

**KINESIOLOGY – SYSTEMATIC REVIEW****Goran Sporiš<sup>1</sup>, Marko Badrić<sup>1</sup>, Ivan Prskalo<sup>2</sup> and Dobromir Bonacin<sup>3</sup>**<sup>1</sup> Faculty of Kinesiology, University of Zagreb, Croatia<sup>2</sup> Faculty of Education, University of Zagreb, Croatia<sup>3</sup> Faculty of Education, University of Travnik, Bosnia & Herzegovina*Original scientific paper***Abstract**

*The absence of movement, as a biotic need of every living being, has severe consequences on human health. This fact is extremely important in the modern world characterised by a growing tendency to neglect movement. This has been recognised by scientists who have generated a vast body of research tackling this issue. This is a very advanced area of research considering the complexity of human movement and the fact that the study of the development of principles of movement require an interdisciplinary approach. Movement has been studied throughout the history and there has been a long-standing need to produce a name for a scientific study of movement applicable in the areas of education, sport, recreation and kinesiotherapy. The most adequate term for the science of movement is kinesiology. The word "kinesiology" was coined in Europe in the mid 19<sup>th</sup> century. In Croatia, it only came into wider use in 1967. In Europe, the predominant use of the word "sport" in the terms sport science(s) or sport studies is probably a result of social, economic and historical factors shaping the meaning of the word "sport" in Europe. The term kinesiology is increasingly recognised and accepted as the adequate term for the science dealing with an extensive scope of multidisciplinary study of human movement, regular physical activity of different duration, intensity, purpose and content, as well as its effect on the body and life of the individual and society as a whole. The situation within kinesiology does not necessarily affect the wider academic community; however, this problem concerns the position of kinesiology in the wider scientific community and its struggle for recognition and identity. In the structure of sciences, kinesiology falls into the group of social sciences. All these sciences are mutually intertwined, whereby the findings from one science are adopted by the other in a different form. There are no independent sciences. Kinesiology and its disciplines constitute a homogenous research area reflecting distinct and real human needs which cannot be addressed without adopting a scientific approach (Mraković, 1997).*

**Key words:** kinesiology, definition, content, integration, terminology, purpose

**Introduction**

Kinesiology is the scientific study on the principles governing the maximum efficiency of human movement (Momirović 1969). Kinesiology is a scientific study on specially conditioned movement whose aim is to establish principles of transformational processes affected by that movement (Mraković, 1971). In other words, kinesiology is the scientific study of the principles governing exercise processes and the effects of these processes on human body (Mraković, 1992). The word kinesiology has roots in Greek words *kinesis* (motion, movement) and *logos* (science, study). Thus, kinesiology is etimologically a scientific study of movement. The word kinesiology is of the Greek origin (*kinesis* /κίνησις/ - motion, movement and *logos* /λογος/ - word, evidence, theory, affirmation, which, when put together, means the study of movement. Kinesiology is the scientific study of the principles of structured exercise processes and the effects of these processes on the human body. As every other scientific study, kinesiology does not deal with its subject matter only conceptually, but rather it provides scientific evidence based on valid research methodology which allows for the verification of certain principles. Definition of what is considered scientific depends on the convention of competent experts in the given period.

Kinesiology does neither study all human movement nor the movement of all objects. Movement is a biological need of every living being (Starosta, 2001). In the process of building the modern civilisation, people have forgotten their biological needs. The sedentary way of life has resulted in numerous civilisation diseases and illnesses. In this situation people are faced with two possibilities – they will either put effort in their physical health or the number of kinesiologyally disabled people will continue to grow. Over the years, movement has been the subject of various fields of study (Starosta, 2001). Its meaning was simply defined by Aristotle: „Movement is life“. A number of different names that were given to the study of human movement show a great interest that other fields of study have taken in this budding area of research, especially in the 20th century. The fact of multiple names for this field of study indicates the extensity of the scope of study of human movement. Scientific study of human movement has always had a universal meaning, since it encompasses all people, regardless of their sex, age, race, occupation, etc. The paradox we are facing today is that our professional activities require an ever growing level of motor skills, while the level of motor skills is generally decreasing.

The orthopaedist Senger has put the meaning of movement in one sentence: "Movement is life – life is movement." This sentence best describes the essential value of movement – human life begins and ends with it. Possibly, Senger was inspired by the great thinker of the Antic period, Aristotle, when phrasing this definition of movement. Aristotle described the link between movement and life in simple terms: Movement is life and the physical activity and creativity – weather its nature is productive, professional, artistic or athletic – always manifests itself through movement. Movement exists even when its external manifestation is less noticeable, in, for example, the process of breathing, blood circulation, metabolism, digestion, etc. Movement is the universal need of all living beings; without movement there would be no life, and movement is also necessary if we want to change location, express emotions, work or perform any other activity. The study of movement and its principles has a long history. First findings regarding the essence of movement date back to the time of the Roman physician Galen (130 – 200). In his work, we find experiments observing muscle contraction occurring during the transfer of the movement impulse by the nerve. Likewise, Leonardo da Vinci (1452 – 1519), one of the greatest Renaissance polymaths, also studied certain aspects of movement. He was one of the first theoreticians to tackle the question of how human body is subject to the laws of mechanics. An important role in the history of the study of kinetics is occupied by the scientist Borelli, a mathematician and a physician. Borelli conducted research into the classification of the loco-motor movements in humans and animals and the location of the body's centre of balance. Orthopaedist Bayer formulated the so-called kinetic chain theory, which was further developed by Schmidt. One of the first studies into the fundamental development of motor abilities was carried out by Woodworth in the late 19<sup>th</sup> century. He looked into the basic principles of the performance of the fast movements of the arm and the hand. Evidence provided by Thorndike (1914) also had a major effect on the development of new trends in research. This evidence concerns the very root of the learning phenomena and other habitual behaviour. He pointed to the purpose of linking reward and motivation in repetitive exercises. He pioneered research on individual differences in the results of physical activities.

### History of the concept of kinesiology

The word kinesiology was first coined by the Swedish gymnast Carl August Georgi, and the first record of the word appears in 1854 in the biography of Per Henrik Ling, the founder of the Swedish gymnastics system. The word kinesiology originates from two Greek words: *kinesis*, meaning movement and *logos* meaning study. The term has a 150-year old tradition and it dates back to 1857, the year in which Nicolas Dally gave his book on movement the title *Cinesiologie*

(Renson, 2000) and defined the term kinesiology as the scientific study of movement related to education, hygiene and therapy. Literally translated into English, the word kinesiology means the study of movement. Some consider Aristotle the father of the study of movement, while others mention N. Dally, the author of the first booklet entitled *Cinesiologie*, published in 1857. However, the scientific approach to motion and movement only became possible in the 20<sup>th</sup> century. New ideas in the field of the study of human movement were introduced by Bernstein (1897 – 1966) and published in his fundamental books: *On Building Movement* (1947), *An Outline of Physiology of Movement, Physiology of Activity* (1966), and *On Agility and its Development* (1991). His ideas were very advanced at the time (Starosta, 2001). A number of new topics in study of movement were also introduced by Meinel, who synthesised the existent body of work in the area of human kinetics. The many years of work yielded the book entitled *Bewegungslehre*, (eng. Movement Teaching), published in 1962. Meinel complemented the title with a lengthy subtitle: *The Attempt to Form Theories of Sport Movements in Pedagogical Aspects*. In the aforementioned synthesis Meinel proved to be an extremely versatile researcher who was, despite his humanistic education, also successful at other types of study. The scientific study of movement has been given a number of names throughout history, such as kinesiology, anthropomotrics, kinanthropology, motorics or psychomotorics. These are not the only terms used to cover the definition of this field of study. Some of these terms have their origin in other, more general attempts at defining this academic discipline: science on human movement, science on physical activity, anthropokinetics (Blahus, 1999), "reflexomotorics", somatomotorics, sensomotorics, psychomotorics, kinetics, technomotorics, anthropomotrics, sports motorics (Hirtz, Kirchner, Pöhlmann 1994). Throughout history, the following terms were proposed for the study of human movement instead of the term physical education: kinesiology, exercise, sport science, movement science (Thomas, Nelson, 1990). The number and diversity of the proposed names indicates the great interest that many experts from different fields of study took in the development of this discipline. This interest is entirely justified, since the study of movement bears great significance for all people, regardless of their sex, age, race, occupation, and other characteristics. Development of a new scientific field opens up a vast uncharted territory and numerous prospects for the future development of interdisciplinary studies. Furthermore, the scope of study is very wide and it lends itself to researchers from almost all fields of study. Looking for an adequate term for the scientific study of movement involves a tinge of rivalry in tackling the "super-problem" that allows everyone to find their own place. Additionally, the choice of the name probably determines the leading area of research.

