The Metric and Structural Approach to Sport[1,2]

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"We should not concern ourselves with what the majority says about us. We should pay attention to the person who understands justice and injustice, to the one who knows the truth about such matters." (from *Crito* by Plato)

Abstract

In this lecture we discuss that just like all social phenomena sport can be analysed in two ways. Influenced by the classic Newtonian world view previously such social science had been developed which locates social phenomena in a metric space. This approach breaks down the complex social phenomena into subcomponents and does not see their interaction. The generalisation of the Einsteinian relativistic world view aided by up-to-date structural theories on the other hand offers a more flexible interpretation framework for the study of social phenomena and processes. As human thinking is structural, complex social phenomena must be considered as 'multi-structures'', which do not exist in metric but in structural space. Evidently, there is some practical use of the quantitative approach, too as it is able to simplify or reduce complex social phenomena. But it is exactly this reduction that gives up the possibility of applying concepts to the phenomena of reality and cognition. The structural model created about sport, however, with a relevant approach, converges to reality and is able to represent the interaction between the fundamental concepts of cognition and the real world. The representation is done by mathematical graph theory, the detailed discussion of which will naturally not be part of this short presentation.

Key words: sport, truth, value, structural cognition

The traditional interpretation of sport

The organisers of this conference gave the working title 'The problem of value and truth in sport and social sciences' to our section. When I read it a witty thought of Engels came to my mind which says that there is only one truth but that's so long that it cannot be fully told.

This is how we will end up if we want to talk about sport. Sport is, similarly to other social phenomena, an extremely complex formation. It is not by mistake that an ancient Indian parable came to my mind in connection with this complexity. The parable is about six blind people and an elephant. All of them highlighted a different characteristic of the elephant that they touched depending on where

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[2] The present paper translated from Hungarian Tamás Dóczi. The Hungarian version: http://www.titoktan.hu/_raktar/_e_vilagi_gondolatok/FJ-Sportszociologiai-konf-eloadas.pdf

they touched the animal. Actually all of them were right; however, none of them could answer the question: 'what is the elephant like?'

If my lecture just discussed all those concepts, one after the other linearly between which the Organisation Board seeks some connection, then that approach would examine the content of the concepts one by one using the classic method of cognition, and would make an attempt to define them and then would aspire to uncover the supposed relationships. But I will not do this, as this cannot work. And the reason for failure would be the fact that we would not uncover the examined phenomenon (sport for instance) in its structural and relational construction. The concepts are in a way juxtaposed and subordinated to one another and just by getting to know them they do not fit together into an organic model. While sport really is an organic structural entity. Because of this I would rather make an attempt to sketch the structural model of sport, where the different elements, characteristics are in reality the manifestations of the same social phenomenon (i.e. sport). This way it may turn out that the functions of sport, scientific cognition, truth, facts, measurement, experiment, value etc. are not concepts and phenomena that are unified externally, but are manifestations of sport as a social institution (subsystem) and are dependent on a special reference system. And as such they are related, connected internally and form one multi-structure.

So in this lecture I intend to discuss that the concepts (sport, truth, value, fact) put forward by the organisers can be answered in two different ways. The first approach is the *classic*, traditional one. For this we assume a metric space, where we define numeric, quantitatively measurable concepts. But at the cost of not being able to detect the interaction of concepts.

The other approach can be called *structural*. The natural way of human thinking is like this. The associational processes in our minds create a complicated network system. The core of the problem is that although we map the world in our heads structurally, we are only able to communicate it in a quantitative and sequential way. The key concept of this is 'measurement' which, however, includes a subjective component. Some kind of virtuosity appears in this as both the measurement device and the measurement unit is defined by man and thus these are not objective. That is why Werner Heisenberg says that in the process of measurement man always finds himself in nature. (Heisenberg, 1967) In the process of communication the following happens: we simplify complex structures, divide them into parts, frameworks, different ways, so we involve our subjectivity in the process of cognition.

