apply these ideas to combat sports and their relationship with technique and tactics, it would be a mistake to think that the mere repetition of technical gestures (movements) is sufficient to generate learning and develop combat skill (Myszka et al., 2024). Following Bernstein, it would be more appropriate to understand technical gestures as ideal solutions to tactical situations (Sánchez-García, 2011); that is, to view technique as actions, not mere movements. In fact, what technique poses (especially if it is in pairs, like the kata of Japanese budo) are typical problems through a paradigmatic example of a solution. Speaking in terms of ecological dynamics, these techniques show anchors (Renshaw et al., 2019, p. 143) in the space of possible combat patterns, and their repeated practice (as technical work is conceived in traditional models) allows for some, albeit restricted, exploration (Krabben et al., 2019, p. 1833). What is needed, therefore, is to study these typical problems with diversity and variability, using games and tasks modified for the development of a combat dexterity. This is something we will see below when presenting the CLA model, where the students themselves take an active role in learning and cease to be mere performers, passive recipients in the learning process.

### *5.2. The CLA Teaching-Learning Model*

Depending on the motor learning theory we adopt, our assumptions about the teaching-learning model we use will vary. These types of assumptions have serious pedagogical implications, both for understanding and teaching content and for generating the transfer of these learning situations to the real-life competitive context. Let's briefly review the differences in teaching approaches derived from information processing theory and ecological dynamics theory.

Fitts and Posner's (1967) classic motor learning model on the different stages of skill acquisition faithfully reflects the information processing theory. According to this model, we should understand martial arts or combat sports as a set of techniques based on a schema or protocol that must be stored somewhere in the brain so that it can later be retrieved and executed bodily when necessary. For skill development according to this model: (1) first, we find the cognitive phase or stage, where the development of the perceptual and motor elements linked to basic movement patterns occurs; (2) then comes the associative phase, in which the association between perception and movement is consolidated, producing a refinement of the basic movement patterns; and finally (3) the autonomous phase, where information and movement are automatically processed. This type of learning model has been based on the traditional approach of linear pedagogy, based on the repetition of technical execution to establish and automate patterns that can then be applied in

tactical game situations. The student's role is passive and limited to receiving the prescriptive transmission of information from teachers or coaches.

In contrast, the motor learning model derived from ecological dynamics (Renshaw & Chow, 2019) considers two main phases in skill development: (1) the search and exploration phase to develop coordinative patterns in the interaction of the subject with the environment or with the subjects among themselves and the environment; (2) the adaptation phase, in which stable but flexible coordination patterns are formed, capable of taking advantage of the diversity of elements linked to the subject(s)-environment system, tuning intention and attention toward more relevant information that allows for fluidity and adaptation to the actions that emerge.

From this perspective, the difference between novices and experts lies not so much in their capacity to store and process information but in their ability to directly exploit information from the surrounding environment and to better perceive affordances through better attentional training. As Button et al. (2021) state, while novices explore to learn, advanced learners learn to explore, and experts explore efficiently (p. 133). Student exploration in classes takes place through the proposal of modified games and tasks, designed from pedagogical criteria linked to non-linear pedagogy (Button et al., 2021; Chow et al., 2022; Renshaw & Chow, 2019; Renshaw et al., 2019) of the constraint-based proposal, known as CLA (Constraints-Led Approach). This proposal is framed within the so-called active methodologies,[7] which are based on student-centered teaching; they give importance to the contextualized experience of students, favor discovery learning; and consider the active role of the student in the process of constructing their new learning and the role of the teacher as mediator or guide (León-Díaz et al., 2020, p. 588). All of these characteristics are shared by comprehensive teaching, both in the Integrated technical-tactical model and in Teaching Games for Understanding (TGFu) (Bunker & Thorpe, 1982; McNamee, 1992), which has opened the debate on the possible suitability of ecological dynamics as a theoretical basis for TGFU (Chow et al., 2023; Harvey et al., 2018; Renshaw et al., 2016; Tan et al., 2012). However, despite commonalities between comprehensive and CLA approaches, there are some key differences due to the theoretical model of information processing on which certain assumptions of the comprehensive approach are based (Figure 4), something that is developed in more detail in the following section (see especially point 5).

