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Paradigms Shift in Sport Sciences: Body's focus

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***Abstract*—**Sports Sciences has been historically supported by the positivism idea of science, especially by the mechanistic/reductionist and becomes a field that views experimentation and measurement as the mayor research domains. The disposition to simplify nature and the world by parts has fragmented and reduced the idea of body-athletes as machine. In this paper we intent to re-think this perception lined by Complexity Theory. We come with the idea of athletes as a reflexive and active being (corporeity-body). Therefore, the construction of a training that considers the cultural, biological, psychological elements regarding the experience of the human corporal movements in a circumspect and responsible way could bring better chances of accomplishment. In the end, we hope to help coaches understand the intrinsic complexity of the body they are training, how better deal with it, and, in the field of a deep globalization among the different types of knowledge, to respect and accepted the peculiarities of knowledge that comprise this area.

***Keywords*—**sport science; body; complexity theory; corporeity.

I. Introduction

PARADIGMS are the values, perceptions and practices shared by a community that will give shape to a special view of reality, and that will be the base for the organization of the community. Sports Sciences community has been historically supported by the positivism idea of science, especially by the mechanistic/reductionist paradigm that has guided the way coaches treat athletes and all knowledge produced.

From that point of view, all phenomena could be measured and quantified, and so sports sciences becomes a field that views experimentation and measurement as the mayor research domains. The disposition to simplify nature and the world by parts has fragmented and reduced researches which became compartmentalized, with no longer exchange of information among scientists. In this paper we suggest how to re-think some of paradigms that have been following our area by using the systemic and the complexity theories focusing on body context and idea.

II. Paradigms shift

Regardless of time and society, science tries to identify the causes of the world events. In its restless pursuit of understand the nature´s phenomena, the human behavior and his several and worn out relationships, science relies on the acquisition of authentic and objective information, mostly, to bring us the idea of predictability of a coherent and methodical world. Scientific knowledge started to be regarded as a "new religion"; that was trustworthy and could be objectively proved [1].

With the adoption of paradigms, the sciences begin to support transformations on all human fields and in a dialectic praxis to influence the world and it is influenced by its own history. In an ongoing and dynamic direction, science supports different perceptions and new understandings of the world.

Being highly influenced, mainly by the newtonian/cartesian sports science started, just few decades ago, to discuss about paradigms that guide the practice of training sports [2]-[3]-[4]-[5].

Trough the ideas guided by Complex Theory, we believe it is necessary to change some punctual paradigms, as we show at the figure below:

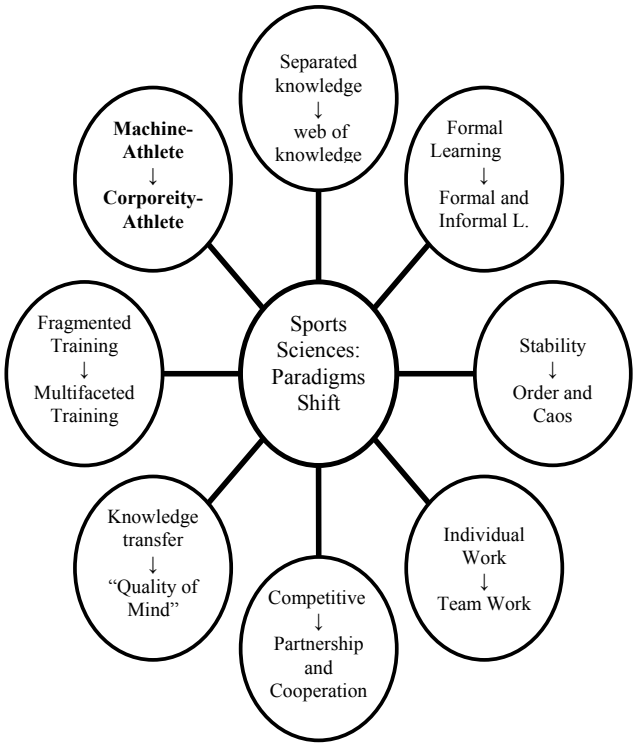

Fig. 1Paradigms Shifts in Sport Sciences

It would be impossible to explain our ideas about each of those paradigms shifts. By now we will discuss about the shift between athlete-machine to corporeity-athlete.

III. The Paradigm of body-machine

The speech about body strongly started with Plato. He has developed a dualistic theory, in which body and soul are completely distinct realities. For Plato, the body is imperfect and mortal while the soul is part of the perfection of forms and ideas. Nonetheless, he declares that we cannot neglect the body because we need it, and for that matter he suggests physical exercises to strengthen it [6].