Education authorities opted for the term kinesiology, referring to the scientific study consisting of areas of study that focus on the research and application of physical education (Wuest and Bucher, 1991). In the Central European countries, especially Germany, Austria and the Czech Republic, this term is very often used in the context of physical therapy, functional anatomy and medical science (Blahus, 1999). In the same year, Renson proposed the name "kinanthropology", pointing the origin of the word to the Greek words *kinein* (to move), *anthropos* (human being), and *logos* (study, science). Some people would agree with Blahus (1999), at least with regard to the concepts close to kinanthropology and kinesiology.

### **The directions of the development of human movement (human kinesiology) and their different names**

The brief overview of all the names that have been ascribed to the scientific study of movement also indicates the level of interest that almost all disciplines have taken in this subject (Starosta, 2001). This is an extremely advanced approach, considering the outstanding complexity of the performance of human movement and the fact that the study of the development and principles of movement indeed requires an interdisciplinary approach. A different scientific point of view may provide certain answers to at least a tiny segment of the wide and complex scope of study of human kinetics. Unfortunately, human kinetics is the term that has become the most commonly used to refer to this young academic discipline. However, of all the proposed names, kinesiology is considered the most adequate one (Starosta, 2001). Aside from the fact that this name emphasises the independence of this academic discipline as well as its scientific status, it also defines its subject matter in a precise and explicit manner. Nowadays, the term kinesiology is used to refer to the entire academic and scientific field of study of human movement. In Croatia, kinesiology is considered to be an empirical, experiment-based science that studies the laws, principles and patterns of controlled and targeted processes of physical exercise (activity) and their impact on human body (Mraković, 1992). Kinesiology is a fundamental scientific field which is superior to and which finds its application in various areas, such as sport, physical and health education, health, recreation, sport management and kinesitherapy. It contains fundamental principles which apply to all branches of kinesiology (systematic kinesiology, sport kinesiology, sport training, recreational sport, kinesitherapy and kinanthropology).

### **Term kinesiology in the names of higher education institutions**

Kinesiology is not the only term in use for this academic field in Europe or North America. Over the past few decades, many names and their

varieties have been used to refer to this academic discipline, faculties, professional organisations or academic journals in the field of the study of human movement. There is no general consensus in the matter. Sport, sport science, exercise science, human performance, movement science, human kinetics, kinesiology, kinanthropology, anthropomotorics, anthropokinetics, anthropokinesiology, health, body education, physical education, recreation, leisure time study, training, sports training, tailored physical education, sport management and other terms and their combinations are currently in use. The research area exists regardless of the multiple terms used to define it. However, this variety in terminology may lead to confusion and misunderstandings in the academic community. Furthermore, Wade and Baker (as cited in Mills, 1992) warned that the lack of a clearly articulated and acceptable definition will have severe consequences on the structure of programmes in higher education (Čustonja et al., 2009). Even though the word kinesiology was coined in Europe in the mid 19th century, it had not come into official use in Europe until much later, namely 1967, when the Institute for Kinesiology was founded at the Faculty of Physical Education (*Fakultet za fizičku kulturu*) (in 2001 renamed Faculty of Kinesiology) of the University of Zagreb in Croatia in 1967. This is the first time that the word kinesiology was used as an official term in the context of the European higher education system, i.e. the European academic community. Currently, only one faculty in Belgium (the Catholic University in Leuven, Faculty of Kinesiology and Rehabilitation Science) and two faculties in Croatia (Faculty of Kinesiology of the University of Zagreb and Faculty of Kinesiology of the University of Split) have fully accepted the term kinesiology and incorporated it in its official name. In the United States of America the term kinesiology first appeared in 1886 and it became widely known when Baron Nilns Posse published "Special Kinesiology of Educational Gymnastics" in Boston in 1894 (Renson, 2002). The modern era of kinesiology as an academic discipline began in North America about 50 years ago when the first university departments began to use the word kinesiology in their names. The American Academy of Physical Education changed its name to the American Academy of Kinesiology and Physical Education (AAKPE) in 1993, acknowledging the importance and fundamental values of kinesiology as a multidisciplinary and cross-disciplinary science of human movement. Previously, the term kinesiology was often combined or even used interchangeably with the term biomechanics (Čustonja et al. 2009). The American Kinesiology Association was established in 2007 to promote and enhance kinesiology as a unified field of study within the higher education system of the United States and advance its many applications. The debate about the proper name for this science has a relatively long history. Several papers addressing this subject appeared at the end of the 1980s and at the beginning of the 1990s (Ojeme, 1984; Bird, 1988; Caldwell,

1988; Piper, 1988; Vincent, Wunningham, and Caldwell, 1988; Corbin & Eckert, 1989; Ojeme, 1989; Kretchmar, 1989; Newell, 1989; Vincent, 1991; Wade & Baker, 1992; Mills, 1992; Baker, Hardman, and Pan, 1996a; Baker, Hardman, and Pan, 1996). However, this discussion has not been concluded and the diversity of the terms for identifying this science has remained. There are great variations between Europe and the USA in the frequency of use of different terms in the official titles of their respective university departments and faculties in the academic field of human movement studies (Čustonja et al., 2009). Contrary to the USA, the most frequently used terms in the official names of the higher education institutions in the field of human movement studies in Europe are sport (sport sciences, sport studies, etc.) and physical education. In the USA, the most frequently used term is health. At the same time there is only one higher education institution that uses the term health in its official name in Europe. The term sport is not as frequently used in the USA. The term physical education is the second most frequently used term in the USA. There are 100 study programmes that use the term physical education alone in their names (Čustonja et al., 2009), or about 58% of all the study programmes that use the term physical education. When physical education is combined with other terms, the most commonly used terms include exercise science, health and recreation or wellness. There is only one department that combines the term physical education with the term kinesiology. Similarly, the term physical education is the second most frequently used term in Europe. In most cases (about 76%) the term physical education is combined with the terms sport or sport science(s). In Europe, 5 university departments or faculties use exclusively the term physical education (Čustonja et al. 2009). Both in Europe and the USA the term physical education is widely used as the name for higher education institutions. It is the only term that has a similar status both in Europe and the USA. This can be explained by the historical fact that physical education was the first commonly used term when the first high school and university departments or faculties in the field of human movement studies were established in Europe and the USA. Scientific understanding and appreciation of human movement studies have emerged from the field of PE which is today ever more considered as only one of the areas of human activity in which findings of the science in question are applied. The majority of PE departments in Europe and the USA were established at the beginning of the 20th century and soon after World War II with the purpose to prepare PE teachers (Čustonja et al., 2009). With the growth of fundamental scientific knowledge in the field of human movement studies, scholars realized that PE teaching was not the only area where this knowledge can be applied. Further, they realized that the term physical education is not an adequate name for a science and that, if they wanted to be recognized and appreciated by the scientific community, they

needed a more appropriate term that would better describe and define this scientific discipline. During the 1950s, 1960s, and 1970s, the divergences in terminology started. Terms like sport, sport science, exercise science, human performance, movement science, human kinetics, kinesiology, kinanthropology, health, physical culture, recreation, leisure studies and other terms or their combinations emerged in Europe and the USA in the pursuit of the best or most convenient term. Although the term physical education is still frequently used in the USA and Europe, where about 20% and 24% of all the university study programmes use this term in their names, respectively, its usage frequency has gradually decreased in recent decades (Čustonja et al., 2009). The main difficulty with the term physical education is the traditional heritage and understanding that PE study programmes are focused on the occupational preparation and therefore lacking in scientific substance. However, fundamental scientific knowledge that supports PE studies is the same as in other disciplines of the science in question and therefore physical education can be considered as a part of a bigger whole, or a branch of general science. The term sport is very often used in Europe (Čustonja et al., 2009). It has been observed that 54 study programmes, or about 44% of all the university departments or faculties, use the term sport. In most cases it is sport science(s), sport studies or just sport. About 25% of all study programmes in Europe encompassed by this investigation use the term sport science(s) (Čustonja i sur., 2009). The predominance of the term sport, like in sport science(s) or sport studies, in Europe is probably a product of social, economic and historical significance of the term sport on the old continent. Sport is a word used in almost all European languages; it is widely recognized and common in everyday use. European culture and history has become less flexible to accept a different term. Since the middle of the 1960s, the concept of sport science, based on the theory of PE, has started to emerge. Unstoppable change in social conditions and the increasing social importance of organized sport led to the implementation of academic chairs for sport science first at the universities in German-speaking countries and partly in other European countries in the 1970s. During the 1980s, the differentiation from PE was mostly finished and sport science with its theoretical framework and interdisciplinary character was established in Europe. The European social and political situation strongly influenced sport science during the 1990s. Scientists from the former East-European block countries are considered to have been dominant in scientific achievements in human movement studies in Europe before 1990s. After the fall of the communist regimes in Eastern Europe, the term physical culture, previously so popular, was widely replaced by the term sport. The foundation of the European College of Sport Science (ECSS) in 1995 was a decisive step in the process of promoting sport science as an international

discipline, at least in Europe (Müller, 2008). Nowadays the European College of Sport Science (ECSS) is the strongest and most important scientific organization in Europe in the field in question (Čustonja et al., 2009). It promotes sport science through the organization of annual international and multidisciplinary congresses on sport science; through the publication of the scientific journal the *European Journal of Sport Science*, and by supporting both the concept and the term sport science with position statements on central issues, concerns, or areas of interest. Therefore, these are the reasons why the term sport prevails in the names of European higher education institutions. However, since sport is also a form of human activity, we consider this term hardly a proper name for this scientific discipline or for a university department or a faculty.

