# THE ROLE OF THE BODY IN COGNITION – APPLICATION IN SPORTS AND MILITARY INSTRUCTION –

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*This essay proposes the idea that an individual's body has an undeniable role in the understanding of the concrete world. Embodied cognition is an approach to cognition that puts emphasis on locomotion, which is one of the most important ways an organism receives sensory signals about the environment. 4E Cognition theory has as a core idea the fact that our mind is not limited only to the brain, and it expands throughout the whole body and also in the environment. This view came as an opposition to Descartes' ideology that supports the existence of the mind without a body. Furthermore, 4E Cognition critiques traditional cognitive psychology, which is strongly influenced by computationalism, which classifies the mind as an abstract information processor and places minimal importance on the mind's connection to the outside world.*

*This paper argues that the body is an essential tool that provides information about the exterior world and influences cognition. This idea connects to the way an athlete or a soldier perceives and manages information through the body's motion, therefore the study explores how bodily experience shapes perception and action by making use of the comprehensive framework provided by the embodied cognition theory, giving representative examples from sport and military contexts.*

*Keywords: embodied cognition; perception; physical performance; military instruction; automatisms;*

## INTRODUCTION

The mind as a complex internal structure offers multiple perspectives regarding cognition and how it works. I advocate the view that the body's role in cognitive processes is essential, and that embodied cognition explains the best how it is possible. In this regard, athletes and soldiers provides the best examples that demonstrate exactly how repeated movements and physical actions improve certain cognitive processes and influence perception and mental activity. This idea contradicts the view that physical performance is based solely on muscle memory or automatisms, and that it does not have any effect on the mind and does not influence our way of thinking.

*4E Cognition theory* best presents the importance of our bodies in our understanding of the world and the way our interaction with the environment directly shapes how we perceive reality. By supporting this view, there seem to be important consequences for professional athletes and soldiers considering the number of physical trainings they do and how they constantly work with specific objects that also influence their cognition and how they relate to the environment.

## 4E COGNITION IN SPORTS AND MILITARY INSTRUCTION

The approach proposes that cognition is not limited to our heads, that it is embodied, enacted, extended and embedded. It contradicts the traditional views which argue that cognition occurs in the head through mental representations of states of affair, which are interpreted symbolically and generate an action, a response.

Sports and military domains generate valuable input that successfully defends the 4E cognition theory. There are several examples that can be taken into consideration. In sports such as tennis, canoeing, baseball, athletes must make use of certain objects from the environment, such as rackets, paddles, bats, in order to perform tasks required by that specific sport. These objects help them understand how the movement works, the biomechanics behind it, and ultimately, they represent ways in which players and soldiers understand the properties of the environment by their interaction within it.

In military instructions, soldiers work with weapons and perform specific physical activities that require always having such objects at hand and learning

to control movement and actions while handling these tools. A consequence would be that soldiers get used to the physical properties of the object, and they redefine their motions in correspondence with it and the way it works. It has an important effect on their mental representation of the environment, which subsequently provides necessary structure and support for them to effectively think and act. These ideas show how embedded cognition applies to sports and the military domains and they also highlight the importance of embedded cognition in skill acquisition, a central part of sports and military physical practice.

In terms of extended cognition, the objects mentioned previously and defined as external tools become extensions of the mind because they serve a purpose that is completed by manipulating them in the intended way. For instance, in tennis, the interaction of the agent with the racket causes the ball's change of trajectory. In this way, the immediate state of affairs modifies according to the knowledge that the player has about the tool used and its properties, therefore the racket constitutes a part of the agent's cognitive function.

The same rationale applies to the soldier in his interaction with weapons and equipment within contexts of tactical operations. Soldiers integrate weapons to their body schemas, by repeatedly interacting with them. Therefore, they extend their sensorimotor system and act in accordance to a renewed mental configuration of their own persona. It happens as an effect of the *"extended mind"*, which adapts mental processes in order to improve cognition by relying on the body's activity in the environment.