There is, however, a clear hierarchization of values between body and soul, even taking into consideration the dependency of both of them. The movement is made by the body, but it is only possible due to the action of the soul, or, the existence separated from its essence, once it lives for the development of the soul.

This body is not allowed to have desires, once they hinder the journey towards the spiritual sanctification. This body is a synonym of home, the place where for a while, the soul becomes its tenant and when the lease expires, the house is either shut down or torn down. Sacred body, deified not human, that forgoes living the today in order to have a better life after death.

This is the message of the traditional Christianity. We inherited from Judaism the belief on the sacrifice of the bodies in order to reach eternal life. This, among other reasons may shed some light on the strong reaction from the central power of the Church on the 20th century against the Theory of Liberation: a movement that demanded the participation of the body in the process of sanctification starting in the present.

We can see the paradigmatic ruptures that in turn led to ruptures of theories and to new techniques of investigation with distinct goals and new ways of looking at the functions science could perform in philosophy and society. From that period on, despite having managed to be freed from religion, mankind became submitted to science.

During the Renaissance, a new view of the world based on the anthropocentrism began to organize the thoughts and paved the way to a new understanding of the world. Man started to think of himself, not only to serve God but rather to serve himself, interfering on nature, using it and exploring it for his own benefit. Everything on the universe exists solely to serve man, strengthening the empirical rationalization. This is when science begins to add utilitarian characteristics to its studies.

At that time there was a growing interest in experiments with human beings, especially the ones based on mathematical sciences. Thus, the challenges, the curiosities and knowledge started to be explained based on calculations, on geometry and logarithm. An example of it can be found on the famous work of art by Leonardo da Vinci "*Vitruvian Man*", where the human body is explained in proportional and perfect parts. The interest in learning about the human body led to a constant and necessary dissection of corpses, once that technique would make feasible the understanding of the mystery of death, as well as, how our organs operated and were connect to keep us alive.

The severe anthropocentrism of the Renaissance paved the way to an upsurge of humanist interests in the Modern Times. Man was the centre of everything, he rediscovered himself and believed the world was something that could be manipulated and tested, determining the experimentalism. In the 18th century we come across the beginning of great experiments, based on reason, and the development of Science Academies .

This period experiences the growth of research methods, which were conducted in a careful and thorough fashion. Research was controlled with repetitive verifications an ingenious experimentation.

On the second half of the 18th century, the philosopher, René Descartes adopted two categories that embodied knowledge: the category of the physical world, extension (*res extensa*) and the category of the thinking being, thought (*ego cogitans*). Both are independent; the first is the material and the second is the soul [7].

When Descartes separated the domain of the subject (philosophy) from the domain of the things (science), he laid the basis for a rupture between humanistic culture, grounded on reflection and incapable of developing a non objective knowledge, and scientific culture, grounded on the objectiveness of knowledge and incapable of self-reflection. Following the analytical thought, that separates the whole into parts, by understanding one part we could understand the whole. This is a reference to the world seen as a machine (a metaphor for everything as machines in movement). He introduced the strict separation between mind and body, with the the idea that the body is a machine that can be thoroughly understood in terms of organization and operation of its parts. For example, a healthy person would be like a well built clock in perfect mechanical conditions and a sick person, a clock with malfunctioning parts [08].

This Science conception of mechanicism/reductionism was the key to the truth and stopped man from acquiring a better understanding of the environmental and social structures. It was possible then, to understand the "more than perfect" structure of the world; all man's fears and curiosities could be overcome. From that point of view, all phenomena could be measured and quantified. View experimentation and measurement as the only research domains becomes a field in kinesiology [5].

A Science that sees the universe as a mechanical product will soon ascribe this idea to the body, where science and technique started to determine the exact angles of each movement made by the body and so, physical exercises were slowly classified, analyzed and meticulously redesigned by scientists and should appear in a scientific and esthetical project, above all distant from its primary nucleus -the pleasure and desires inside it.

Let's focus our attention, for instance, on the sports phenomenon, exerting no judgment, once it is one of the most important events of the 20th century, and we will come across a body that adjusts itself to whatever is needed. As we identify the athlete-body, we will see a body that is very often invaded in its intimacy, deteriorated in its essence as to keep a specific level of efficiency. Bodies submitted to deprivation, to the use of anabolic steroids and to hardships that can be irreversible in the future. The biases in the area of sports reveal our "knowing-looking" bodies, creating a new metaphor: the indifferent bodies. This validation may intervene in a harmful way in our lives, once misery, hunger, diseases and deaths will not affect us anymore. Hence, we must change this paradigmatic view that sees the body as a machine in operation and becoming worn out can be discarded. We must rewrite this perception of a machine body that in order to be understood has to be separated in its several parts, invaded in its privacy, disregarded in its sensitivity and be considered as an accessory to the intellect or to the soul.