### **Kinesiology as a scientific discipline**

In 2009, National Science Council of the Republic of Croatia classified kinesiology as an independent scientific field in the area of social sciences. Kinesiology was listed in the official nomenclature of scientific disciplines in Croatia, next to all other affirmed disciplines, such as economy, law, sociology, psychology, political science, speech-language pathology, pedagogy, etc. Furthermore, inside the defined scientific field of kinesiology, scientific branches were determined. The classified branches of kinesiology are the following: systematic kinesiology, sports kinesiology, kinesiological education, kinesiological recreation, kinesitherapy and adjusted physical activity, and kinanthropology. The first use of the term kinesiology in the name of the Institute of Kinesiology, founded in 1967, the recognition of kinesiology as a scientific discipline and its classification as an independent scientific field mark the end of a long pursuit for the adequate name for the scientific study of human movement in Croatian academic community. Croatia seems to be the pioneer in the promotion of the term kinesiology in the European scientific and academic community. Despite the fact that only three higher education institutions in Europe use the term kinesiology in their official names, this term is used among the European academic community and it occurs in the names of journals, scientific institutions, and subject curricula. It may be concluded that the term kinesiology is increasingly recognised and accepted as the adequate term for the science dealing with an extensive scope of multidisciplinary study of human movement, regular physical activity of various duration, intensity, purpose and content, as well as its effect on the body and life of the individual and society as a whole. Kinesiology as a fundamental science finds application of its theory, concepts, developments and principles in various everyday activities, such as sport, physical education, therapeutic exercise, recreation, exercise, physical therapy, sport management, etc. Since kinesiology encompasses principles governing all these areas, the global and universal

use of the term kinesiology for both the science and the profession is only a matter of academic and scientific consensus. Kinesiology is defined as the scientific study of movement, or even more widely, as the scientific study of physical activity. The term kinesiology is an umbrella term for all the criteria designating the area of academic study of physical activity and it makes a valuable contribution to the objectivity of many current debates over the science, profession and dimensions of the related activities and their subareas.

### **Kinesiology as a universal term**

Despite the fact that the name kinesiology meets all the above mentioned criteria, there are still several potential hindrances for the selection of the word kinesiology as the official term. First, the term kinesiology is, despite its growing popularity, still not generally as well known as the terms physical education or sport. However, the term kinesiology is becoming more frequently used in media reports. It is clear that there is still a lot of work to be done in the promotion of the term kinesiology, although major steps have already been taken. Secondly, even among physical education academics, some faculties still object the limited view of the structural and functional aspects of movement that the term kinesiology suggests and they propose the more recent term biomechanics. However, this limited interpretation of the term kinesiology is now completely abandoned and this use of the term will in time become outdated. Some faculties in this area can agree that the term kinesiology is adequate for the study of physical activity, but they reject the idea of using this term for the study of professional and performance aspects. They advocate a much more general use of the term kinesiology, which presents an unnecessary expansion of the disciplinary use of the term. First of all, even though several departments eliminated the explicit elements of professional training from their curricula, it seems that this practice will not be generally accepted in the near future. Creating separate departments on the academic level for the disciplinary, professional and performance aspects of the study of physical activity does not seem feasible. Therefore, a name that will encompass all programme orientations in the study of physical activity is to be used. Even though physical education academics often claim the word kinesiology, it is important to notice that the word kinesiology traditionally has a much wider use in terms like gymnastic kinesiology (Slowikowski and Newell, 1990) and, more recently, dance kinesiology. Next, it may be necessary to address the misconception of some academics in the area of social sciences and humanities, who consider kinesiology to be the scientific study of the biology of physical activity. Even though this interpretation may be popular in some scientific branches, the name kinesiology does not directly suggest this meaning.

Furthermore, the name kinesiology literally means “the scientific study of movement”. The expression “the study of” suggests a non-explicit orientation in the form, or one type of academic model, although some academics assume that the suffix “-ology” stresses the social study orientation. Therefore, it may be inferred that, by definition, physical education is a subordinate term to kinesiology in the same way that visual arts are a subordinate term to art. Additionally, other established fields of study with a similarly discipline-oriented name (e.g. psychology) comprise professional-oriented components (such as clinical psychology) in their curricula. There are numerous competing certified programmes within the general field of study. Whether physical education will exist independently within kinesiology or not in a certain area will depend on local decision-makers. To sum up, a universal perception of the term kinesiology can only be achieved by putting continual effort in the common presentation of its scope of study on the academic level, on the level of departments and on the level of the wider academic community. The more general view of the term is essential. Since the perception of the word is still very vague, it is possible to define the meaning of the word kinesiology more generally. It is extremely important for the field of kinesiology to have a universal description both as an academic field and a field of scientific study and for the term kinesiology to be used consistently. Another obstacle is the limiting nature of the word “education” in the term physical education, which suggests a clearly defined and accepted focus as an education model. Physical education is a well-established concept in the academic community and society as a whole and it is difficult to modify it.

Simultaneously, the terms physical exercise and sport are also well-defined (Newell, 1990a); even though the more general, so-called European interpretation of the term sport (Kretchmar, 1989) cannot logically encompass the entire field of physical activity. Furthermore, it should be recognised and noticed that the conceptual and terminology-related problems extend to subordinate fields as well (Newell, 1990b). It is therefore necessary for the academic community to harmonize the terminology so it can be extended to the subordinate fields as well. The support and understanding of numerous associations that represent the subordinate academic fields of the study of physical activity is necessary. A logical and coherent taxonomy of the academic field of physical education study is long overdue. There are a number of strong arguments supporting the introduction of the term kinesiology in primary and secondary education. Finally, the constantly changing nature of academic fields must be recognised. The general quality of the term kinesiology ensures the necessary flexibility and lends itself to successful presentation and promotion of the academic field in the 21<sup>st</sup> century.

### ***Kinesiology in relation to other scientific fields***

The current orthodox view of the scope of scientific study of kinesiology is being re-evaluated in order to allow social sciences to enter the debate over the nature and the purpose of kinesiology. An alternative vision of kinesiology’s potential has been proposed: a more scientific picture of human beings than is currently available may be produced if human beings are studied as whole selves, not as isolated physiological or psychological units. If a multidisciplinary synthesis were to be adopted, the subject, via its component disciplines, should provide a model for the reintegration of disciplines in the urgent need to study people based on a human-development rather than the performance-efficiency model. The model of the ideal science arising from physics is inadequate for many natural science models as well as for social science disciplines (Maguire, 1991). That model does not in any way exhaust the possibilities that science offer. There is only one universally accepted definition of scientific methods, which in a simple and absolute way draws a distinction between science and non-science. The current orthodox view of science is in kinesiology reflected in the ideas advocated by traditional scientific realists. The scientific method is to be found in natural science procedures, an example of which is physics. In addressing the distinction between the logic behind social sciences and the logic behind natural sciences some naive positivists describe social sciences as an underdeveloped imitation of natural sciences at best, in which the pure and eternal scientific logic is contaminated with non-scientific, socially determined ideological factors (Maguire, 1991). Sport scientists, unconcerned by the modern developments in the philosophy of science, seem to have readily accepted this model of science and retained the empirical explanations from curricula and research topics (Maguire, 1991). The first step that kinesiologists need to take in order to change that is to acknowledge that athletes must be viewed “in the round”, rather than as fragments of an entity. This observation relates not only to a critique of existing sport science practice, but also to an alternative (Maguire, 1991). A bolder and more imaginative view of the sport sciences would centre on its potential to tell us something about human beings generally, not solely relating to their performing in sport events. The existing tendency, however, is to treat individual elite athletes as machines. Highly rationalized and technologized physical and mental training methods, combined with scientifically evaluated and scheduled fitness regimes, are designed to produce maximum performance (Maguire, 1991). Hoberman (1988) has observed that modern high-performance sport is a global monoculture whose values derive in large measure from the sphere of technology. The body of the athlete has become, quite literally, a laboratory specimen whose structure and potential can often be measured in precise quantitative terms.