The structural cognition of sport

We have been working on a book with my mathematician colleague Tamás Dénes since 2004 which is to present a new social theoretical paradigm. (Dénes and Farkas, 2007, 2009). We have constructed a system theory where society, being an incredibly complex phenomenon, can be represented as a multi-structure. The structure is made of 'elements' that transform into a system beyond a certain point of saturation, and which again becomes an element of further construction at a higher stage of development. Sport in this respect is a social subsystem. This argument, as mentioned before, is not new to the relevant literature. But we work with qualitative analysis instead of the traditional quantitative one. Because of this, natural and social phenomena are not constructed of quantities but structures in our model.

Structural cognition contains the following characteristics, concepts, operations:

a) Firstly, the question 'What is structure?' must be answered. That is no other than a construction, internal form which manifests itself as a network. To signal this we introduce the

concept of the S-system, where the whole is more than the sum of the components. The characteristics of the system do not follow directly from the characteristics of the components. The relationship between the components forms a complex network (structure). (Ludwig von Bertalanffy, 1944) This system concept enables us to discuss social phenomena such as sport not just along quantitative, descriptive models (cognitive schemes). We describe the characteristics of the S-system with a graph model.

b) The approach working with the concept of 'multi-structure' (or SM-container), in contrast to the quantitative, metric description can be summarized that the real nature of living nature and society is not isomorphic with its metric space (and time) structure, but can be described by a system of interrelations i.e. multi-structures. Society is the highest level of multi-structure. So relation is a more ancient concept than the set or the numeric (quantitative) thinking. We can see as a consequence of this that the evolution of the thinking of mankind has gone through a process of becoming more and more simple-minded which intends to simplify as much as possible the handling of relations (structures) that are so naturally complex for the brain, which eventually virtualizes the objective relations of society.

c) We are searching for the bridge that connects the abstract structure-definitions with the experienced real structures. The transition happens formally in the form of the structure and component transforming into each other. So the structure/component transition can be considered as the basis of the process of the formation of multi-structures. When a system structure is saturated, it becomes a component, which is, as a subsystem, component and system at the same time. The 'saturation' (density) of a structure describes the capacity of a structure, which is none other than the relationship of the structure and the relevant complement of the structure belonging totally to it. The complement is apparently the 'missing' but clearly defined part in the structural space. As these missing parts constitute the complement, if a structure saturates, that complement will be decreased by this. The bridge of transition can be grabbed by the equivalence triad of *material≡energy≡information*. This we acquire from the generalisation of Einstein's material/energy equivalence thesis. In social science we also introduce the concept of 'reference system' generated by 'reference criteria'. This means that cognitive man can only model, measure, examine reality and its characteristics according to his own reference criteria. It follows from this that 'measurement' is always relative as it can only be interpreted in one reference system. So we always realise the result of the comparison (isomorphism) of the man-constructed measurement device and the measurement process. And exactly because of this preciseness is not based on being measurable but on the isomorphic level of the measuring device (reference system) and reality (system).

d) Based on the thesis of the interaction of structure and functioning we worked out the structural concepts of accumulativeness and development. The concept of accumulativeness and its mathematical modelling enabled the structural description of the cognitive process. As a starting point, we take that the functioning of every system (e.g. sport) is accompanied by a series of structure changes. By accumulativeness we mean the structural interdependence of phenomena description and the knowledge represented by them. If the definition of development is built on accumulativeness then the thesis that the process of development converges to truth can be proved. The integration of new structures into the SM-model happens according to the principle of isomorphism. As a result of this the SD-effect (structure-difference) can be defined which is the sole fundamental law of the SM and the generator of the multi-structural systems. The integrated structures create 'functional blocks' in the SM-container. We distinguished two components of the concept of 'development': the structural complexity and the stability of systems. As an outcome we worked out the concepts of 'structural development', 'structural space' and 'structural time'.

e) With the structural discussion of accumulativeness it became possible to show that in terms of cognition, truth and convergence are equivalent. We have thus arrived to the thesis of the equivalence of convergence and truth criteria. From the side of content this means that the convergence of the cognition process is equivalent with approaching the ideal cognition process. A piece of knowledge represented by a phenomenon description is true and is only true in that case if it is the result of a convergent cognition process. That is the convergence of the cognition process leading to a piece of knowledge follows from its true nature. In terms of cognition truth and convergence are equivalent if the cognition process is accumulative.