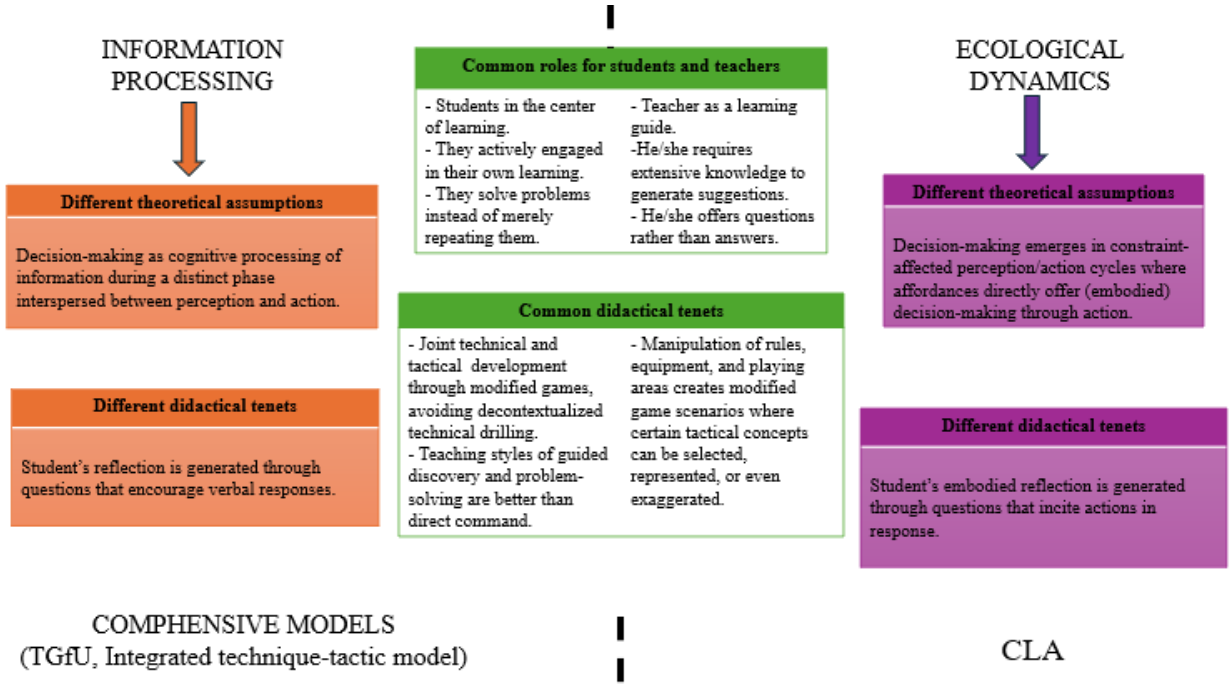
### *5.3. CLA Didactic Principles for Teaching/Learning Combat Sports*

Focusing specifically on the principles used in the CLA approach for teaching/learning combat sports, we would highlight:

(1) *Design based on representative learning*: The proposed tasks/games should require the same functional requirements from students as the target skill. Practice environments should be designed to simulate key aspects that appear in actual sport practice. That is, task/game design should allow students to explore and detect those invariants in information from optic, kinaesthetic, haptic (dynamic touch), and sound flow that specify action opportunities (affordances) for striking, taking down, throwing, locking, etc.

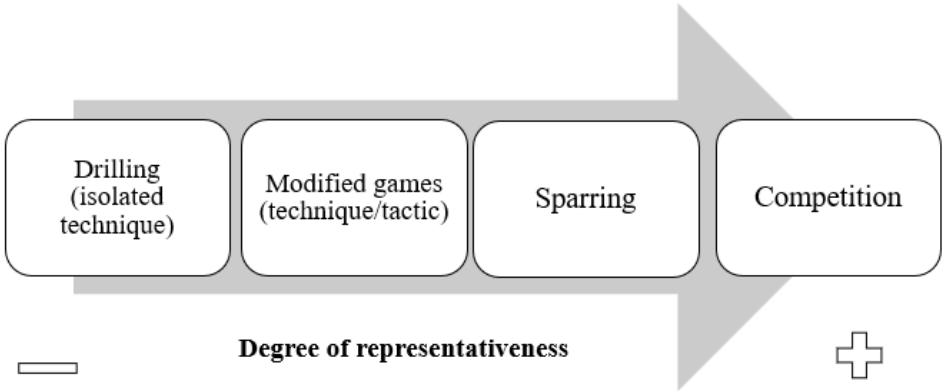
[7] Some notable examples of the implementation of active methodologies in combat sports can be found in proposals such as that of Guerra Brito (2002), who conducted a study on the initiation to Canarian wrestling, in which he concluded that the teaching methodology with semi-defined tasks, semi-open execution models, and the use of technical content with a strategic orientation improved learning compared to the use of a model with defined tasks, closed execution models and exclusively technical content. Robles Rodríguez (2003) showed in a study on judo initiation how the application of an active methodology, through the use of student-centered teaching styles, increased student creativity, the development of technical-tactical thinking and decision-making. For their part, Álamo Mendoza et al. (2011) showed in a judo initiation program how the application of active methodologies (linked to the guided discovery style) improved student learning more than the application of traditional styles. The teaching methodology with semi-defined tasks and semi-open execution models provided superior learning than the model with defined tasks and closed execution models, since it improved decision-making.