IV. The Paradigm of Corporeity

With the arrival and development of the Universities, in their original meaning of universality of knowledge, and Integrated Research Centers, the first oppositions to the Cartesian paradigm took place.

In contemporary times, the notion of interdependency grows and brings to life the belief on the web of relationship as a an essence of all living beings, it is an "ecological" thought, once it places all happenings, information or knowledge regarding the inseparability of the cultural, social, economic , political and natural environment.

In view of this change of thought, from the mechanicist to the systemic relation between the parts and the whole was inverted .Cartesian Science claimed that in any complex system, the behavior of the whole could be analyzed from the properties of its parts. What we call part is just a pattern in a web of inseparable relations. The whole manifests itself on the parts, as well as, the parts are present on the description of the whole. This concept will be developed by Edgar Morin in his proposition of the Theory of Complexity.

If world and life are given by the body, this implies assuming the body as being thoughtful, rational, sensible, transcendent and not in characterizing it as something less or as hindrance to knowledge [4]. Corporeity is an attitude only understandable through a reconnection of knowledge in the attempt to know the body-problem and the body-mystery.

The Theory of Complexity and the Corporeity

Edgar Morin, the distinguished thinker of the Theory of Complexity, criticizes the unbridled Capitalism which leads our society and organizations to the constant search of efficiency, profit and productivity. He discusses the disdain of some researchers for the different human dimensions, such as cognitive, linguistic, psychical and symbolic, among others. The term complexity comes from the word complexus, that is interweaved, the indissolubility between order, disorder and organization. Complexity intends to awake us and makes us explore everything, in a dialogue with the mysteries of the world.

Lined by complexity theory, for example, coaching is viewed as comprising agents working collectively in a dynamic and often non linear ways within a complex adaptive system [09].

In an effort to sensitize people to the over helming needs of our thinking and to make clear that that a mutilating thought leads necessarily to mangling actions, Morin [10] proposes to connect the subject domains, now broken by the disjunctive thinking. In a way, transcending the Theory of Systems, the Complexity quest is not to separate a phenomenon entirely to understand it, but the need to connect it to its natural articulations [11].

One of the principles of the dynamic systems approach is the Complexity that consists in great heterogeneity, manifested in all organizational levels, from the molecular components of cells to the diversity of types of tissues and organic systems. The key condition for the biological coordination is the route of energy flow amongst the systems, which is dependent on the organic balance.

Complexity´s first great step is not only to reveal that the part is in the whole, but also that the whole is in the parts .

> This means that we can no longer consider a complex system according to the reductionism´s alternative (that wishes to understand the whole from the qualities of the parts) or from "holism", that is no less simplifying and that neglects the parts to understand the whole. As Pascal did say: I can only understand the whole if I know, specifically, the part, but I can only understand the part if I know the whole [12].

Therefore, to better understand the phenomenon of corporeity it is not enough to know the isolated parts, it is necessary to think how it occurs, how it organizes itself in the system. Despite of its recognizable value, the studies that isolate the variables to better determine the function of each part cannot supply information in regard to the dynamic relationship among the components of the system and, mainly, how innate factors and elements of the environmental context interact and manifest themselves in a corporal expression.

Complexity calls our attention to something that slips from us, that we find difficult to understand. Complexity is to be aware of the existing connections among the studies that were separated for a long time, isolated and even reduced to one or another factor to simplify thinking. As a matter of fact, complexity does not intend or is not against to what is not whole, but rather against the mutilation. The idea is to allow the disrupted articulations by cuts between subjects, cognitive categories and types of knowledge; for example, complexity is what tries to conceive the articulation, the identity and the difference among physical, biological, social, cultural, psychical and spiritual beings [12].

Morin [11] considers that the observer mingles himself with the object of his observation and he interferes on the acquisition of information concerning it, after all, each individual has his own perception and conception of life when experience life situations, even if it is the "pure and simple" observation of facts, once the perception of specific stimulus will be influenced by the habits and knowledge of the observer.

To this philosopher, the human being is at the same time, totally biological and cultural.

> What is more biological – sex, birth, death – is also what is more culture permeated. Our most basic biological activities – to eat, to drink, to defecate- are closely linked to norms, prohibition, values, symbols, myths, rites, that is, to what is more specifically cultural. Our more cultural activities – to talk, to sing, to dance, to love, to meditate – they move our bodies, our organs, consequently, the brain [16].