The concepts acquired by classic (metric, quantitative, numeric) cognition processes adopted from natural sciences will have a different interpretation in structural cognition processes this way. 'Value' here is nothing else but judgement depending on the 'reference system', and as there are different social contexts the values depending on these are relative from the moral, evaluating and cognitive point of view. The relativity of values results the relativity of truth. By the structural discussion of accumulativeness it becomes possible to show that in terms of cognition truth and convergence are equivalent. This practically means that cognition converges towards reality which enlarges the cognition structure, increases the true nature of phenomenon description and possesses the function of confirmation relation. Similarly, 'facts' cannot be considered absolute truth as they rely on subjective 'measurement' and the subjectively created 'measurement devices'.

Subsequently, let us endeavour to apply our simplified methodological principles to the *social institutions of sport*. Sport, as a complex social phenomenon, is thus for us a multi-structure ready to be analysed. As a consequence of the philosophy of system analysis the system fulfils functions and as a result of this it becomes a valuable component of social culture. In a given case the social phenomenon of sport for us is such a social object where the graph edges represent the objects. So we assign graph series to the description of the phenomenon.

Accepting the different definitions of sport, according to our preferred values we highlight the *interaction of sport and health* in the first place. We set out from the definition that illness is always the dissolution of structural equilibrium, stability on the given system level. It follows from this that health can only be defined, according to the principle of complementary, as lack of illness. That means that the structural clocks (self-time) of the structurally stable, balanced i.e. healthy organism tick evenly, and so the functioning of the system is stable.

In connection with this we may mention the phenomenon that people do not deal with their organs and body parts as long as they function naturally. So the natural way of biological health is preventing illness not healing illness that occurred. If the finding relevant to the individual is applied to society then we think that healthy society is also based on the prevention of illnesses that occur on different system levels (individual, group, society). That is why sport is a special view of the structure and functioning of society through the eyes of health. As health is a structural category according to the above mentioned definition, it follows from this that healthy society can only be described (modelled) by the structural approach to society.

Quantitative, i.e. metric description (modelling) leads to fundamental contradictions that are rooted in the interest-driven (money-oriented) economic, i.e. zero-sum game approach. That leads to virtual values, i.e. the virtualization of the ethos which is the basis of globalisation.

According to this approach, instead of transforming the potential energy accumulated by the inequalities in society into 'kinetic energy' that would lead to equilibrium and the levelling off of

inequalities due to the structure-difference effect, sport not just conserves the inequalities resulting from the nature of the zero-sum game but even increases it.

In our forthcoming book we start from the flow chart diagram created by Tamás Dénes which shows the functioning model of multi-structural society in a condensed way.(Dénes and Farkas, in press). The model illustrates that in the formation of the multi-structure there exists a so-called evolutionary (big blood circle) and a small blood circle. The later one regulates the structural balance of the functioning of society by the flow of energy. In this circle social energy triggers social movements by the Sd-effect (which means the structural changes inside the system). These can be social hierarchy, mobility, differentiation and naturally inequalities. These provide the different individuals, groups, communities of society with different amounts of information, knowledge and know-how by different referential structures. The different social spaces, distances and self-times can de derived from the social contexts formed this way. All these have an impact on the given type of culture which is based on defined values naturally, and which also evokes the differentiation of society. The so-called 'big blood circle' is the multi-structural (evolutionary) blood circle. The informational processes that go on in the two circles work according to significantly different self-time i.e. structural clocks. Because of this the most suitable way of describing the structural functioning laws of society is the SM (System Memory) structure-space, which can be approached in a quantitative way in the metric space that makes phenomenon description more inaccurate.

So besides the classic approach to sport there exists a so-called structural approach which is the humanistic one, i.e. social alternative to the quantitative, i.e. economic oriented (competition, interest, victory, fight) approach. These two fundamentally differing approaches can be seen in the two diagrams below, the theoretical grounds for which can be easily deduced from the *'two blood circles model'* (Figure 1.).