**Figure 4.** Relationship between comprehensive teaching and CLA, highlighting commonalities and differences linked to different theoretical models of motor learning (information processing and ecological dynamics). Source: own elaboration.




To understand what representativeness implies in task design, it is essential to understand the difference between movement and action, as referred to in Bernstein's work. Action implies goal-directed movement, aimed at solving a problem linked to a specific functional requirement. For example, the action of (effective) striking can be performed with multiple movement forms, but the truly important thing is to generate tasks that require finding these forms of effective striking, without specifying specific movements to achieve them. Thus, it makes no sense to separate technical and tactical work because what is worked on as technique should be understood as ideal solutions to tactical problems; that is, technique refers to actions, not mere movements, and therefore should always be worked on in a contextualized manner, in scenarios that respect the representativeness of learning. In fact, from the perspective of representativeness, what we call technical work and tactical work differ only in their degree of representativeness with respect to competition (Figure 5).

**Figure 5.** Different types of work in training/teaching linked to the degree of representativeness with respect to the target activity. Source: own elaboration.




Another issue linked to the principle of representativeness implies that the simplification of the skill should not be carried out through its analytical decomposition, since such segmentation modifies the key affordances for the execution of the skill as a whole. A typical error in teaching a technique in combat sports consists of breaking it down into steps that are then rehearsed against an unresisting opponent (oftentimes called drilling), which makes it impossible to explore the key affordances that will arise in a real competitive practice scenario.

(2) *Constraints to generate affordances*: The manipulation of constraints can address different categories, whether task-related (e.g., modifying rules or materials), the individual's organism (e.g., fatigue or stress), or the environment (e.g., changing the number of opponents). Constraints should not be understood as something negative (restrictive) but rather as conditions that allow for the detailed exploration of certain key affordances. That is, constraints emphasize or exaggerate the presence of certain affordances to be explored. It is important not to "over-constrain" the activity to force certain solutions to emerge because learning when and how to use an affordance is just as important, if not more so, than learning which affordance to use. This is something that can only be developed if variation in exploration is allowed (Renshaw et al., 2019).

The introduction of constraints should always respect the criterion of representativeness in the activity design. Representativeness not only refers to the scope of permitted actions linked to calm and rational decision-making, but also contains an emotional dimension that should not be neglected, introducing constraints that bring the training practice closer to the conditions of activation and stress during competition (Headrick et al., 2015). An example would be the introduction of handicaps, such as one of the players losing by a certain number of points and/or half the time remaining in a round.

(3) *Repetition without repetition*: Following Bernstein's (1996) maxim in proposing the coaching/teaching activity, functional variability should be ensured through search and exploration. There is no single ideal technical model or single linear progression from lesser to greater complexity. The degree of variability introduced into practice should be commensurate with the students' level of mastery. That is, for beginners, a lower degree of variability in the environment and/or task would be appropriate by exploring one or two possible solutions to allow for an effective appreciation of key affordances. For more advanced practitioners, the degree of variability would be increased to promote greater adaptability and inventiveness (Renshaw et al., 2019, p. 82).

(4) *Do not overuse instructions, information, or feedback*: From an ecological dynamics perspective, any type of information provided by the coach is understood as another type of constraint, halfway between task and environmental constraints (Newell & Ranganathan, 2010). This information influences how students relate to their physical and social environment.. That is, unlike traditional models in which the teacher verbally provides initial instructions and then corrections and guidance on the solution linked to an ideal model on an ongoing basis, based on ecological dynamics, the trainer's use of information of any kind must be measured and selective, knowing that it is an element that affects the student's exploratory activity in their search for solutions.