Another view to extended cognition associates the knowledge and intentions of a larger group of people that serve a common purpose, the case of military groups being relevant in this respect. In this case, the coupling between systems is mediated by language (Clark, Chalmers, 1998). This socially extended cognition could be represented successfully by how a sports team functions during a match or a performance and how a platoon manages to cooperate and apply certain field strategies. There seems to be an exterior conscience of the group, which *"acts"* and *"thinks"* according to the guidelines imposed by game regulations, specific tactics and trained movements.

Practicing sports at a performance level implies repetition of specific movements and repeated usage of certain aptitudes, and an effect is that athletes develop a different perception of the world. For example, behaviour is influenced by sport activities, which in the long term impose certain values that athletes have to acquire and integrate in their own value system. Consequently, using this concept, it could be easily argued that *"the perceived world is a consequence of the actions the body*

*takes toward it"* (Cappuccio, 2019). In this case, sports model an agent's world by requiring both physical activity and certain mental processes that influence the overall perception.

This is also the case in the military domain, because soldiers take repeated actions and exercise certain tactics and movements that restructure their perceptual map and creates automatisms and certain *"neural shortcuts"* that ultimately constitute the basis of performance in the military field action.

These ideas lead to the same conclusion, that enacted cognition plays a central role in the athlete's physical and mental development, and it also justifies the superior cognitive abilities that athletes and soldiers exert during their physical performances.

## COGNITION IN AUTOMATISMS

Skill acquisition in sports and military instruction is considered a process from an initial cognitive phase to a superior phase where performance becomes automatic. This view includes the action of muscle memory, which allows an athlete and a soldier to pay less attention to their movements, because they require less conscious action. In this way, they manage to focus more on variables that interfere with their performances, exterior stimuli such as the opponent's actions, the public or commanders, weather and other potential stressors.

Motor skills development consists of three stages of learning (Fitts, Posner, 1967). These three stages are represented by *the cognitive stage, the associative stage* and *the autonomous stage.* The focus is going to be on the last stage, because it is the most common process among professional athletes and soldiers and the way it works offers important insights into their cognitive abilities.

Automaticity is an advanced cognitive process that is accessed through repetition and constant training. As opposed to perspectives that argue against the role of cognition in advanced physical skills, the main idea is that, in complex automatized movements, cognition plays a central part.

It is generally believed by coaches, superiors and even athletes and soldiers that the actions they perform after long periods of training, in competitions and in battles, is only limited to their bodies. Moreover, it is also considered that it is an almost immediate reaction of the body in certain contexts, such as field tactical exercises with troops or sport championships, which does not require anything from the mind, being just the body's reaction to intensive trainings. The whole concept of embodied cognition is in opposition to approaches such as this, because the perspective of embodied cognition presents a unitary cognitive

system compounded of the body and the mind, which functions as a whole. Therefore, this holistic approach of cognition excludes the possibility of physical performance without the cognitive counterpart.

In order to create a better understanding of the automatisms displayed in elite athletes and soldiers, this paper clarifies certain aspects that influence their extremely precise and efficient movements. Athletes and soldiers have superior cognitive skills at the level of perception, anticipation and decision-making. Their trained skills include an advanced reaction time with great coordination between the interpretation of exterior stimuli and their mental and physical response. These aspects, presented in the light of the mirror neurons action, reveal the common neuronal basis of action observation and execution. It is also empirically demonstrated that when athletes and soldiers develop their skills in certain moves, their perception regarding contexts that include those moves will enhance considerably (Schorer et al., 2018). Given the perspective that perception is a *"trainable"* mental process among others, there are two important consequences that deserve to be mentioned:

- Firstly, physical exercises performed repeatedly lead to a special mental development experienced by elite athletes and soldiers. In this way, certain cognitive components are enhanced. The architecture of the mind seems to remodel, to adapt to the actions performed by the body. Therefore, the analysis suggests that intensive physical trainings that test the limits of the body help both athletes and soldiers to have a better understanding of their physical capacities and to develop mental abilities that support and facilitate their actions by transferring part of the cognitive load, prominent in cognitive and associative stages, to the body, therefore resulting in the autonomous stage. It does not undermine the action of the mind, but simply shows how it is distributed across the body and the environment with the purpose of enabling the athletes and soldiers better concentrate on things that they cannot control instead of directing energy and attention towards actions that could be internalized and ultimately automized.

