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LINKING THEORY AND PRACTICE

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In this 5th edition of the Complex Systems in Sport Congress it is time to evaluate where we are and get a consensus about where to go in the near future. The science of complex systems is evolving very fast and society is requesting for practical applications of our research, a non easy endeavour that obviously keep us really busy and involved.

Complex Systems in Sport is still a baby learning to walk. It started its development in areas like biomechanics, motor learning and control, and during the last two decades evolved fastly diversifying into fields like decision making, performance and game analysis, talent identification, sport injuries or thought dynamics with outstanding research published in top journals. We hope to be able to provide in the future enough research evidences and rigorous mathematical models for changing the dominant statical paradigm of sport science, still based on timeless inferential statistics. In our humble opinion, future efforts should be oriented towards a) trying to formulate deductive mathematical models and theories which should more rigorously channelize the experimental and empirical research, and b) extend the realm of Complex Systems in Sport to other areas (e.g., molecular and cellular biology in sports) by collaborating with specialists which already model and analyse these levels of organization using the complex systems toolbox.

We are very grateful to the join collaboration of Complex Systems in Sport Research Group, FC Barcelona and INEFC for organizing this congress and we hope to contribute with our scientific work to do a step forward in the understanding of sport related phenomena. Sport scientists and also sport professionals can benefit of the complex systems approach because there is nothing more practical than a good theory.

Natàlia Balagué

Learning Dynamical Systems Concepts through Movement Analogies

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Introduction: Fragmented scientific understanding seems to be caused dominantly by existence of emergent levels of substance organization whose key properties cannot be formally, i.e., mathematically, deduced from the laws that govern the behavior of the more microscopic components. Therefore, each level is endowed with specific and novel structures and properties which need a specific language to explain them. These languages, thus, use context-dependent concepts to name and explain the processes under scrutiny. Context dependence is viewed essentially as a major cause of the fragmentation between the vocabularies of different scientific disciplines. That is, while within specific scientific fields and subfields the communication of knowledge is made possible by a common vocabulary, the more distant disciplines are, the more difficult communication becomes. As this language fragmentation is also translated into science education, this inevitably leads to the formation of a fragmented worldview in learners and limits the possibilities of a learning transfer between different scientific subjects. In his UN manifesto "Seven complex lessons in education for the future," Edgar Morin made a plea for an integrated approach in education. In his view, the contemporary education, based on a fragmented structure of topics, limits reasoning and critical thinking in students, contributing little to the development of the integrative competencies and knowledge considered essential in modern society. The main issue, then, becomes how to integrate and reduce the barriers within and between widely different areas as STEM (Science, Technology, Engineering, and Mathematics) and Humanities, which is not achieved by various forms of multidisciplinary and interdisciplinary approaches. We think that the tension arising from the coexistence of context-dependent and unifying tendencies in science can be seen as an opportunity rather than a problem: resolving it may result in explanatory patterns that are characterized by both a coherent explanatory skeleton coming from unifying tendencies and flexibility due to its context-dependent vocabulary (Hristovski et al., in press). We propose that this integration would be possible through teaching common concepts and principles of dynamical systems. Moreover, we claim that physical activities in a form of movement analogies may form the content of such an integrative education through formation of an embodied and

experientially grounded understanding (Hristovski et al., 2014). The application of movement analogies for teaching pluricontextual and transdisciplinary concepts is the objective of the proposed teaching methodology, that through the learning platform www.SUMA.edu.mk aims: (1) to help teachers and students to discover and learn the connecting dynamic conceptual patterns common to STEM and Humanities, (2) to promote a synthetic understanding, and (3) to contribute to building a synthetic world view. The proposed embodied and experientially grounded-based understanding can be applied to all education levels, including early ages. It is expected that the development of learning transfer and integrative competencies in students will empower them to face the novel and challenging emergent problems of our society.

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