Thus, during practice, the teacher should avoid prescribing solutions or stating how the task should be done according to an ideal model. Instead, they should suggest what needs to be done (focus of intention) and where to pay attention (focus of attention) to find relevant information that helps achieve the objective. In the field of motor learning, there is already considerable evidence (Wulf et al., 1998; Wulf & Su, 2007) regarding the greater convenience of an external focus of attention (linked to the effects of the action) compared to an internal focus (linked to positions or parts of the performer's own body). Leaving aside the criticism of the internal-external separation (Hutto & Sánchez-García, 2015), the interesting point this distinction raises is the difference between movement and action. While the internal focus focuses on reproducing the model faithfully, the external focus focuses on fulfilling the functional requirements of the action; therefore, it focuses on the effects of the actions and is more appropriate for learning.

In any case, the coach's offering of the focus of attention seeks to provide attention training through which students are able to perceive relevant affordances linked to a goal (an intention). In this sense, it is important to distinguish between the final goal (e.g., an ippon in judo) and intermediate goals (e.g., generating openings, unbalancing, entering, etc.) and how they relate to the affordances linked to each of those goals (Esteves et al., 2011). The sequence of affordances selected in such a goal-directed activity involves the perception of nested affordances in multiscalar dynamics in which information for the next affordance plays a crucial role in the selection of each affordance in the sequence (Araújo et al., 2019, p. 567).

Regarding the type of feedback and error correction offered by the coach/teacher, ecological dynamics emphasizes avoiding excessive intervention at all times. For example, detailed correction

immediately after the attempt could prevent the athlete from taking advantage of the type of implicit feedback they receive for simply performing the action, which is linked to greater or lesser success[8]. It has been shown that students who learn through implicit instruction and feedback are more resistant to situations of paralysis under pressure, a phenomenon known as "choke", which is linked to the use of large amounts of detailed explicit and declarative knowledge of the skill during teaching (Masters, 2000; Masters & Maxwell, 2008; Sánchez-García & González, 2014). Otte et al. (2020) provide a model developed from an ecological approach (Skill Training Communication Model) on when and how to communicate this information throughout the different stages of learning development.

(5) *Questions that provoke actions, not verbal answers*: Regarding the use of questions as a teaching element used by teachers/coaches, we find here the greatest difference between the comprehensive models (e.g., TGfU, Integrated technical tactical Model) and CLA, due to their divergent positions regarding the concept of cognition and the importance given to the type of information relevant to learning.[9] Starting from the fundamental distinction established by Gibson (1966, 1977) between "knowledge of" (referring to the information directly present in the environment in different types of information flows) and "knowledge about" (information indirectly expressed in human language[10]), while for the representatives of the comprehensive models the important thing is the declarative or procedural knowledge about what to do and how to do it ("knowledge about" or symbolic cognition) before being able to execute it, for the representatives of CLA the important thing is the exploration and detection of key information in the environment ("knowledge of" or perceptual cognition) that is capable of specifying action opportunities (affordances) useful for that type of sporting activity (Araujo et al., 2009). That is, although both perspectives seek to generate more intelligent students, for the comprehensive models (TGfU and the Integrated Technical-Tactical Model), this implies explicitly knowing why things are done the way they are ("knowledge about"), and for CLA, this implies being able to perceive and use the affordances ("knowledge of") required to carry out actions capable of solving the different problems posed in each case.

This difference is clearly reflected in the different approaches of both proposals when using questions within formative assessment (linked to learning and integrated into the teaching-learning process) and shared assessment (dialogic assessment between teacher and students to encourage the latter's participation in their own learning process), considered key elements in the motor teaching-learning process (Herrero-González et al., 2024). While in comprehensive models, questions might be more like a type of Socratic dialogue in which the coach tries to get the student to reflect on tactical content, in CLA, the objective of this type of questions is to provoke actions, not verbal responses, since the questioning should aim to develop the athlete's "knowledge of" about the performance environment (not "knowledge about"), encouraging self-regulation activities during practice. That is, the questions the coach asks require a response through situated behavior. For example, a basketball coach might attempt to guide the athlete toward the desired response implicitly and externally by saying, "Show me how you could handle the last 1-on-1 situation differently, when you're pressured by an opponent and trying to find your open teammate in space"

[8] In CLA, the notion of error is not linked to a supposedly ideal technique that exists in itself, independently of the tactical situation in which it unfolds. Rather, error is understood as a suboptimal solution to the demands of the situation at that moment. That is, speaking of error always requires referring to the interaction context within which it occurs.