It is these general taken-for-granted assumptions and the outdated philosophy of science guiding sport science thinking that is seen as problematic. A more adequate and "scientific" picture of human beings than is currently available may be produced if human beings are studied "in the round", as whole selves, not as isolated physiological or psychological units. That is, if a multidisciplinary synthesis were to be adopted, it might then be possible to glimpse the fuller potential of the sport sciences. The subject, via its component disciplines, should not only contribute to the stocks of knowledge of the parent disciplines but also provide a model for the reintegration of disciplines in the urgent need to study people in their totality, be it in a sport setting or elsewhere. Such an approach would also be one step in the direction away from the drift toward the restricted "scientization of physical education discourses" to which Whitson and Macintosh directed attention McKay, Gore and Kirk (1990), the present analysis endorses the critique of "technocratic physical education" provided by McKay, Gore, and Kirk (1990), and the alternative proposed here is underpinned by a belief it shares with these writers: Science is not irretrievably flawed; it still has the potential to be a mode of enlightenment and emancipation. In the search for the "truth," be it in the natural or the social sciences, the question of objectivity repeatedly crops up (Maguire, 1991). Furthermore, the majority of authors in the field of philosophy of science argue that observations are dependent on the theory (Polanyi, 1973). Observations cannot simply be collected, stored, and presented as facts to be explained. Observations are always guided by some theory, no matter how simple or vague. On a continuum, there are no zero points, no absolute states of detachment or involvement, observation or theory formation. Rather, it is a matter of balances and degrees. This balance varies not only both between and within groups in the same society and between different historical periods but also with respect to what is under consideration or being experienced. (Maguire, 1991). This observation is connected to the scientization of human knowledge, a process involving a detour via detachment that resulted in greater human control over first physical, then biological, and then (though not yet to the same degree) social processes (Elias, 1987). As a consequence, it can be argued that the scientific enterprise is currently marked by a relatively high measure of autonomy—not absolute, but relative, autonomy. This is not to say that natural scientists are unaffected by values external to their craft but that these values are usually held in check by the study of broader, less time-bound problems defined by the theories and observations of generations of investigators in each field. Thus some problems of such scientists have a relatively high autonomy *vis-a-vis* the pressing social, political, and economic problems of their day (Maguire, 1991). However, this analysis was not always the case, and today it is more true for scientists working at the purer end of the

continuum. This has obvious implications for those working within the sport sciences. An overemphasis on the quest for peak performance may restrict the ability of the sport scientist to study sport in terms of a human-development model. This observation applies not only to sport scientists in Leipzig and elsewhere in the German Democratic Republic but also to western sport scientists such as those at the U.S.A. Olympic Training Centre in Colorado Springs or at the Australian Institute of Sport who have been just as keen to produce optimal performances from their countries' athletes. Despite such relative autonomy, the practice of natural scientists is also influenced by heteronomous evaluations—that is, values of powerful outsiders or values of the scientist that are more related to personal and social interests than they are to scientific concerns. Reference to the work of Kuhn (1962), Lakatos and Musgrave (1970), and Feyerabend (1975) in the philosophy of science confirms such analysis. The persistent reference in physiological and psychological research to the assumed existence of racial differences to explain patterns of sport performance illustrates another aspect of heteronomous evaluations (Bouchard, 1988; Himes, 1988). In order to avoid the trap of relativism, the answer is not to endlessly repeat the objectivity-relativity debate. Rather, the balance and blend between involvement and detachment is what varies. As stocks of knowledge have been accumulated over generations and spread to wider sections of society, scientific concepts and models have increasingly displaced magical/mythical explanations of natural processes (Maguire, 1991). Indeed, where once scientists sought to make the conceptual leap required to understand some aspect of nature, now people take for granted the recourse to scientific concepts (Maguire, 1991). This is not to suggest that involved thinking has been completely replaced by detached thinking. Indeed, in times of extreme insecurity, the dominance of the former can be so complete that the exercising of the detour via detachment is prevented. Consider, for instance, the contribution that social scientists can and have made to understanding football hooliganism (Dunning, Murphy, & Williams, 1988) and contrast this with the knowledge base on which governments and sports organizations have made decisions. People's ability to recognize and acquire new knowledge is interdependent with the substance of the knowledge they and their society already possess (Maguire, 1991). In the sense that they have developed a greater range of more object-adequate representations of the material world, the natural sciences can be said to be more "advanced" than the social sciences. One should not, however, infer that this is due intrinsically to the subject matter studied by social scientists being inherently less susceptible to investigation by methods yielding a high degree of adequacy. Given the powerful critique provided by Kuhn (1962), Lakatos and Musgrave (1970), and Feyerabend (1975), extreme caution has to be

exercised with this line of thought. Notwithstanding these problems, the general aim of both the natural and the social sciences remains the same: to find out in what ways theory-dependent data are connected with each other. There is no reason to suppose that social data are any less accessible to human understanding. By removing hypothetic-deductive nomological theories from the central place in their conception of the natural sciences, the neo-realist philosophers have been able to argue that the social sciences are sciences in exactly the same sense but not in exactly the same ways as the natural sciences. What is different and what makes the task facing social scientists more difficult is that the objects they study are also subjects, who have a consciousness and exercise free will, and that they, the researchers, form part of the patterns they are researching. Classic philosophy of science and indeed the early work of Popper (1959) have used physics, with its emphasis on universal and timeless laws, as the unique model of what "true science" should be. Sport scientists appear to have too readily accepted this model. For social scientists, this is an unattainable ideal. Nor is it an ideal worth pursuing. This model is based on what Elias (1987a) termed an "atomistic fallacy"—that the properties of composite units can always be explained in terms of the properties of their smallest component parts studied in isolation from each other. There is, however, an alternative available that is especially relevant to subjects composed of a number of disciplines (e.g., sport sciences). A "model of models," proposed by Elias (1987a), in which he places the aggregate units of observation characteristic of each kind of science along a continuum, could be used (Maguire, 1991). And as you move along the continuum away from congeries, first structure theories, then process theories become more useful than "law-like" theories. Toward this end of the continuum, it is not a matter of utilizing induction or deduction. Rather, it is more appropriate to talk of analysis and synthesis, with the latter ascending in importance as you ascend the scale. The term analysis refers to those steps in research where theoretical attention is focused on constituent parts, with the larger unit treated more as the background. The term synthesis refers to those research phases where attempts are made to construct a more coherent theoretical representation of the whole (Maguire, 1991). In chemistry, for example, structure theories emerged during the course of the 19th century. Researchers were concerned not just with the quantities of atoms constituting a substance, but also with how the atoms were connected to each other. Three-dimensional models of the structure of molecules emerged. In the biological and social sciences, it became gradually clear that some investigations require four-dimensional models. That is, there emerged process models, models tracing why one thing happens after another in a sequence of directional, though not always irreversible events, involving spatial and time

dimensions. These models are not, however, always mutually exclusive (Maguire, 1991). But whereas in the natural sciences process models involve four dimensions, in the social sciences there is a fifth dimension—experience (Maguire, 1991). This fifth dimension involves probing the experiential aspects of human thoughts, feelings, and psychological drives. The need for such five-dimensional models is an important reason why the development of consensually validated and empirically based theories in the social sciences is more difficult. In conducting research on the basis of five-dimensional models, the researcher has to exercise a process of self-distancing. In order to achieve the required degree of relative detachment, researchers must learn to observe themselves as people, observe themselves in the situation as they examine it. In addition, the idea of a structured process of change, which moves in a discernible direction but is not planned or intended by the individuals or groups involved, has yet to become widely accepted in the social sciences. Unlike processes in the biological sciences, social processes, because they involve learning and experience, are reversible. The task facing scientists is to steer a path between absolutism and relativism. One needs to recognize that most scientific knowledge is informed by involved values and that modern ideologies are informed by more factual, scientific knowledge than were the ideologies of earlier ages. When comparing the natural sciences and the social sciences, it is clear that the latter are still in the throes of establishing a measure of relative detachment (Maguire, 1991). Kinesiology, too, is very much involved in the same process, locked in as it is to disciplinary rivalry, traditional physical education concerns, national interests, and the International Olympic Committee (IOC) policy regarding the role that sport science can play in the preparation of elite athletes. The difference between the natural and the social sciences within the scientific community as a whole and within the sport sciences in particular is therefore one of degree (Maguire, 1991). Natural scientists in the sport field have to ensure that they avoid a too-involved role in such areas as peak performance and coaching and maintain a more detached perspective by viewing people "in the round." But due to their desire to be accepted by, or their actual involvement in elite sport circles and their quest for status, funding, and academic/professional advancement, they appear unwilling or unable to exercise this degree of detachment (Maguire, 1991). The dangers of the trajectory on which some sport sciences headed, namely, toward a technologized view of human beings, have been well highlighted by John Hoberman (1988). For Hoberman, sports science does not physically hybridize humans and machines. Instead, sports science treats the human organism as though it were a machine, or as though it ought to be a machine. This technologized human organism comprises both mind and body, for which there are distinct sets of strategies.

