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Embodied Cognition and Imagination in Sport
A Review of the *Handbook of Embodied Cognition and Sport Psychology*

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Abstract

The author critically reviews the content and specific chapters of the *Handbook of Embodied Cognition and Sport Psychology*, focusing on the importance of imagination and creativity within the cognitive science of sport. Emphasis is placed on the concept of motor imagery, which plays a central role in enhancing athlete performance. In addition, the following section explores the topic of measuring creativity in a way that is appropriate to the specific discipline, while also taking into account its enactive and embodied nature. This understanding allows for a more comprehensive exploration and cultivation of creativity.

Keywords: embodiment; embodied cognition; imagination; creativity; anticipation; sport

1. Introduction

In January 2019, Massimiliano L. Cappuccio edited a publication that showcases the interdisciplinary collaboration between cognitive scientists and sport psychologists, highlighting the importance and impact of embodiment in sport activities. Comprising twenty-six chapters, this substantial volume includes cutting-edge perspectives and research findings that demonstrate the intrinsic relationship between sport and science. At over 800 pages, the book is divided into seven distinct parts, each focusing on a specific topic area. Each chapter represents a collaborative effort among specialists from diverse fields, primarily philosophers and psychologists, but also including sociologists, neuroscientists, coaches, and educators.

This remarkable publication stands out as the first comprehensive and wide-ranging monograph to explore the collaboration between cognitive scientists and sport psychologists, underscoring the interconnectedness of these disciplines and the substantial benefits that can result from their joint efforts. The practical implications of their findings are of immense value to both professional and amateur sport.

2. Outline of Structure and Content

Part One of the book explores the basic concepts and assumptions of embodied cognition and its relevance to sport psychology. Chapter 1 provides an in-depth examination of the key propositions and emphasizes the importance of understanding them correctly. Chapter 2 highlights the importance of emotions in sport and draws parallels between physical exercise and the exercise of emotions. Chapter 3 explores the application of ecological psychology to the development of novel training strategies for athletes. Chapter 4 presents a perspective that advocates evaluating sport outcomes through the lens of discipline-specific considerations, focusing on individuals as embodied beings with unique achievements and challenges.

The second part of the book focuses on the nature of embodied skills, their development, and the factors that influence them. Chapter 5 explores theories based on Roy Baumeister's assertion that self-awareness has a significant impact on an athlete's performance. Chapters 6, 7, and 8 examine various facets of cognitive control theory, exploring phenomena such as skilled performance and unreflective action.

The third part focuses on theories of learning and skill development and the interplay between sensorimotor and mental skills. Chapter 9 presents theories of embodiment in two distinct variations: enactive and extended cognition, and highlights their practical implications for physical education. It also emphasizes the value of expanding physical activity to include contemplative and

mindful presence exercises. Continuing the discussion of physical education, Chapter 10 highlights its positive impact on the development of children's cognitive skills. Chapter 11 extends this exploration in some ways by addressing the question of talent and the interplay between innate factors and skills acquired through diligent effort. Complementing this discourse, Chapter 12 examines the influence of technology on the accelerated and more effective development of sensorimotor skills.

The fourth part examines the social dimension of sport skills, particularly relevant in team sports. Chapter 13 introduces the theory of "embodied simulation" (cf. Gallese, 2007), which posits that an individual's motor system learns by observing the actions of others, thereby enabling advantages within the team, such as rapid responsiveness to situational changes. In contrast, Chapter 14 highlights the potential drawbacks of observation, which can increase the likelihood of failure. Chapter 15 reviews the literature on joint action in sport.

Part Five examines the socio-cultural context in which each athlete operates and its influence on performance. Chapter 16 examines how the ethos of martial arts, particularly East Asian martial arts, shapes the pursuit of victory. Chapter 17 illustrates how the imposition of external constraints based on gender visibly affects the performance of athletes, with sexist stereotypes creating obstacles for athletes, particularly women, in achieving their goals and achieving success. Chapter 18 highlights the importance of developing accurate sociocultural research methods and approaches, as a comprehensive understanding of this context helps to determine its influence on sport practices.

Part six explores issues related to the concept of affordance (cf. Gibson, 1966; Norman, 1988) and its extension to embodied cognition. Chapter 19 outlines the application of this concept in sport psychology, while chapter 20 focuses on the mechanisms that enable athletes to make decisions. Chapter 21 focuses specifically on throwing as an affordance relevant to evolutionary development. Expanding the definition of affordances, Chapter 22 includes anticipatory actions based on predicted consequences.