[9] Despite the differences between comprehensive models and the nonlinear pedagogy of CLA (Renshaw et al., 2016), both proposals are framed within active methodologies (León-Díaz et al., 2020) and use activities/tasks/games similar to real sports so that learning takes place within authentic contexts, which engages players cognitively (tactically) in the game and in learning the techniques required. Both proposals are also related to teaching styles that focus more on students, specifically on guided discovery and problem-solving (Mosston & Ashworth, 1999).

[10] According to Gibson, a distinction should be made "…between perceptual cognition, or knowledge of the environment, and symbolic cognition, or knowledge about the environment. The former is a direct response to things based on stimulus information; the latter is an indirect response to things based on stimulus sources produced by another human individual" (Gibson, 1966, p. 91).

(Otte et al., 2020, p. 8). Applied to combat sports, they might say, “Show me how you could escape this armbar situation using whole-body movement.”

Before concluding this section, I would like to briefly point out how, using the ecological dynamics/CLA approach, we could assess whether an adequate learning process is taking place (whether the tasks and games we are designing are offering the desired transfer). If, as we have pointed out from the ecological dynamics approach, the student does not need to be aware of or able to verbally communicate the technical-tactical elements worked on in the tasks/games to have acquired them, we can obtain evidence of learning by observing the behavior of their actions when performing specific assessment tests. For example, Davids et al. (2013) provide a clear vision for the design of a "representative performance test" to assess learning from an ecological dynamics perspective.

## 6. Some practical examples: MMA training methodology and modified games in judo and grappling/BJJ

This section presents some practical examples of the use of CLA in the teaching/training of combat sports. Although they refer to specific modalities, not the entire range of combat sports, they offer interesting insights into how to work with this methodology. We first present a generic example related to MMA training and then specific examples of modified games in judo and grappling/BJJ.

### *6.1. MMA Training*

Recently, Yearby et al. (2024a) proposed training for mixed martial arts (MMA) based on the assumptions of ecological dynamics, in which the athlete-environment relationship should always be taken into account as a unit of analysis to understand the acquisition and adaptation of the skill.[11] In fact, the authors considered in their analysis of MMA the dynamic development of the entire fighter-cage system, made up of the two opponents, the cage (in the shape of a hexagon with a metal mesh), the referee, and the audience. As they recommend, the fundamental mission of the coach or teacher should be to design environments and tasks that promote and encourage the constrained exploration of those action opportunities (affordances) that are key to carrying out the combat interaction, always maintaining the criterion of representativeness that guarantees an adequate transfer between training and competition. The authors propose various examples of work according to ecological dynamics for the development of skill in MMA training. For the purpose of sports initiation, the following would be of interest:

(1) An MMA skills development program based on four consecutive phases in which possible actions are restricted to work on specific phases of the fight as they normally occur in the competition sequence, always taking into account the representativeness of the proposal through the introduction of constraints. The phases are: (a) Shoot boxing, where coaches assign one athlete to deliver (light) boxing punches while pursuing offensive takedowns, and the other athlete to deliver (light) boxing punches while defending takedowns; (b) Clinch fighting, with both players practicing the clinch similar to Muay Thai, where fighters are at close range, grabbing the opponent's neck and striking (lightly) the opponent's abdomen with their knees; (c) Fence fighting, starting in single- or double-leg positions, where one athlete attempts to deliver a takedown and the other defends the takedown; and (d) Ground fighting, where starting situations are established with restrictions on permitted actions (e.g., light punches).

(2) Introduce sparring from the outset, whether linked to striking (e.g., tapping games as a warm-up); to wrestling/grappling (e.g., guiding students' intention and attention with phrases such as "inside space" to encourage dominant grip and control positioning; "be the bully" to encourage aggressive disruption of the opponent's dominant movement and control position; or "grab their hips" to develop hip (core) control); or to ground fighting (e.g., emphasizing a hierarchy of effective positions to guide students toward exploring a range of strategies that shape intentions to maintain control for the top player and escape for the bottom player).