The vision of viewing people "in the round" and adopting a human-development model stands in opposition to such a trend. But, as with natural scientists, social scientists must seek to avoid the pitfalls of having to be (and inevitably being) involved in the subject matter they are researching. If sport sciences began studying people "in the round" and adopted a human-development rather than a performance-efficiency research agenda, certain consequences would flow from this decision (Maguire, 1991). Some existing areas of research would receive less priority. Other research areas currently considered crucial would be refocused. Research areas that are, at present, neglected by sport scientists would receive greater prominence. Not all areas tackled by different disciplines would, however, lend themselves to a multidisciplinary approach. The task of contributing to the stock of knowledge of the parent discipline would remain. But the examination of some areas would require rethinking (Maguire, 1991). But until the importance and value of a multidisciplinary synthesis is raised, further discussion and elaboration of the precise details of what such an approach would look like is precluded. The task of studying people "in the round" requires a collective scientific effort. The research areas chosen include the emotions, violence, drugs, and exercise and lifestyle. Other areas such as alienation, aging, and child development could be examined. Though it is not appropriate, in this context, to go into any great depth regarding Elias's (1987b) analysis of the emotions, some specific, relevant points can be made. The process sociologist's concern with human emotions centres on both characteristics of human emotions that are shared with nonhuman species and characteristics that are uniquely human and without parallel in the animal kingdom. Such an approach represents a decisive break with a long-standing tradition that induces biologists and psychologists to disregard or to blur structural differences between human emotions and those of nonhuman species. This approach seeks to avoid two opposing tendencies in the human sciences, both of which are misleading: on the one hand, ethological and some psychological approaches that stress unvarying, natural human characteristics and, on the other hand, almost all social science that treats its subject matter as something set apart from nature and is concerned with uniquely human aspects of life. For Elias (1987b), both tendencies suffer from an inability to understand the nature of processes. In contrast to these tendencies, Elias (1987b) proposed three interconnected hypotheses regarding a theory of human beings and their emotions. Elias's work on the emotions has also been complemented by research he conducted with Eric Dunning on a theory of leisure (Elias & Dunning, 1986). The essence of their argument was that it is not possible to work out an adequate theory of leisure, of which sport is part, within the framework of any single human science, whether it be human physiology, psychology, or sociology.

The problems of leisure, in fact, belong to that large class of problems which, at the present stage in the development of scientific specialization, do not fit wholly into the frame of reference of any one of these sciences as they are at present constituted, but rather belong to the unexplored no-man's land between them. If sociology is considered as a science which abstracts from the psychological or the biological aspects of human beings, if psychology or human biology are regarded as sciences which can proceed on their own without taking account of the sociological aspects of people, the problems of leisure will be left out on a limb. At the present stage in the development of the scientific study of sport and leisure, disciplinary analyses suffer from the defect that they deal with aspects of people as if they in fact exist independently of each other (Vallerand, 1984). Indeed, some subdisciplines such as sport psychology further compartmentalize athletes by referring to stress and arousal in isolation from the more general issue of the emotions. Other dimensions of the emotions and sports are dealt with by "humanistic psychology" with reference to "altered states" (Murphy & White, 1978) and "peak experiences" (Gauron, 1984). In addition, there is now a growing body of literature that examines the physiological concomitants of these psychological dimensions (Glasser, 1979; Riggs, 1981). Here, multidisciplinary work examining the role of endorphins and enkephalin in the psychological experiences of sport encounters could be combined with the overall sociological analysis provided by Elias and Dunning (1986). A relative advance in the adequacy of the scientific study of sport and leisure would be gained if an overall framework within which to place both disciplinary and multidisciplinary analyses could be devised. One contribution toward this task has arguably been provided by Elias and Dunning's analysis of sport and leisure (1986). It is therefore suggested that aspects of leisure and human development require a multidisciplinary synthesis: The study of socially structured processes and emotions cannot be pursued in separate compartments. The study of leisure is one of the many instances in which it is not possible to disregard the problem of the actual relationship between phenomena on the sociological level and those on the psychological and physiological levels. Some psychologists and sociologists have employed social-learning theory as a way of considering human aggression (Smith, 1983). This theory assumes that aggression is learned like any other behaviour. Aggression is the consequence of observing and imitating others. The incidence of aggression is related both to the prevalence of aggressive acts and to the extent such behaviour is condoned and its imitation rewarded. Rejecting the catharsis thesis, social-learning theory argues that, far from channelling aggression in harmless ways, sport's aggressive acts and displays serve to normalize, heighten, and reinforce aggressive behaviour. Learning aggressive behaviour is part of the socialization process, and one of the key areas of interest

would be sport violence shown in the media (Messner, 1990; Siann, 1985). Although there is much to agree with in this approach, it was argued earlier that the steering of human conduct is always the result of an intimate interweaving of learned and unlearned processes (Maguire, 1991). Several multidisciplinary alternatives exist. Sociobiology has its devotees, but this approach, despite its name, may not be multidisciplinary in practice. Drugs and sport is one challenging issue facing sport scientists. More often than not, the issue is dealt with in a biomedical way (Goldman, 1984). Researchers are involved in a range of activities: from designing specific physiological or psychological drug programs for the needs of individual athletes, to examining the side effects of drug use or developing tests that reveal such use. When an ethical issue is raised, it is often with reference to the actions of a specific individual caught using banned performance-enhancing substances (e.g., the Ben Johnson affair). A case can be made for the need for biomedical research that examines the alleged or actual side effects of specific drugs (Maguire, 1991). A case can also be made for research that reveals the use of specific drugs. What are the ethical and social issues involved in the design, prescription, and recourse to drug use (Brown, 1980; Lavin, 1987; Simon, 1985)? The answer to this question cannot be found in the biomedical sciences, though this does not mean that researchers working in this area have not the responsibility to address these issues. For example, Simon (1985), in dismissing many conventional reasons for banning drugs in sport, argued that a ban is more ethically defensible when it involves participants in a mutual quest for excellence. That is, competitors should view themselves as under a moral obligation to their opponents. This obligation involves not only trying their best but also maintaining that the contest is a true test of worth. Such a position may overlook, however, the socioeconomic context in which elite athletes find themselves: The moral choice may not be theirs to make. In fact, the development of a coherent policy on drugs and sport is one of sport sciences most pressing needs. At present, however, the subject may be contributing, by its actions or inactions, to the trajectory Hoberman (1988) has observed elite sport is taking—that is, an experiment in human engineering. Philosophers and social scientists can, in conjunction with natural scientists, assist in the process of a critical appraisal of such a trajectory and develop a more humane sport system than currently exists. One extensively funded and researched topic in the sport sciences is exercise and lifestyle. Research that has broadened our understanding of the physiological consequences of various kinds and forms of exercise is important, though even here questions have been raised regarding the adequacy of such work. Again, problems of definition and of the interpretation of collected data arise (Hale, 1989). Questions regarding the nature of scientific craft reappear.

Important though such questions are, of more concern is that such physiological research is viewed as lopsided and one dimensional in certain respects and that it has failed to take into account the social context in which the exercise prescriptions are enacted (Featherstone, 1982; Glassner, 1989; Turner, 1984). When such research remains based on an individualistic and voluntaristic notion of health, exercise, and lifestyle, with citizens making "good" or "bad" choices, then the structural origin of illness, disease, and lack of fulfilment is overlooked. Attention to the social construction, patterning, and reproduction of these elements is required. In the study of health generally, the contribution the social sciences can make is more readily recognized and accepted. What is argued here is that the psycho-physiological parameters of exercise and lifestyle cannot be adequately studied in isolation from questions regarding existing socioeconomic and political structures. Ingham (1985), for example, argued that our recent preoccupation with our bodies is being mobilized as one solution to the fiscal crisis of the welfare state. The priority given to individual choice and lifestyle diverts attention away from the structural impediments to well-being by framing health issues in terms of personal and moral responsibilities (Maguire, 1991). Ingham's analysis of the research practice of many kinesiological and health scientists is worthy of quoting at some length: Focused on fitness, well-being, and lifestyle, such research is deemed necessary for the maximization of human potentials and, irrespective of specific features of political economy, the maximization of human potentials is a good thing. The exercise programs devised and the recommendations made by health scientists and physical educators have failed to consider how meeting these health needs is undergoing a process of commodification and how, in a consumer culture, the body is marketed, presented, and stylized in specific ways that bear little resemblance to real personal needs (Grover, 1990). Indeed, by laying emphasis on what the individual can do for his or her self, these programs and recommendations inadvertently reinforce the shift away from the state provision of health care occurring in a range of western societies (Maguire, 1991). It is necessary for researchers, when formulating their work on exercise and lifestyle, to have a sophisticated grasp of the social context within which exercise occurs and subsequently to provide critical observations on the utilization of exercise programs and healthy regimes in this wider social context (Glassner, 1989). Once more, a case is being made for a multidisciplinary human-development approach to problems the sport sciences can combine to tackle (Maguire, 1991). Several issues in the sociology of knowledge were tackled, in particular the emergence and current status of "science" and the similarities and differences between the natural and social sciences. Emphasis was placed on the importance of recognizing the diversity of approaches within