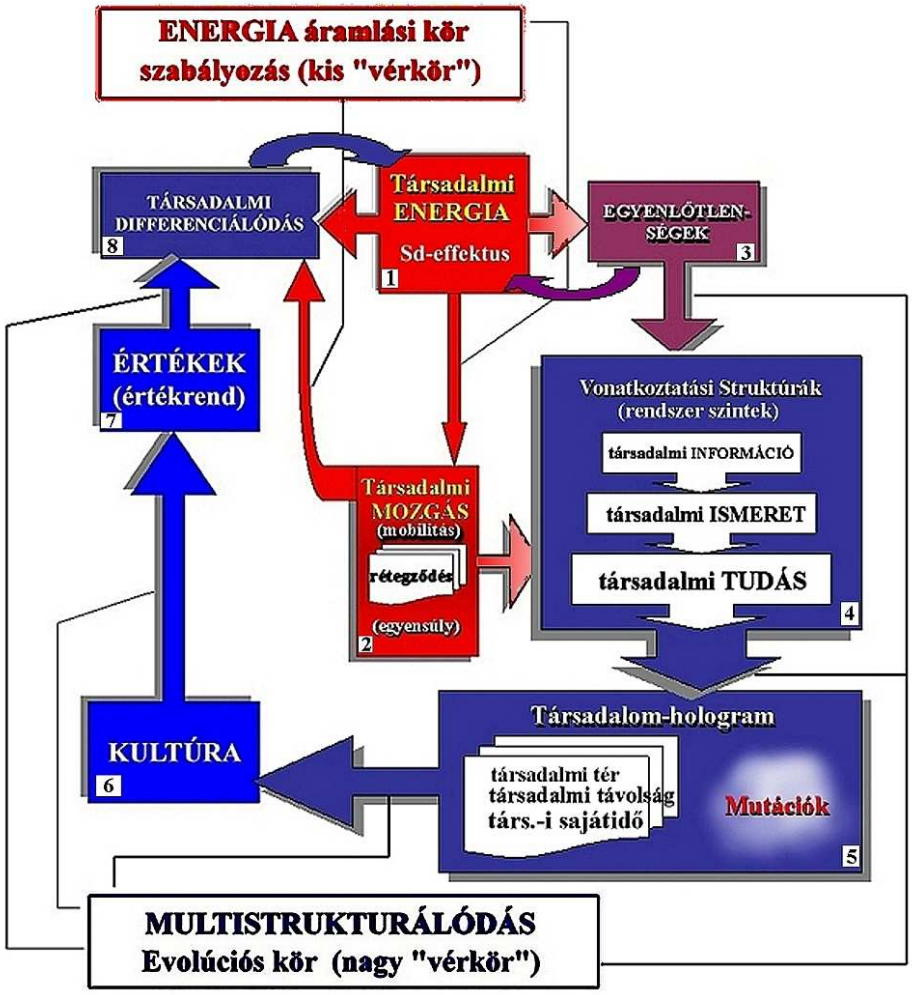

Figure 1.

Legend:

ENERGY flow circle control (small 'blood circle')

MULTISTRUCTURALITY Evolutionary circle (big 'blood circle')

1. Social energy – Sd effect
2. Social mobility – hierarchy (equilibrium)
3. Inequality
4. Referential Structures (according to levels) social information – social knowledge
5. Social hologram – social space – social distance – social self-time - Mutations
6. Culture
7. Values (ethos)
8. Social differentiation

The following diagram shows that just like all social phenomena, sport can be analysed in two different ways.