Surpassing duality would be possible through an ontological conception of being in which his presence in the world would define his identity. The body "is not an object, nor an idea, it is the unique expression of the moving human being. To separate subject and object is to reduce the complex human body. When analyzing the body there is the dissociation and we come across biological, anthropological, physical studies with no information exchange among them. Consequently, the human being, who gradually learns more about the functions and functioning of his parts, will gradually know less about this body in relation to the other and to the world.

Both culturally and historically we were led to consider that the human being is shaped by the association of two halves: the first half is biological and the second is psychical-social-cultural. Having complexity as reference we dare to say that we are human beings, we are enrolled in a bio-psychical-social-cultural complex order, we have elements from both cultural and natural/biological life.

Proceeding with the complexity rules we come to the idea of the human being as a reflexive and active being. Both are fundamental and complementary: after all, we cannot be reduced to individuals submitted to stimulus bombardment which are absorbed without any interference as we are beings of desire and drives and it is through these relations that we can recognize, distinguish, constitute oneself and be satisfied or not with these desires and drives.

The knowledge until then separated, fragmented and packed in accordance to the subject of interest, should be seen through an ecological focus – all living organisms and human being have equal value. This ecological focus will enable us to know and deepen the relations among the subjects without considering one knowledge area as the primary one, but rather, conceiving all of them as interdependent and complementary, fundamentals to the objective of thinking about the realities and problems that are "steadily multidisciplinary, transversals, multidimensional, transnational, global, planetary [13].

What consequences would this way of thinking bring to the studies of the phenomenon of corporeity? Seeing, perceiving, conceiving and thinking are inseparable, interdependent corporal qualities and that each one has its own needs, its own limits.

The importance of an education for the human existence, through corporeity, demands to see oneself in order to better see the exterior. This is the turning point of a possible rupture line between the dismembered thinking and the complex thinking The relationship among the self, the Other and the world is always present in the reality, therefore the complexity of the corporal life experience.

To undertake the corporeity principle in education is to assume that we are not seeking for a recipe as the answer, rather for a challenge, a stimulus to thinking. It is also to assume that aiming at complexity is leaning to the multidimensional knowledge, knowing that complexity arises as distress, as uncertainty and not as clarity or as an answer.

The education of the learning corporeity in this new century claims for the complexity of thinking in which single and multiple, certain and uncertain, logic and contradictory are in intimate relationship, always including the observer in the observation. It is important that researchers of the corporeity phenomenon are aware of these elements, thus it will be possible to undo the hegemonic rationality pentagon, formed by order, determinism, objectivity, causality and control notions still alive in the way of conceiving and doing science.

Therefore, the professionals working with corporeity the use of the theory of games, in which it is always possible to integrate contingency and determinism and see the combination between order and disorder, between chance and necessity.

The corporeity experience calls for education concerned with the human condition. To know the human being is to place him inside the Universe rather than separate him from it. Not to be able to do so is to keep alive an epistemological problem, as Morin reminds us

> The human being remains dilacerated, separated as pieces of a puzzle in which one piece is missing. We find here an epistemological problem: it is impossible to conceive the human being complex unity through the disjunctive thinking, that perceives humanity as secluded, outside the surrounding Cosmos, outside the physical substance and soul from which we are made of, as well as by the reducing thinking that restricts the human unity to a purely bio-anatomic sub-stratum. The human sciences are themselves fragmented and subdivided. Thus, the human complexity makes itself invisible and the man vanishes "like footprints in the sand". Furthermore, once the new knowledge was not reconnected, it cannot be either assimilated nor integrated [12].

Experiencing corporeity one should recognize that all truly human development means, a priori, the development of the collection of the individual autonomies, communitarian associations and the feeling of belonging to the human species.

As a conclusion, the complexity here relates to the interrelationship, interaction, and interconnectivity of elements or actors within a system, and between that system and its context [09].

V. Conclusion

Change of paradigms is difficult and slow. Its imply the collapse of a whole structure of ideas and reliance in the new ideas are requested, in the sense of searching improvement from one theory to another.

Marked by the Complex Thinking, we believe that sports sciences should harmonically recognize the body athlete in its physical, biological, cultural and social lives.

In the field of a deep globalization among the different types of knowledge it is of utmost importance to plan, to know, to make dialogues viable, to cooperate and, above all, to respect the peculiarities of knowledge that comprise the scientific areas which are focusing their concerns into the phenomenon of corporeity, as sports sciences. Therefore, the construction of a project that considers the cultural, biological, psychological elements regarding the experience of the human corporal movements in a circumspect and responsible way could bring better chances of accomplishment [09]-[14]- [4].

In fact, we can observe organizations in sport and physical activity are increasingly using teams to accomplish the varied tasks and work [14]-[15]-[16], mindful of transdisciplinary teamwork possibilities.

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