science and the need to avoid "process reduction." One task facing the sport sciences is, for example, to find out more about the way the uniquely large, unlearned human potential for learning is activated and patterned by the learning process itself. Such a move would be bold: It goes against existing vested interests, funding sources, and the status insecurity evident in the sport science community. But only in this way will a more adequate and, in that sense, more scientific picture of human beings than is currently available be produced. In the process of doing such research and disseminating the knowledge produced, the emancipatory potential of science and sport science could be glimpsed. Sport sciences, however, may be too new to make such an emancipatory move. Each discipline within the sport sciences is more or less successfully engaged in a struggle for relative autonomy. Such struggles persist in departments globally. Some disciplines, as in the sciences generally, are more established than others (Elias, 1982). As highlighted by McKay et al. (1990), some disciplines are marginalized in terms of curricula resources, time, and status. The sociology of sport, a comparative newcomer and hence an outsider in this regard, does not stand aloof from such struggles. Indeed, in its gradual integration into the sport sciences, it would be a mistake to assume that all of its practitioners would take the easy option and accept the benchmark of science expounded through physics. Sociologists, too, no doubt, will join the fray and struggle to demarcate the principles on which their social-scientific explanation of sport rests. At this stage, therefore, the degree of relative detachment required to grasp the potential of what is being proposed may not be present. In that sense, the situation within the sport sciences is not unlike the struggles that take place within the general scientific community. But this problem is compounded by the position in which sport science finds itself relative to the wider scientific community.

### **Structure and interdisciplinarity of kinesiology**

Every science is interdisciplinary and has a certain structure.

- 1) Interdisciplinarity refers to kinesiology's relation to other sciences;
- 2) The structure of kinesiology is defined by fundamental, applied and auxiliary disciplines.

Interdisciplinarity of kinesiology positions kinesiology in relation to other sciences. Kinesiology belongs to the group of anthropological sciences, a group connected with the group of methodological disciplines and the teaching methodology of kinesiology. All these sciences are interrelated and findings of one science are adopted by the other in a different form. We may conclude that no science is independent. For example, new findings in the area of pedagogy or medical science are applicable to kinesiology. Verification of these findings on kinesiological issues deepens and expands these

findings and these new findings in turn make a contribution to the original theory. The findings of medical physiology initially affected kinesiological physiology, and the knowledge on, for example, the functions of the cardiovascular system was in turn enriched by the findings of kinesiological physiology. Developments in the area of didactics were initially reflected in the teaching methodology of kinesiology, which has later become a fully developed scientific discipline with its own research methodology and which generates new findings that have application in didactics and other education-related fields.

Mraković (1997) argues that this structure is the most acceptable one from kinesiology's point of view. Such organisation of sciences is beneficial for kinesiology since it facilitates the establishment of a controlled exercise process. These scientific fields are necessary for kinesiological study of the results of a kinesiological treatment or inactivity. Due to their status of borderline sciences, kinesiological anthropology and research methodology of kinesiology can only be auxiliary disciplines of kinesiology, and teaching methodology of kinesiology an applied discipline of kinesiology. The goals of controlling the exercise process in kinesiology are as on figure 3. Basic disciplines of kinesiology include general disciplines of kinesiology and kinesiology of specific sports, as shown in Figure 2. General disciplines of kinesiology encompass systematic kinesiology, kinesiological biomechanics and non-sports kinesiology. The general purpose of these disciplines is to study general principles of controlled exercise processes and the results of these processes; the principles of efficient movement; and the principles governing the transformation of anthropological characteristics and motor skills under the influence of physical exercise (Mraković, 1997). Kinesiology of a specific sport provides the synthesis of the principles governing the exercise processes typical for the specific sport activity or a group of relatively homogenous sport activities. Kinesiology of sports can be divided in four categories. The first category refers to monostructural activities that involve covering a measurable distance either with one's body or a projectile. The cyclic structure of the movement prevails and the result does not depend on the cooperation among the members of a team. The second category refers to polystructural activities that involve non-cyclic activities whose aim is to symbolically defeat the opponent; the movement is performed and restricted through the contact with the opponent. The third category encompasses complex activities that involve hitting a target in space either by using a dribbled or ejected projectile; the structure of the movement is complex and can be either of cyclic and non-cyclic type; the result depends on the cooperation among the members of a team.

Finally, the fourth category refers to aesthetic activities whose goal is to achieve certain

aesthetic standards by performing permitted movements; the non-cyclic movement type prevails in the form characteristic for the given sport activity. Applied kinesiological disciplines primarily refer to teaching methodology of kinesiology. Teaching methodology of kinesiology is an applied science that studies the education principles in formal education, sport, sports recreation and kinesiotherapy. Teaching methodology of kinesiology is divided into several areas: education, recreation, sport and kinesiotherapy. These disciplines study specific principles referring to the respective kinesiological system and the management of these systems in all the areas of application. The specificity of the principles is determined by the differentiation between the purpose and the application of the transformation process methods (Mraković, 1997). Auxiliary disciplines of kinesiology refer to the fundamental research areas related to kinesiology, parent sciences and various fields of human activity. This area includes kinesiological anthropology and research methodology of kinesiology. This structure of kinesiology has been established many years ago and, as such, it needs to be continually updated and expanded. Kinesiology and its disciplines constitute a homogenous research area reflecting distinct and real human needs which cannot be addressed without adopting a scientific approach (Mraković, 1997). Kinesiology places a special emphasis on planning and programming contents:

### **CONTROLLING THE PHYSICAL EXERCISE PROCESS**

#### **What is the subject of study in kinesiology?**

The subject of study (interest) in kinesiology as a science is each controlled exercise process aimed at:

- 1) Health improvement;
- 2) Optimal development of personal characteristics, abilities and motor skills and their maintenance at the highest possible level for the longest possible period of time;
- 3) Prevention of early deterioration of certain anthropological characteristics and motor skills; Maximum development of characteristics, abilities and motor skills in competitive kinesiological activities.

#### **Planning and programming of the controlled exercise process (Mraković, 1997)**

Each controlled process consists of several factors. It is generally divided into planning and programming. The steps of a controlled cybernetic process in kinesiology are the following:

1. defining the goal of the exercise process
2. determining the subject's state
3. determining limiting factors
4. selection and distribution of exercise means
5. selection and distribution of exercise volume components

6. selection of the most adequate exercise modes; organisation and execution of a kinesiological treatment
7. periodical check
8. analysis of the effects of the exercise process

Defining the goal of the exercise process, determining the state of the subject and determining limiting factors fall into the planning phase, whereas the selection and distribution of exercise means, selection and distribution of exercise volume components, selection of the most adequate exercise modes, organisation and execution of a kinesiological treatment, periodical check, and the analysis of the effects of the exercise process fall into the programming phase of the exercise process. All the steps are closely interrelated, and the omission of one of them would undermine the entire controlled process. It is pointless to implement the programming procedure without previously defining the goal on the basis of the pre-existing state or vice versa, which is often the case in practice. It is also unacceptable to ignore the limiting factors, such as, e.g. poor material conditions etc. This means that the decisions are made intuitively and that the subject's needs cannot be properly met.

### **Conclusion**

An overview of the body of knowledge in the field of kinesiology as a science of movement compiled to date clearly indicates that the term kinesiology is the most adequate one in the structure of sciences. In Croatia, kinesiology is considered to be an empirical, experiment-based science studying the laws, principles and patterns of controlled and directed physical exercise processes (activities) and their effects on the human body (Mraković, 1992). Kinesiology as a fundamental area of research finds its application in various areas, such as education, sport, recreation, kinesiotherapy, health and sport management, and it is positioned in relation to them as a parent science. Kinesiology studies fundamental and universal principles applicable to all branches of kinesiology. Furthermore, it can be concluded that the term kinesiology is gaining popularity and recognition as an adequate name for the science dealing with a wide area of multidisciplinary study of human movement, regular physical activity of various duration, intensity, purpose and content, as well as its effect on the body and life of an individual and society as a whole. Kinesiology as a fundamental science finds the application of its theory, concepts, developments and principles in various everyday activities. Kinesiology studies principles common to all areas of applied kinesiology – education, sport, recreation and kinesiotherapy.