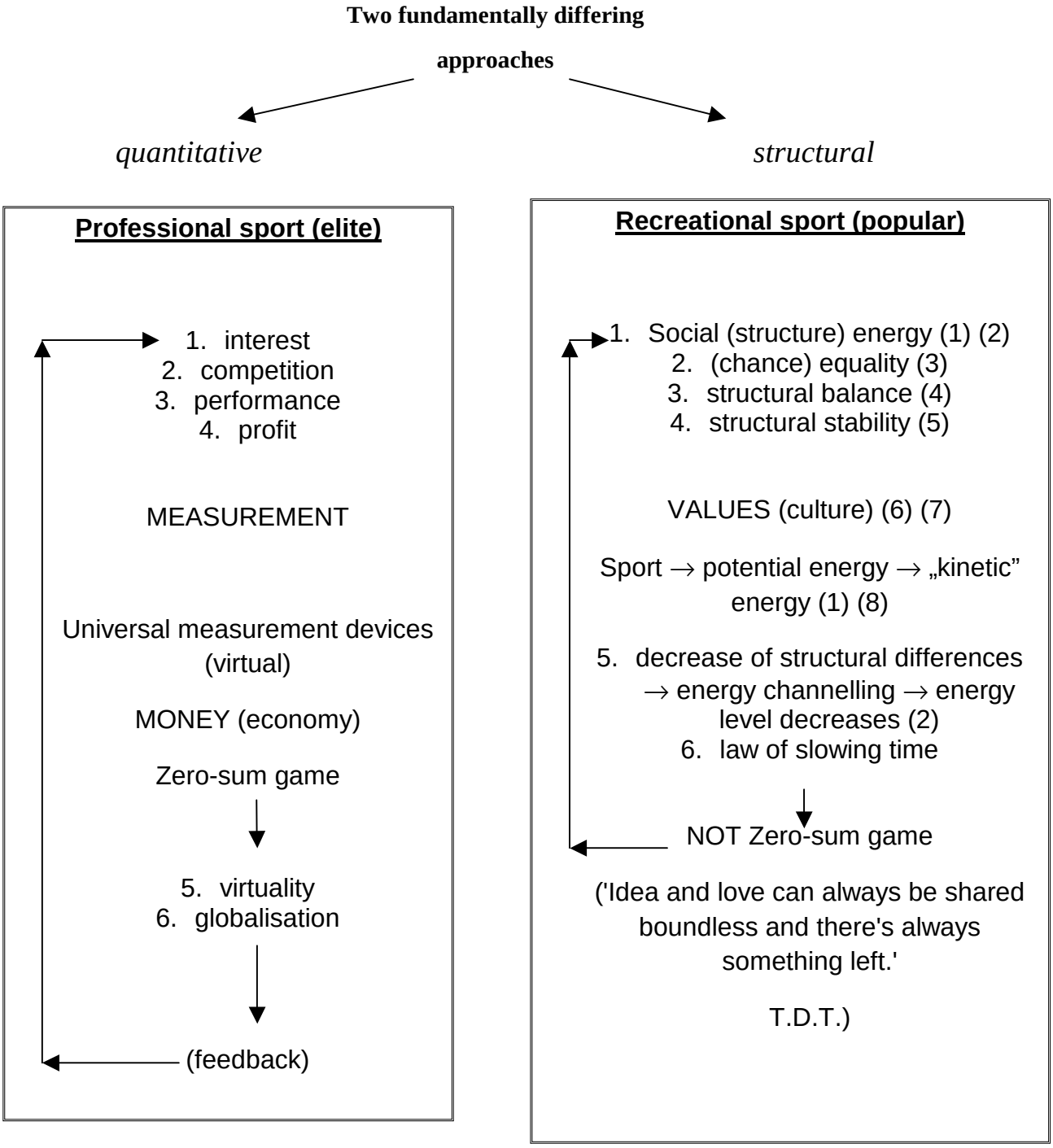

Figure 2. (The numbers in the brackets signal the blocks in the two blood circle model in Fig. 1.)

The diagram on the left explains that professional sport is an enterprise oriented towards interest, competition, performance and profit. Its fundamental value is performance and increasing profit. 'Measurement' is an important concept here as we compare performances with the help of (subjective) measurement devices created by them. Of all these devices money is the most significant as a universal measurement device. Athletes play zero-sum games with one another where the profit of

one competitor means loss for another. In professional (elite) sport virtuosity and the role of symbols are gaining ground due to the impact of advertising and propaganda which is a prerequisite to the globalisation of sport. (We may just think about the incredible selling/purchasing price or the salary of some athletes which are evidently remote from the real material-economic value.) The nature of time is 'acceleration' which makes the competitors analogous to a 'greyhound race', run faster and faster while the ultimate goal cannot be reached any more.