Part Seven focuses on human anticipatory abilities. Chapter 23 highlights the crucial role of imagination in an athlete's preparation for competition or overcoming challenges, emphasizing its predictive function. Chapter 24 explores the application of the predictive processing framework (cf. Clark, 2016; Piekarski, 2021) to the study of saccadic eye movements. The chapter focuses on the predictive capabilities of these eye movements, which play a crucial role in the intelligent recognition of object features in the context of interaction (cf. Friston et al., 2012). Chapter 25 highlights the importance of anticipation in generating original solutions in challenging situations, emphasizing that expertise extends beyond responding appropriately to familiar scenarios to creatively learning from past actions and envisioning innovative solutions. This theme

continues in Chapter 26, which introduces the concept of improvisation and its remarkable ability to blend existing knowledge with anticipation.

The variety of topics covered provides multiple perspectives on embodied cognition in sport. Success in sport does not depend solely on rigorous training or innate talent; it involves multiple components, with mental preparation playing a crucial role. Collaborative efforts between cognitive scientists and sport psychologists can foster an understanding of the mental skills and abilities necessary for athletes to achieve increasingly ambitious goals, as well as strategies for developing these skills in the general population.

3. The Role of Imagination and Creativity

I will now discuss selected chapters with particular attention to the possibilities offered by the use of imagination in training and competition, as well as research on creativity, especially in its embodied and enactive forms. Chapter 23, entitled *Imagery, Expertise, and Action: A Window into Embodiment*, by sport psychologists Tadhg E. MacIntyre, Noel E. Brick, Jürgen Beckmann, Aidan P. Moran, and neuroscientist Christopher R. Madan, provides an overview of the paradigm shift in mental imagery research. The authors begin with a broad discussion of the nature of mental imagery, highlighting key research that has contributed to a deeper understanding of the subject. They then explore the concept of motor imagery and examine Jeannerod's action simulation model (Jeannerod, 2001), which conceptualizes imagery and movement as integral components of a continuous action continuum. The authors emphasize that significant developments have occurred over the past two decades in the establishment of conceptual frameworks, measurement methods, and application of the expertise paradigm. As a result, they present the current state of research on imagery and imagination. The use of imagery in skill development is commonly referred to as mental practice, and researchers recognize its practical importance as well as its theoretical significance. The study of visual imagery has led to a better understanding of visual perception, while studies of motor imagery have helped to elucidate the processes underlying action control in the brain. The authors point out that the issue of action has been somewhat neglected in research that has traditionally focused on disembodied perceptions.

These issues are approached differently within the framework of embodied cognition, which posits that cognitive representations are rooted in and simulated by sensorimotor activity (cf. Shapiro, 2011; Wilson & Golonka, 2014). The concept of embodied cognition draws attention to the influence of the body on cognitive processes, the interplay between cognition and action, and the dependence of cognition on the environment. It also emphasizes that internal representation is not a necessary condition for cognition to occur. Lorey et al. emphasize that this perspective also has implications for imagery, which has

traditionally been understood in a disembodied way. However, there is currently no consensus among researchers on this issue. Some researchers have shifted their focus to sport in search of solutions related to embodied cognition at this level.

The authors then delve into the definition of motor imagery, highlighting the unique human ability to recreate past events and to fabricate non-existent objects or scenarios. They emphasize its central role in planning for the future and simulating situations that may never occur.

Mental imagery has been approached from different perspectives. Cognitive scientists have defined it as "a mental simulation process that involves the systematic use of imagery to covertly rehearse a movement without actually executing it" (Moran & O'Shea, 2020, 1). Conversely, sport psychologists emphasize the multisensory nature of imagery and refer to it as a sensory experience, which differs from the understanding of cognitive scientists. Neuroscientific research on imagery has led to increased interest in motor imagery.

Given the lack of clarity surrounding the understanding of motor imagery, the authors present the current debate within the field. Some researchers conceive of motor imagery as disembodied representations, while others argue that it involves a dynamic mental state in which motor actions are processed in memory without external execution, albeit accompanied by implicit movements in the limbs and muscles. Ultimately, the authors assert that these quasi-motions are central to their thesis, which posits that "motor imagery is a construct highly relevant in advancing our accounts of grounded cognition" (MacIntyre, Madan, Brick, Beckmann & Moran, 2019, 630).