Thus, the global and universal use of the term kinesiology for both the science and the profession is only a matter of academic and scientific consensus. Equating the term kinesiology with the term physical education is misleading, since physical education has a well-defined and

established focus as an education model. Furthermore, the term physical education has a long tradition in the academic and wider community and it is difficult to modify its meaning at this point. The first formal use of the term kinesiology in the name of the Institute of Kinesiology that was founded in 1967, the recognition of kinesiology as a scientific discipline and its classification as an independent scientific field mark the end of a long pursuit for the adequate name for the scientific study of human movement in Croatian academic community. Croatia seems to be the pioneer in the promotion

of the term *kinesiology* in the European scientific and academic community. However, of all the proposed names, kinesiology is considered the most adequate one (Starosta, 2001). Aside from the fact that this name emphasises the independence of this academic discipline as well as its scientific status, it also defines its subject matter in a precise and explicit manner. Kinesiology and its disciplines constitute a homogenous research area reflecting distinct and real human needs which cannot be addressed without adopting a scientific approach (Mraković, 1997).

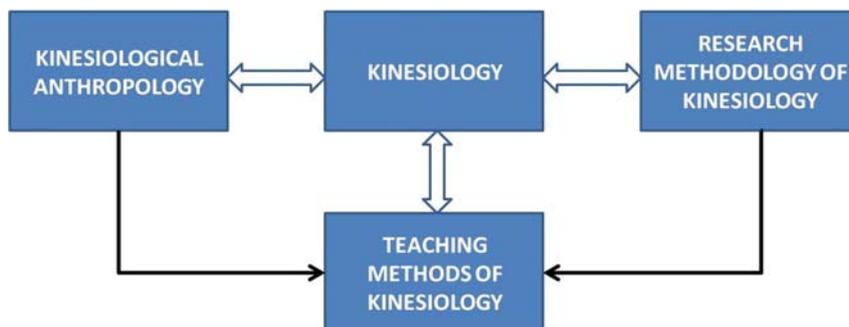


Figure 1: Kinesiology in the structure of sciences (Mraković, 1997)



Figure 2: The exercise process goals

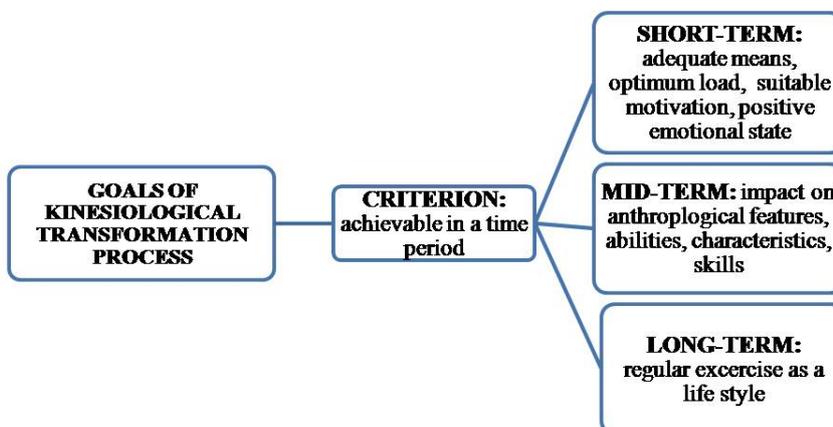


Figure 3: Exercise goals achievable in a time period

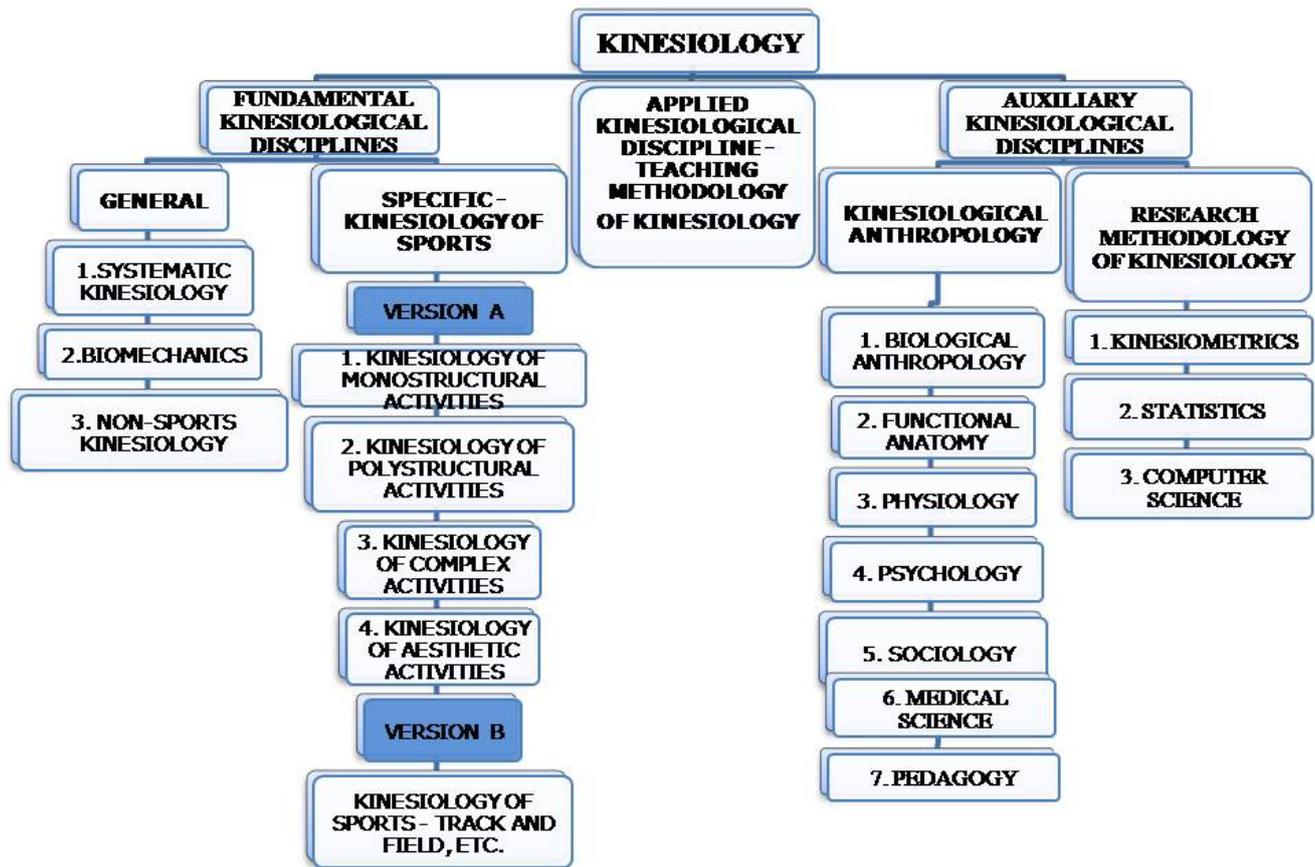


Figure 4. Internal structure of kinesiology (as revised by Mraković, 1997.)