Recreational sport on the other hand is based not on the values of economy but on (human) culture. It is not a zero-sum game as everyone is a winner in it and because of it. The physical joy of movement nourishes health and unleashes intellectual energies as well. Its social impact and consequences are clearly positive. It transforms the potential energy present in everyone into kinetic energy. It channels the superfluous energies, reduces the structural differences between people, social groups. By increasing structural social energy, it increases the level of equal opportunities for people and groups. This way it strengthens the structural balance and stability of society. It supports the law of 'slowing time' when man synchronizes his activity to the clocks of Nature with his physical and intellectual activity, after realising that the majority of his illnesses are of psychosomatic origin and are a result of our artificially accelerated rhythm of life that evokes cultural illnesses in us.

Naturally both types of sport have their own function and they complement and assume each other. Our structural model assumes that the more a structure becomes saturated the more its complement reduces. If the balance shifts disproportionately in favour of professional sport then structural balance and stability are lost and that can harm the quality of the multi-structure. According to all this we differentiate between elite sport and recreational sport. This differentiation is not new as others use it as a commonplace as well. However, the advantage of our differentiation is that it is derived from a model that is deduced from a theory and is represented by mathematical apparatus. Its major advantage is that it does not view sport as a disorderly sum of different characteristics but as a social multi-structure, where the components of the system structurally assume one another and form one whole. Utilising the value principle sport considers the sustainment and development of the physical and intellectual health of man its most important social function. In comparison the elite type of competitive sports can be viewed as an option, based on the values of money and the increase of performance, derived from mass sports. It can be claimed of the model of elite sport that in the Huizingian sense it is not a game any more, it has lost its game content. (Huizinga, 1990; Hankiss, 1997). It is functioned by interest relationships, and it is that sub-branch of social signalling systems and symbols which is not governed by socially important cultural values but is stimulated by the mass of profit acquired from the performance during competition. It means those types of symbols that get more and more detached from reality, virtualises and sooner or later will rise above people as an estranged power. This fits into the similar minded process of the process of globalisation which may lead to the decline of autonomous national cultures. Practically, the idea of Coubertin: 'The important thing in life is not the triumph but the struggle' can cease to exist.

On the other hand, the model of recreational sport expresses the fundamental social function of sport which is establishing and sustaining health. This is an important value in the development of human civilisation which was also discovered by the Ancient Greek. Among the most important components of classic Greek education we can find physical education serving military preparation and grammatical-literary-musical education indispensable for public performance. The famous proverb 'a healthy mind in a healthy body' was well-known to Roman culture to. (Mens sana in corpore sano). This increases social energy, equality, stability and balance. All these create a specific structure. Value has cultural nature; it does not develop only the individual but society as well. Cultural-civilizational development moves from the money driven single-value society towards the so-

called INFOSANCE[3] society which will crystallize around the ethos of the renaissance ideal using the technological appliance system of the information based society. 'The law of slowing time' means that man should calibrate his pace of development to the natural processes again. Sports, preserving health and prevention all have important roles in this, as the majority of the so-called 'cultural illnesses' originate from the fact that it is less and less possible to synchronize the biological and the social clocks of man.

Summary and conclusions

So we think that the metric (quantitative) approach that we applied previously does not help in clarifying and solving the problems of sport as a social institution. This traditional approach divides the complex phenomenon of sport which is a social multi-structure into isolated components, characteristics that do not unite into a coherent structure. Instead of that we suggest our own method which was named as 'arena model' by my colleague Tamás Dénes, which is based on 'structural energy' i.e. energy embodied in structures. (Dénes and Hardicsay, 2010). The bull and the toreador standing in the arena are still, but the sheer raising of the red drapery makes the bull move and it runs at the toreador with great energy. This phenomenon cannot be explained if we consider the arena as a physical system. The changing of the state of motion in this case is not caused by the effect of physical force but the structural change that appears in the structural space. While in classical (Newtonian) science the law of action/reaction handled force as a symmetry characteristic, but in the structural space the structure force depends on the reference structure, and is thus not necessarily symmetric. The conclusion clearly following from this is that general conservation of energy can only be described by structural equations. The arena model sheds light on the fact that quantitative descriptive theories, methods designed for inorganic systems approach reality systems only with more or less accuracy. This approach derives from the fact that reality functions *as a structure*, while the classical devices of human cognition are able to describe it only in the metric space. The detected inaccuracies of description were so far perceived by science as measurement errors and so it made an effort to enhance the accuracy of measurement devices. But in the case of far more complex multi-structural systems it is clear that by using metric measurement devices the number of difference components handled as measurement errors increases to such an extent that the system itself (and the phenomenon it stands for) became non-interpretable.