The authors delve into the mental rotation paradigm, pioneered by Shepard and Metzler, which involves the mental comparison of two three-dimensional objects. The results of these studies show a correlation between the complexity of the cognitive operation and the time required to perform it. In addition, some subjects reported experiencing kinesthetic sensations. Building on these investigations, Kosslyn and others further explored the concept and offered support for embodied cognition by positing that "motor imagery was grounded in the physical experiences of the imager accumulated". (MacIntyre, Madan, Brick, Beckmann & Moran, 2019, 631).

In addition, recognizing the relationship between movement and imagery challenges previous definitions of imagery as occurring only in the absence of action. Research conducted by sport psychologists suggests that it is motor imagery, rather than visual imagery, that positively influences the performance of athletes.

The authors emphasize that these findings provide empirical support for individual differences in imagery, which are particularly evident in the field of athletics, where professional athletes tend to have more refined imagery skills

than amateur athletes. In conclusion, the authors advocate for collaborative research on motor imagery as it has the potential to enhance our understanding of the intricacies of the human mind.

In Chapter 25, *Embodied and Enactive Creativity in Sports*, the authors explore the topic of embodied and enactive creativity in sport. Zuzanna Rucinska and Kenneth Aggerholm provide an overview of how creativity has been conceptualized in the sports literature, while presenting their own perspectives based on embodiment and enactment. Given the elusive nature of creativity, the authors adopt a comprehensive framework that encompasses its defining features and characteristics, highlighting novelty, originality, flexibility, and usefulness as key components (Rucinska & Aggerholm, 2019). They further emphasize the normative dimension of creativity by referring to Klausen (2010), who argues that creative acts, even if unsuccessful, must meet certain criteria. In addition, the authors emphasize the importance of evaluating the creative output in the context of the intended audience.

In addition, the authors explore the requirements for a process to be considered creative. Some philosophers draw on representational models of cognition, suggesting that it is through these models that novel ways of solving problems can be pursued. According to this view, the essence of creativity lies in thinking beyond the constraints of reality (cf. Taylor, 2013).

Creativity in sport is examined by assessing originality, flexibility and fluency of thinking in sporting activities, as highlighted by Memmert and Roth (2007). The authors emphasize the distinction between convergent and divergent thinking as two cognitive processes associated with these characteristics. Convergent thinking aims to identify the optimal solution to a problem situation, while divergent thinking promotes innovation. In the context of sport, one form of creative expression is tactical creativity, which the authors explore. This type of creativity is characterized by originality and flexibility (Memmert & Roth, 2007) and often manifests itself in surprising offensive actions during a game, catching opponents off guard. Importantly, tactical creativity involves a convergent thinking approach. The authors note that it operates as a representational process outside the realm of conscious thought, constituting an individualized planning segment of the cognitive act (Rucinska & Aggerholm, 2019).

In the third section of the article, the authors introduce their concepts of embodied and enactive creativity (EECA). They emphasize that the embodied and enactive cognition framework emphasizes the importance of interacting with the environment, in contrast to perspectives that prioritize the representational nature of cognition (cf. Fodor, 1975). The authors define the creative act as "an embodied and situated act that involves novelty and flexibility in movement, as well as its usefulness and appropriateness in the context of that movement (the normative aspect of creativity)" (Rucinska & Aggerholm, 2019, 676).

The authors then delve into the basic concepts of embodied and enactive cognition, tracing their origins to phenomenological explanations of creativity. They then examine phenomenologist Merleau-Ponty's stance on the topic, explain the notion of affordances, and present a hypothetical scenario involving basketball players Kobe and LeBron. In this thought experiment, they illustrate how Kobe's creativity in the game increases when LeBron is present on the court.