[11] Pinto et al. (2021) had previously theoretically pointed out the need to develop technical-tactical training methods in MMA based on cognitive models and ecological dynamics but did not make a practical proposal on this matter.

### *6.2. Modified Games in Judo and Grappling/BJJ*

This last subsection offers two examples of modified games following the CLA recommendations as they are being applied in real-life coaching practice. Here, we only present the proposals and briefly mention typical errors[12] or corrections by the coach, something that would require adequate empirical research for each case.; for example, by conducting a cognitive ethnography using video analysis of teaching interactions as they occur in actual practice (Muntanyola-Saura & Sánchez-García, 2018).

The first example shows a modified game for working on leg offensive actions in judo (Figure 6),[13] and the second example shows a sequence of three games (Figures 7, 8, and 9)[14] linked to improving pinning actions in grappling/BJJ.[15] The game names were invented; most of the remaining information comes from original coach proposals.

**Figure 6.** Modified game based on CLA principles for working on leg offensive actions in judo. Adapted from Cal Jones.

<table>
<tr><th colspan="4">NAME OF THE GAME: Sweep, reap or take out<br>Source: adapted from Cal Jones</th></tr>
<tr><td colspan="4">General Objective: to build the skill of leg offensive actions (sweeping, reaping and hooking)</td></tr>
<tr><td colspan="4">Type of game: grappling</td></tr>
<tr><td>Organization: pairs</td><td>Duration: 5 min</td><td>Area: A circle of 3-4m diameter is delimited by cones/belts.</td><td>Equipment: Cones or belts</td></tr>
<tr><th colspan="2">PLAYER 1</th><th colspan="2">PLAYER 2</th></tr>
<tr><td colspan="2">Starting position: Standing facing the opponent.<br>Objective (intention): To take down the opponent with any leg action (sweeping, reaping or hooking) or to force him/her out of the circle by pushing or pulling.<br>Constraints: Only leg actions are allowed for throwing/taking down.<br>Focus of attention: The opponent's posture (whether he/she is more upright or crouched).<br>Scoring: A point is awarded to anyone who successfully brings the opponent down using a leg action or forces him/her out of the circle.</td><td colspan="2">Starting position: Standing facing the opponent.<br>Objective (intention): To take down the opponent with any leg action (sweeping, reaping or hooking) or to force him/her out of the circle by pushing or pulling.<br>Constraints: Only leg actions are allowed for throwing/taking down.<br>Focus of attention: The opponent's posture (whether he/she is more upright or crouched).<br>Scoring: A point is awarded to anyone who successfully brings the opponent down using a leg action or forces him/her out of the circle.</td></tr>
<tr><td colspan="2">Completion/Rotation/Change: the first player to reach 3 points wins and winner stays on.</td><td colspan="2">  </td></tr>
</table>

[12] Typical errors refer to suboptimal solutions that commonly emerge in grappling interactions (see note 9).

[13] This game appears on Peacock (2023).

[14] The series of three games appears at https://www.instagram.com/p/C1cTajYsJII

[15] In particular, the BJJ and grappling community in the English-speaking world is very active in developing this approach, although it is not the only one that embraces these principles. Other current examples of CLA being applied to combat sports training include Phillip Carson's fencing approach at the Salle Ossian Fencing Club (Wales); Emil Fitoussey's Muay Thai approach (Sweden); Adam Haniver's boxing approach at the Eastbourne Boxing Club (England); Kyvann Gonzalez's BJJ and MMA approach at Bodega Jiujitsu (USA); Ed Ingamells's grappling approach at the Institute of Grappling (England); and Demetrio Cereijo Suárez's BJJ approach at EDAM Center (Spain).

In this game, Cal Jones uses TGfU principles (simplification and exaggeration), introducing constraints to work on technical actions involving leg offensive actions, but contextualized within a tactical situation that maintains the functional representativeness of combat. To this end, Jones limits (simplifies) the number of possible judo actions (sweeping, reaping, and hooking) through rules (task constraints) so that (exaggerates) they appear much more frequently. Furthermore, by introducing a double winning condition (either throwing the opponent to the ground with a leg action or removing them from the circle), he allows leg offensive actions to be worked on in an exploratory manner, not through mere closed technical repetition. If the only winning condition were to throw the opponent with a leg action, students would likely lower their center of gravity and separate from each other, preventing the possibility of leg action and therefore avoiding the work they want to do. However, because in order to achieve the condition of pushing the other player out of the circle, they must necessarily stand up at some point in order to push, this opens up opportunities for action (affordances) for the opponent to sweep/reap/hook with their foot, just as would occur in a real competition.