- Secondly, this *"shift"* illustrates the flexibility of the mind and how it can adapt to stressful and intense situations. Thus, when a movement or physical procedure is internalized, the body manages to *"take control"*, especially when the mind is preoccupied with other aspects. Here is important to note the distinction between conscious action and cognitive action. Automatic moves occur more often than not unconsciously when the agent has his attention distributed towards external or even internal factors that could disrupt his performance. In this way, the body's automatic response could be seen as an *"autopilot"* that takes control whenever

other situations that need to be taken care of emerge. That is why, in trainings, athletes and soldiers must be fully conscious and focused on the movements they perform, in order to assimilate and comprehend how they are executed. Only after fully understanding the biomechanics behind it, can athletes and soldiers start the repetition process required by the automatization of the process. This aspect provides evidence that the action of the body is crucial in cognition and has an important role in the way we process information and react to it.

## IMPORTANCE OF THE TOPIC

Combating existent stereotypes in the sport and war collective is extremely important because coaches and commanders that do not understand the power of the mind in sports and battles fail to help their students complete a holistic preparation.

Being aware of the powerful connection between body and mind would help specialists in sports and military instruction focus on developing balanced programs, to train more efficiently the mind along with the body. Techniques that focus more on the contribution of mental processes in the action of the body would optimize the movements performed and provide insights about the body-mind connection that could contribute to the soldiers' and athletes' self-image and overall physical and mental performance.

In the sports domain, integrating specialized trainings that put emphasis on strengthening the connection between body and mind would help athletes develop at a superior level by forming a better understanding of their own bodies and the environment they act upon (Aman et al., 2015).

In the military field, soldiers' mental representations and body-control play a vital role in their activity. The stressful environment and demanding conditions require both mental and physical strength and stability. In addition, soldiers must remain focused and highly vigilant at all times during their operations, they must take fast decisions and overall process data at a very high level. Therefore, the relationship they establish with the environment is essential because they constantly interact with external objects and persons and subsequently develop a mental schema that is in accordance with their immediate reality. Embodied cognition mediates this process by providing the necessary tools for developing a global knowledge that connects data from the environment with mental activity.

Explaining aspects of cognitive sciences by using examples from sports and military fields and vice versa represents a way in which these three domains can gain valuable input and new perspectives can be explored. It is also the evolutionary perspective that provides important ideas regarding the evolution

of physical exercises and of cognition. For instance, natural selection, the process that favours individuals with certain physical abilities which would survive in dangerous situations, could be interpreted as a trigger to more complex cognitive functions. In this sense, the body's actions in an environment would conduct to a better understanding of the world and a manifold perception that is related to complex mental processes.

## CONCLUSIONS

In kinesiology, physical exercises are defined as tools that allow athletes incorporate in a rational way an informational content. This definition clarifies that cognition is strongly influenced by the actions of the body in the environment, view sustained by embodied cognition as well as extended cognition, embedded cognition and enacted cognition. These all put value on the physical interactions and the way an individual perceives the exterior world based on his direct experience.

The 4E (embodied, enacted, extended, and embedded) framework for cognition offers a solid alternative to more traditional views that limit cognition to internal mental representations. Evidence from sports and military contexts illustrates how interactions with tools, objects, and group dynamics extend and shape cognitive processes, restructure perception, and enhance skill acquisition. Through repeated practice and physical activity, athletes and soldiers integrate objects and actions into their cognitive systems, demonstrating that thinking and understanding are deeply intertwined with bodily activity and environmental interactions. In other words, mental processes are directly shaped by physical activity and experience with external objects. These domains provide strong support for the relevance and applicability of 4E cognition in real-world, performance-driven contexts.

The "*activation*" of automatisms requires using specialized and superior mental functions that act rapidly, without the agent being fully conscious. It does not result in actions without "*the mind's presence*," but more likely in actions with the presence of complex and trained cognitive processes.

All the ideas presented in this essay support the same perspective, that the mind is present in all physical interactions and that the physical activity in the environment manages to develop cognition significantly.

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