In contrast with this for the social phenomenon (e.g. sport) examined in structural space and structural time its functions are not examined separately but in terms of their interrelation. Sport does not possess either-or functions, quite contrary; it is a unified (total) phenomenon whose different functions can only be defined in accordance with the referential system of the cognitive man. These functions are equal in principle and only the value they stand for in certain situations makes one or the other dominant. In such cases the other non-dominant functions can be viewed as just 'potential functions'. Hopefully, we managed to relate the concept of 'value' to sport. However, as the material-energy-information triad is merely the manifestation forms of the same substance, similarly the manifestation forms of sport and its different functions are the existence forms of the same structural social phenomenon. But as in our theory we consider the material-energy-information triad equivalent with space structure and time structure, our equivalence principle is not just a triad but also counts as a quint-theory. This way sport, forming a sub-system as part of society which is a multi-structure is also

[3] Tamás Dénes created this acronym: *INFOSANCE*= ***INFO***rmational renais***SANCE*** (for detailed description see: Dénes, Tamás 2002)

a quint, that is, a sum of the complex material, energetic and informational processes existing in space and time.

This radical model change will hopefully contribute to a change in the picture that has been formulated so far of social sciences and sport in the eyes of the public. This will be possible:

1. if social sciences, including the field of sport, do not serve the manipulation of people and society, but serve the enhancement of real values: knowledge, health, equal opportunities etc.;
2. if social sciences in terms of their conception of man do not tear apart the physical and intellectual aspects of human existence,
3. if modern interdisciplinary sport science develops by and towards the organic interaction of natural and social sciences.

The structural sport concept outlined in this lecture and its theoretical, model-like representation puts real values into the focus of attention. The central value can be called 'social health'. If sport politics viewed this as fundamental, then the approach that is upside down today would change: social resources should not primarily serve elite sport but should secure the opportunity of physical training for all citizens. That is also a commonplace correlation that a healthy body usually implies a healthy soul. The significant decrease of psychosomatic illnesses can be expected of such a change in views, which, horribile dictu, may also have a not so irrelevant positive economic impact. Securing body and soul care-taking opportunities for each and every citizen would accelerate the tendency of equalisation in terms of equal opportunities.

It can be shown furthermore that social scientific cognition follows the same procedures that natural sciences do in their cognitive practice. It starts on *information* derived from the objective world, and then it transforms them into a structured form, i.e. *knowledge elements*. So knowledge is structured information. The multi-structure of understood and systematically organised knowledge elements develops into *knowledge.* The difference of the two knowledge fields lies in the theoretical difference between the inorganic and the organic (living) world. It turns out that the metric and quantitative approach of the inorganic world can be considered in terms of examining society as questionably relevant. As society is a complex multi-structure, contrary to nature. We find saturated (complete) structures in nature that are incapable of further development. If a system status stabilizes then two ways of transformation are possible:

1. The complexity of the structure decreases, so the system regresses.
2. The status change of the system stops. In the SM (Structure Memory) a new system level appears where the saturated structures become components.

This is how multi-structures come to existence, sport among them. Such complex structures can be represented with the apparatus of structural mathematics. That paradox can be seen from the above discussed that social sciences are not inferior in rank compared to natural sciences, but quite contrarily due to the incredible complexity of their subject, they can be called even more 'scientific' if any such comparison would make sense. It can not be accidental that several natural or engineering scientists claim that in the case of such complex issues as ecology, economic and/or financial crisis, welfare, politics etc. we face a 'social problem' that needs the special and adequate tools of social scientific study.

As far as sport science is concerned, the structural analysis of sport makes it possible that certain problems, aspects are not examined separately but viewed as a system in which interactions

have an important role. In this case it is not necessary to integrate the whole knowledge set of natural science and social science, just those aspects, methods, components that synthesize the issues of sport into an integrated knowledge sum of different fields and methods. I call this 'problem research' where all such knowledge or method bears practical value that is necessary for the solution of the given social problem or issue.

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