The coach's mission within the practice would be to provide information and feedback that would help guide the students' exploration process. For example, they could suggest focusing on the opponent's posture, since distinguishing whether they are more upright or more crouched is essential for performing a sweep/reap/hook or pushing action, respectively. They could also help players rule out suboptimal solutions (errors) that occur during the game. For example, if players only move linearly backward when pushed, making them more vulnerable to being pushed out of the circle, the coach could suggest a focus of intention at that moment for that player using expressions such as "Sidestep" or "Move in circles." The coach could also ask participants a series of questions to be answered in a corporeal manner, modelling behaviors that demonstrate possible solutions.

Below is a sequence consisting of three games where, in addition to using simplification to encourage exploration of certain motor solutions linked to a specific problem (ground pinning), an increase in complexity is proposed as we move from game 1 and 2 to game 3.

In these games, different conditions are introduced for each player, linked to rules that address the objective and scoring method (task constraints), although no restrictions are added to the type of actions that can be performed, other than the fact that the opponent cannot be submitted. The coach could suggest the following as a focus of attention:

- *In game 1:* for the player on top, they should pay attention to the gaps formed between the elbows and knees of the opponent's defense; for the player below, they should pay attention to the connection between their own elbows and knees.
- *In game 2:* for the player on top, they should pay attention to the gap formed between their chest and the opponent's back. For the player below, they should pay attention to the alignment between the opponent's hips and their own.
- *In game 3:* for both players, they should pay attention to the relationship between the hips of both competitors.

Furthermore, during the games, the coach could guide the exploratory search for solutions through feedback (acting as real-time constraints) about the momentary focus of intention that would help the player avoid or escape from suboptimal solutions (contextualized errors linked to the situation). For example, in Game 3, it is typical for players who are being choked to try to escape by turning toward the side that tightens the choke more. In these cases, the coach could simply suggest another focus of intention through succinct comments such as "Exit to the other side," so that the player could explore that range of possibilities.

To promote practical understanding of the skill targeted in each game, the coach could also ask questions to which the players would respond through motor actions (not merely verbal responses) as possible answers/solutions to the posed question. For example, after positioning the players (or the coach positioning himself/herself as the attacker or defender) in a specific situation that the coach identified as problematic during the interaction (e.g., moving out to the side that closes the choke), they would ask the player to repeat the action several times, but trying to find different solutions each time. In this way, the contrast experienced in situ between more and less optimal solutions would increase the player's (embodied) understanding and combat dexterity.

**Figure 7.** Modified game based on CLA principles for working on pinning actions in BJJ/grappling. Adapted from Greg Souders (Standard Jiu-Jitsu, USA)

<table>
<tr><th colspan="4">NAME OF THE GAME: Pinning (1)<br>Source: adapted from Greg Souders (Standard Jiujitsu)</th></tr>
<tr><td colspan="4">General objective: to build the skill of chest to chest and chest to back pinning.</td></tr>
<tr><td colspan="4">Type of game: grappling</td></tr>
<tr><td colspan="2">Organization: pairs</td><td>Duration: 6 min</td><td>Area: no specific limits</td><td>Equipment: none</td></tr>
<tr><td colspan="3">PLAYER 1</td><td colspan="2">PLAYER 2</td></tr>
<tr><td colspan="3">Starting position: On the ground, holding the opponent's hips with locked hands.<br>Objectives (intentions): To clear the opponent’s hand, reach with the hands behind or under the opponent's elbows, and make chest-to-chest or chest-to-back contact.<br>Constraints: No submission allowed.<br>Focus of attention: Gaps between elbows and knees formed by the opponent's defense.<br>Scoring: Touch chest to chest or chest to back and interlock hands.</td><td colspan="2">Starting position: Lying on the side, hands on the opponent.<br>Objectives (intentions): To create space against the opponent and bring the legs back in front of the opponent.<br>Constraints: No submission allowed.<br>Focus of attention: Connection between elbows and knees.<br>Scoring: Bring the legs in front of the opponent, sit down, or stand up.</td></tr>
<tr><td colspan="3">Ending/Rotation/Switch: Play one round without changing roles for 3 minutes (returning to the starting position each time one of the two players scores) and then switch roles for another 3-minute round.</td><td colspan="2">  </td></tr>
</table>

