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Implicit or Explicit Body Awareness: Which is more Efficient for Professional Athletes?

Application of Embodied Cognition in Sport Science

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Abstract

Objective: Investigating factors that affect the performance of professional athletes has always been one of the important fields of sports science.
Objective: One of the important questions in this regard is whether athletes are better to be self-aware while performing physical movements or, conversely, this self-awareness as an interfering factor will lead to a decline in their performance.
Methods: In the present study, an attempt has been made to examine this issue with an interdisciplinary view based on the physical cognition approach, especially with the application of two models of Dreyfuss (2007) and the meshed architecture (Christensen, Sutton and McIlewin 2016; Gllagher, 2020).
Results: According to the first model, self-awareness will interfere with the performance of skillful movements, and in the opposite model, the performance of movements requires awareness of self, body and position.
Conclusion: Both approaches seem to rightly point to different aspects of awareness in performing movements; although awareness of the current situation is essential for performing movements, overt body awareness interferes with learning and performing movements and can have adverse psychological consequences for athletes in the long run.

Introduction

Exploring the mind-body relationship inevitably involve an interdisciplinary endeavor, ranging from mind philosophy to sport psychology and cognitive science. Sports scientists can help cognitive scientists better understand how mind works and scientific researches in the mind fields can also help athletes to be more succeed. Athletic skill as a form of intelligence has specific cognitive capacities not less complex than complicated capacities required to solve mathematics (Cappuccio, 2018). Accordingly, co-ownership between cognitive and sports scientists seems important and essential. The concept of "Cognition" in sports science is typically based on the classical paradigm of cognitive science according to which mental representations and internal modeling of the world play a central role in athletic skills (Ericsson, 2006; Sutton, 2007); that is, an athlete mentally represents situations, and as soon as he or she feels changes in the environment, relevant information is processed in his or her brain and responses to this change is determined. Thus, the role of body in "Cognition" is a passive role, just as an information carrier. According to the computational approach,

dominating in cognitive science till last two decades, and still has significant influence in the explanation of the mind-body problem, body merely provides sensory input to processing and expresses behavioral output (Wilson & Fagila, 2001). Attention to the causal role of the body in cognitive processes derived from phenomenology, gradually penetrating to cognitive science and profoundly influencing of cognitive scientists' attitudes, led to development a new paradigm called "Embodied Cognition". In this alternative paradigm mental representations can be shaped consequently by embodied engagements with environment (Ilundáin-Agurruza, Krein & Erickson, 2018). Indeed, neither the mental processing of symbols nor the internal modeling of the world fundamentally shapes cognition. Instead, cognition is shaped by dynamic brain-body-world interactions. Indeed, cognitive processes is not limited in the brain, but it is shaped by the whole body (Kiverstein & Miller, 2015). Further, the body itself is interacting with others and environment that is cultural, social and etc. Embodied approaches have influences profoundly and widely on different fields of research in recent years. We should note that these approaches do not deny cognitive processing. Instead, embodied approaches challenge the adequacy of that researches merely investigating cognition in the brain regardless of bodily status and investigating body merely at the level of motor activities. Furthermore, according to these approaches, non-nervous structures of the body (for example, the posture of the body in the environment) are not merely a secondary source of information, but they construct psychological capacities (Wilson and Fagilla, 2011).

At the point of phenomenology, people do not communicate to own their body, others, and world through higher-order cognitive levels primarily, but they have some kind of implicit and pre-reflective self- consciousness; that is, a constantly present awareness of themselves on the periphery of the activities, actually awareness of the current experience before any reflection on it. Although phenomenologist do not have special consensus about what this level of consciousness is precisely defined, they agreed on that any experience always entails this level of self-awareness, basically embodied and engaged with others and the environment. In fact, the body is empirically always present in every perception and action, and it is perceived as a potential of "what can I do with my body" (Gallagher & Zahavi, 2005), and this awareness is the most basic and fundamental experience of our own self.

But do actions and movements require awareness of the limbs really? Is the bodily awareness an implicit consciousness or is it an explicit consciousness? Do professional athletes consciously execute his learned and practiced skills? Answers to these questions underlie many discussions in embodied cognition, and in two opposite approaches they have been answered differently.

Dreyfus's theory: Mindlessness in expert performances

In Dreyfus's view, one of the most important phenomenologists, people are not conscious of the

expert performance because in this situation a person interact intimately bodily with the environment and completely disregard himself or herself and his or her body (Dreyfus, 2007a). Even in a complete bodily absorption, the individual's subjectivity ceases (Dreyfus, 2007b). And just when this situation stops, awareness can come back; in addition, if self-consciousness returns during a movement, the skillful performance will be impaired (Dreyfus 2005; 2007). In accordance with this view, just if expert athletes act entirely automatically without any mediation of any concept and cognitive processes at the level of physical, he or she can perform well and effectively (Chaturvedi,2019).

But according to opposite embodied approaches, skilled people have essentially an enhanced implicit pre-reflective self-consciousness (legrand, 2007) or a heedful consciousness of situation (Sutton, McIlwain, Christensen, & Geeves, 2011) or skillful cognitive monitoring (Montero, 2010) or a combination of them (Hoffding, 2018). And this kind of consciousness not only do not prevent effective performance, but also promote it (Gallagher and Zahavi, 2019). Montero (2010) in her study, focusing on skillful dancing, argue that the best types of performances are thoughtful movements. That is, there is some kind of planning, forecasting, attention, monitoring, and conceptualization of actions (Montero, 2016). Also, according to Schusterman (2008), individuals apply explicit reflective awareness monitoring movements; moreover, according to Suttun (2011) we cannot define expertness by avoiding of conscious and explicit thoughts and in fact there is a flexible relationship between "knowing" and "doing", and thought processes access to motor processes and guide them. Also, meshed architecture proposed by Christensen, Sutton and McIlewin (2016) particularly in contrast to the Dreyfus's model. This model integrates cognitive and motor processing togheter. And, Shaun Gllagher (2020), modified it.