Continuing their analysis, the authors shift their focus to explain their notion of enactive and embodied creativity. They emphasize the ecological underpinnings of creative behavior and assert that tactical creativity in sport should not necessarily be viewed as a cognitive process. The authors argue that "bodily movement and its repetition in training triggers new possibilities for action to be acted on" (Rucinska & Aggerholm, 2019, 689). From the authors' perspective, creativity is not limited to knowledge or a particular way of thinking, but rather emerges as a product of "creative responsiveness" (Rucinska & Aggerholm, 2019, 683) resulting from the interplay between actions and environmental conditions. However, they make it clear that they are not dismissing the role of creative thinking. Instead, they emphasize that "embodied responsiveness to a myriad of affordances" (Rucinska & Aggerholm, 2019, 689) largely accounts for the subtle yet highly creative activities observed in sport practice. As conventional approaches to the study of creativity in sport have predominantly treated it as a cognitive process, it is crucial to employ appropriate methodologies in line with the dynamic systems approach. The authors emphasize that their conceptualization of creativity reveals its resistance to being developed through fixed templates or guidelines. Instead, a comprehensive understanding of the broader contextual factors within a given situation becomes essential. Given the significant differences between sport disciplines, it is clear that measuring and cultivating creativity cannot be imposed through a top-down approach.

In the chapter *Imagery, Expertise, and Action: A Window into Embodiment* by sports psychologists Tadhg E. MacIntyre, Noel E. Brick, Jürgen Beckmann, Aidan P. Moran, and neuroscientist Christopher R. Madan, the authors examine the current state of the imagination debate. They trace interest in the motor imagination back to the late 19th century, when William James devoted considerable attention to the subject (James, 1890). Over the past four decades, there has been a growing interest in motor imagery among researchers in a variety of scientific fields, with seminal studies by Shepard, Metzler, and later Kosslyn making significant contributions. While the authors provide a brief historical overview of this debate and research, their primary focus is on highlighting notable developments rather than delving into comprehensive explanations.

A key takeaway from the article is the recognition of the importance of imagery, particularly motor imagery, in various aspects of human life. While the authors primarily examine their use in professional sports, they also acknowledge their

potential benefits in rehabilitation processes (such as recovery from injury or stroke). In addition, motor imagery may play a role in increasing motivation for physical activity in the general population. This broader perspective reveals the far-reaching implications of imagery byond the confines of specific domains.

In the chapter *Embodied and Enactive Creativity in Sports* by Zuzanna Rucinska and Kenneth Aggerholm, the authors provide an overview of the current state of research on creativity in sport, examining various existing approaches and highlighting their respective limitations. They emphasize the need for a new perspective that overcomes these limitations. The authors propose an innovative approach called embodied and enactive creativity (EECA), which integrates principles from embodied cognition, enactivism, and the phenomenological perspective of Merleau-Ponty.

In their proposed approach, the authors draw attention to the concept of accommodation, which has been extensively explored in ecological psychology. They argue that creativity should be understood in terms of accommodation and provide an alternative framework for examining creative processes in sport. This approach challenges the prevailing notion of creativity as a form of thinking and expands the understanding of creativity in a novel way. By combining ideas from different philosophical and psychological perspectives, the authors offer a fresh and original perspective on creativity. Their approach expands the understanding of creativity beyond traditional thinking-centered models, providing a more comprehensive and nuanced view that takes into account the embodied and enactive aspects of human experience.

They do not reject such a view, but note that a significant part of creative behavior is that which is "an intelligent embodied response to the environment" (Rucinska & Aggerholm, 2019, 689). In essence, the authors suggest moving away from a standardized approach to creativity development and advocate for an approach that is tailored to the specifics of each sport. This nuanced perspective allows for more effective strategies to cultivate creativity in sport training, allowing for a more contextualized and adaptive approach.

4. Conclusion

Handbook of Embodied Cognition and Sport Psychology provides a comprehensive exploration of the relationship between embodied cognition and sport psychology. It covers a wide range of topics, which can be seen as both a strength and a weakness. While the breadth of coverage allows for a comprehensive understanding of the topic, it can result in some chapters straying from the main theme and lacking coherence. For example, the chapter on sexism in sport may seem somewhat disconnected from the central theme of embodied cognition in

sport psychology. While it is important to address such issues, it may have diluted the focus of the manual.

Despite these minor shortcomings, however, the Handbook has value for a variety of disciplines, including philosophy, neuroscience, sport psychology, and education. It addresses important issues relevant to sports theory and practice. Of particular note is the exploration of imagination and creativity in the context of embodied cognition, as presented in chapters 23 and 25. These chapters not only have practical implications for sport practice, but also contribute to a deeper understanding of the workings of the human mind.

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