**Figure 8.** Second set modified according to CLA principles for working on pinning actions in BJJ/CLA. Adapted from Greg Souders (Standard Jiujitsu, USA)

<table>
<tr><th colspan="4">NAME OF THE GAME: Pinning (2)<br>Source: adapted from Greg Souders (Standard Jiujitsu)</th></tr>
<tr><td colspan="4">General objective: to build the skill of chest to chest and chest to back pinning.</td></tr>
<tr><td colspan="4">Type of game: grappling</td></tr>
<tr><td colspan="2">Organization: pairs</td><td>Duration: 6 min</td><td>Area: No specific limits</td><td>Equipment: none</td></tr>
<tr><td colspan="3">PLAYER 1</td><td colspan="2">PLAYER 2</td></tr>
<tr><td colspan="3">Starting position: On the ground, holding the opponent's waist with interlocked hands.<br>Objective (intention): To maintain chest-to-back contact.<br>Constraints: No submission allowed.<br>Focus of attention: Space formed between chest and back.<br>Scoring: Maintain chest-to-back contact or achieve chest-to-chest contact (if turned) and interlocking hands behind the opponent.</td><td colspan="2">Starting position: Lying on one side, facing away from the opponent.<br>Objectives (intentions): To turn around, create space and bring the legs back in front of the opponent.<br>Constraints: No submission allowed.<br>Focus of attention: Alignment between your own and your opponent's hips.<br>Scoring: Put legs back in front of the opponent, sit down, or stand up.</td></tr>
<tr><td colspan="3">Ending/Rotation/Switch: Play one round without changing roles for 3 minutes (returning to the starting position each time one of the two players scores) and then switch roles for another 3-minute round.</td><td colspan="2">  </td></tr>
</table>

**Figure 9.** Third game modified according to CLA principles for working on pinning actions in BJJ/grappling. Adapted from Greg Souders (Standard Jiujitsu, USA)

<table>
<tr><th colspan="4">NAME OF THE GAME: Pinning (3)<br>Fuente: adapted from Greg Souders (Standard Jiujitsu)</th></tr>
<tr><td colspan="4">General objective: to build the skill of chest to chest and chest to back pinning.</td></tr>
<tr><td colspan="4">Type of game: grappling</td></tr>
<tr><td>Organization: pairs</td><td>Duration: 6 min</td><td>Area: No specific limits</td><td>Equipment: none</td></tr>
<tr><td colspan="2">PLAYER 1</td><td colspan="2">PLAYER 2</td></tr>
<tr><td colspan="2">Starting position: On the ground, holding the opponent's waist with interlocked hands.<br>Objectives (intentions): To maintain chest-to-chest or chest-to-back contact and cover the opponent's hips.<br>Constraints: No submission allowed.<br>Focus of attention: Hips-to-hips relationship.<br>Scoring: Achieve chest-to-back or chest-to-chest contact and cover the opponent's hips.</td><td colspan="2">Starting position: Lying on one side, back, or facing the opponent.<br>Objectives (intentions): To create space and bring the legs in front of the opponent.<br>Constraints: No submission allowed.<br>Focus of attention: Hips-to-hips relationship.<br>Scoring: Bring legs back in front of the opponent (regain guard), sit down, or stand up.</td></tr>
<tr><td colspan="2">Ending/Rotation/Switch: Play one round without changing roles for 3 minutes (returning to the starting position each time one of the two players scores) and then switch roles for another 3-minute round.</td><td colspan="2">  </td></tr>
</table>

## 7. Conclusion

This paper has attempted to summarize how combat sports could be analyzed and how an introduction to teaching them could be carried out from the perspective of ecological dynamics. Entering into a fruitful debate with the approach of comprehensive models, especially with the interesting concept of "to know how to fight" the article proposes combat motor literacy and combat dexterity as central axes of combat sports initiation from an ecological dynamics perspective, developed using CLA didactic criteria. The final section on the relationship between examples of real-life proposals and such criteria can serve as a guide for developing modified games aimed at the initiation to combat sports.

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## Author's biographical data

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