Meshed architecture: Mindfulness in expert performances

The model of meshed architecture has been proposed to explain how mindful process reach in to motoric processes during performances.

As Christensen, Sutton, and Mcllwian have argued:

“Cognitive control reduces during skill as automatic control comes to play an increasing role, but cognitive control continues to make a substantial positive contribution at advanced levels of skill."(2016)

So, the model involves a hierarchical division of control processing, with cognitive control focused on strategic aspects of performance and automatic processes concerned with implementation. In addition, there is a "situated awareness" coming in performance as being aware of what one is doing, but also using that awareness as a mode of control for action. So, they have argued controlled and automatic process are closely integrated in skilled action, and cognitive control directly influence motor execution in many cases (2016).

Enhanced meshed architecture model

Shaun Gallagher (2020) modified the meshed model and applied it to explain Social Cognition (processes during seeing or interacting with other humans). At the Gallagher's view if cognition is embodied then social cognition will also embodied. Therefore, social skills are a kind of embodied skills (because our cognition fundamentally is embodied and derived from sensory-motor engagement with the world and others), and social communicating is an execution of the embodied social skills. Since in Group sports or even during the presence of an athlete in a stadium full of spectators or while learning movements and correcting them by the instructor, Social Cognition is involved it is possible to apply the enhanced meshed model for social aspects of performance that are integral parts of sport situations.

Gallagher have modified the meshed model with following suggestions:

- Cognitive processes involved in strategic control of performance is not merely limited to explicit conscious control, and we can consider cognitive aspect from higher-order thought to pre-reflective awareness.
- Control is not entirely top-down driven by cognitive process, and there is a bottom-up control that is not automatic.
- Environmental, social and normative factors integrate into performance.
- Affective processes modulate the dynamic of integration control processing with environmental, social and normative factors.

As we can see of the meshed model and enhanced meshed model, during the expert performance, cognitive processes either explicitly or implicitly affect the motor functions. Also, the bodily states have a mutual effect on cognitive control, and intensity and valence of emotional situations at the moment of expert performance modulate physical situations and cognitive controls. In addition, social, cultural and ethical norms are also effective in the way through which movements are implemented. And eventually, in the tournaments the similarity of the location of exercises with location of the competition, atmosphere of the stadium, spectators ' encouragement, connecting to the coach, empathy between members of teams in group sports, and perceiving the competitors ' postures all provides a situated consciousness that is inseparable of the expert performance.

Discussion and Conclusion

There have been many discussions in the area of embodiment on being conscious or unconscious in implementing athletic skills. According to Dreyfus (2007), individuals do not have any self-awareness of their bodies and themselves during skillful performance, and they are absorbed entirely in the execution of movements. Instead, the alternative approaches also have many supporters. In these approaches' expert performances involve mindful processing, and low-order aspects (bodily aspects) are modulated by higher level cognitive aspects. The Dreyfus model has an intriguing aspect that requires further investigation and cannot be simply put aside. In cognitive psychology, information and concepts are organized in two explicit and implicit categories.

Explicit knowledge is a propositional knowledge; for example: "for cycling, the legs must rotate in a circular axis." But knowing this proposition alone cannot lead to learn to ride a bike. Our body must be in a real cycling position, then first we should think about details of movements, but riding a bicycle becomes an automatic and unconscious process with more exercises and encodes in the procedural memory that is one of the implicit memory types. Indeed, the procedural knowledges (such cycling) are acquired via experiencing the performance not just through propositions. So, when a skill is acquired, it is stored as implicit knowledge and then not so explicitly accessible. Moreover, reducing explicit access to implicit knowledge's leads to develop and consolidate that skills (Sternberg, 2006). When we asked a skilled cyclist how to ride a bike, he probably couldn't have a completely detailed answer rather than a beginner who is just learning to ride a bike. In addition, awareness of each detailed movement leads to an increased sense of agency disrupting expert performances. The traumatic effect of the enhanced agency also has been seen in severe psychological disorders. Therefore, there are close boundaries that violate them can lead to adverse and negative consequences.

On the other hand, disregarding any kind of consciousness and cognitive processes from the motor skilled is also not accepted. As we mentioned in the meshed model, it is not possible to ignore the role situated awareness and cognitive controls in the expert performance. So, being conscious of "what am I doing in this moment?" and "what situation am I in?" is not only essential for skilled athletes but also an integral part of the best skilled performances. Nonetheless, reflecting on the details and planning further movement consciously at the moment of performance can cause an enhanced sense of agency disrupting on the automatic processes, and it can also gradually cause an exposure to the negative psychological consequences.

Finally, integrating important aspects of both models, we argue that situated awareness is essential for the expert performance, but the explicit awareness of detailed bodily movements can disrupt the execution of movements and have negative consequences. Hence, further cooperation between sports and cognitive scientist is a bilateral interaction. As studies on physical movements provide new attitudes underling a better understanding of the relationship between mind and body, cognitive science researches also offer more effective suggestions on learning and executing motor skills and for maintaining and promoting mental health of athletes.

Conflict of interest

The authors declare no conflict of interest.

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