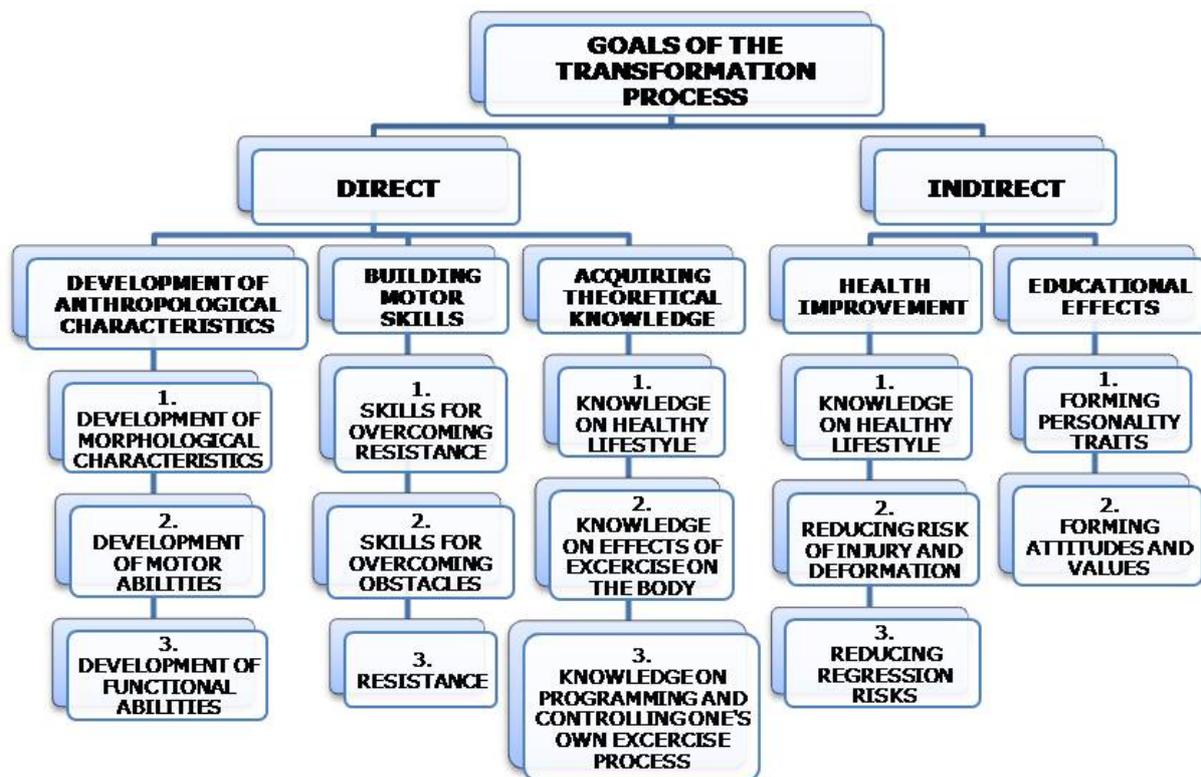


Figure 5: Transformation process goals

## References

- Baker, J.A.W., Hardman, K., & Pan, D.W. (1996a). Perceptions of department titles in the United States of America and the United Kingdom. *Journal of the International Council for Health, Physical Education, Recreation, Sport and Dance*, 33(1), 58-63.
- Baker, J.A.W., Hardman, K., & Pan, D.W. (1996b). A perceptual mapping approach to determine an appropriate descriptor for our field. *European Physical Education Review*, 2(1), 75-81
- Bird, P.J. (1988). College name change - A rationale. *Journal of Physical Education, Recreation and Dance*, 59(1), 25-27.
- Blahus, P. (1999) Measuring and modelling motor abilities as concept formation in scientific theory building in kinanthropology. *Intern. conf. Kinesiology for the 21st century*, Faculty of Physical Education University Zagreb, (pp. 43-50).
- Bouchard, C. (1988). Genetic basis of racial differences. *Canadian Journal of Sport Sciences*, 13, 104-108.
- Brown, W. (1980). Ethics, drugs and sport. *Journal of the Philosophy of Sport*, 7, 15-23.
- Caldwell, S.F. (1988). To "energize" physical education - change the dualistic term. *Journal of Physical Education, Recreation and Dance*, 59(1), 11.
- Corbin, C.B., & Eckert, H.M. (Eds.) (1989). *The evolving undergraduate major*. American Academy of Physical Education Papers #23. Champaign, IL: Human Kinetics.
- Čustonja, Z., Milanović, D., & Sporiš, G. (2009). Kinesiology in the names of higher education institutions in Europe and the United States of America. *Kinesiology*, 41(2), 136-146.
- Dally, N. (1857). *Cinesiologie ou science du mouvement dans ses rapports avec l'éducation, l'hygiène et l'herapie*. Paris: Librairie centrals des Sciences.
- Dollard, N., Doob, L., Miller, N., Mowrer, O., & Sears, R. (1939). *Frustration and aggression*. New Haven, CT: Yale University Press.
- Dunning, E., Murphy, P., & Williams, J. (1988). *The roots of football hooligan violence*. London, Routledge.
- Elias, N. (1971). Sociology of knowledge: New perspectives. *Sociology*, 5, 2-3.
- Elias, N. (1982). Scientific establishments. In N. Elias, R. Whitley, & H. Martins (Eds.), *Scientific establishments and hierarchies*. Dordrecht, Holland: Reidel.
- Elias, N. (1987). *Involvement and detachment*. Oxford, England: Blackwell.
- Elias, N., & Dunning, E. (1986). *Quest for excitement: Sport and leisure in the civilising process*. Oxford, England: Blackwell.
- Featherstone, M. (1983). The body in consumer culture. *Theory, Culture & Society*, 1, 18-33.
- Feyerabend, P. (1975). *Against method*. New York: New Left Books.
- Gauron, E. (1984). *Mental training for peak performance*. Lansing, MI: Sport Science Associates.
- Giddens, A. (1976). *New Rules of sociological method*. London: Hutchinson.
- Glasser, W. (1979). *Positive addiction*. New York: Harper & Row.
- Glassner, B. (1989). Fitness and the postmodern self. *Journal of Health and Social Behaviour*, 30, 180-191.
- Goldman, B. (1984). *Death in the locker room*. Tuscon, AZ: The Body Press.
- Grover, K. (Ed.) (1990). *Fitness in American culture: Images of health, sport and the body, 1830-1940*. Amherst: University of Massachusetts Press.
- Gruneau, R. (1982). Sport and the debate on the state. In H. Cantelon & R. Gruneau(Eds.), *Sport, culture and the modem state* (pp. 1-38). Toronto: University of Toronto Press.
- Guttman, A. (1986). *Sport spectators*. New York: Columbia University Press.
- Hale, T. (1989, September). *Science and the search for truth*. Paper presented at the British Association of Sport Sciences Conference, Bangor University, Wales.
- Himes, J. (1988). Racial variations in physique and body composition. *Canadian Joimnal of Sport Sciences*, 13, 117-126.
- Hirtz, P., Kirchner G., & Pöhlmann R. (1994), *Sportmotorik*. Univesität Gesamthochschule Kassel.
- Hoberman, J. (1988). Sport and the technological view of man. In W. Morgan & K. Meier (Eds.), *Philosophic inquiry in sport* (pp. 319-327). Champaign, IL: Human Kinetics.
- Hollis, M., & Lukes, S. (1982). *Rationality and relativism*. Oxford, England: Blackwell.
- Ingham, A. (1985). From public issue to personal trouble: Well-being and the fiscal crisis of the state. *Sociology of Sport Journal*, 2(1), 43-55.
- Kretchmar, R.S. (1989). Exercise and sport science. *Journal of Physical Education, Recreation and Dance*, 60(9), 68-69.
- Newell, K.M. (1989). Kinesiology. *Journal of Physical Education, Recreation and Dance*, 60(9), 69-70.
- Kuhn, T. (1962). *The structure of scientific revolutions*. Chicago: University of Chicago Press.
- Lakatos, I., & Musgrave, A. (1970). *Criticism and the growth of knowledge*. Cambridge, England: Cambridge University Press.
- Lavin, M. (1987). Sports and drugs: Are the current bans justified? *Journal of the Philosophy of Sport*, 14, 34-43.
- Maguire, J. (1991). Human sciences, sport sciences, and the need to study people „In the Round“. *Quest*, 43, 190-206.
- Mckay, J., Gore, J., & Kirk, D. (1990). Beyond the limits of technocratic physical education. *Quest*, 42, 52-76.
- Meinel, K. (1962) *Bewegungslehre (Versuch einer Theorie der sportlichen Bewegung unter pädagogischem Aspekt)*. Berlin: Volk und Wissen Volkseigener Verlag.

- Meinel, K. (1967) *Motoryczność ludzka (zarys teorii czynności sportowych i działań ruchowych z punktu widzenia pedagogicznego)*. Warszawa: "Sport i Turystyka".
- Messner, M. (1990). When bodies are weapons: Masculinity and violence in sport. *International Review for the Sociology of Sport*, 25(3), 203-220.
- Mills, B.D. (1992). Physical Education in higher education: What should we name ourselves? /on line/. Retrieved from the address: [http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content\\_storage\\_01/0000019b/80/14/08/ac.pdf](http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/14/08/ac.pdf) on October 14, 2008.
- Momirović, K. (1969). *Influence of scientific foundation of physical education on its social affirmation. In the book Theory of Physical education*. Belgrade: Yugoslav institute for Physical Education (pp, 166-133).
- Mraković, M. (1971) Kinesiology in Croatia. *Kinesiology*, 1(1), 1-5.
- Mraković, M. (1992). *Uvod u sistematsku kineziologiju*. [Introduction to kinesiology. In Croatian.] Zagreb: Faculty of Physical Education, University of Zagreb.
- Müller, E. (2008). Sport science in Europe – History and perspectives. In D. Milanović & F. Prot (Eds.), *Proceedings of the 5th International Conference on Kinesiology: Kinesiology Research Trends and Applications* (p. 32). Zagreb: Faculty of Kinesiology, University of Zagreb.
- Murphy, M., & White, R. (1978). *The psychic side of sports*. Reading, England: Addison Wesley.
- Newell, K.M. (1990a). Physical activity, knowledge types, and degree programs, *Quest*, 42(3), 243-268.
- Newell, K.M. (1990b). Physical education: Chaos out of order, *Quest*, 42(3), 227-242.
- Ojeme, E.O. (1984). Has the name Physical Education outlived its usefulness. *The Physical Educator*, 90(4), 190-194.
- Ojeme, E.O. (1989). A philosophic view of the Physical Education profession (brass ring revisited). *The Physical Educator*, 46(3), 121-134.
- Piper, R.A. (1988). P.E. recognized as a core subject: No name change necessary. *Journal of Physical Education, Recreation and Dance*, 59(4), 10.
- Polanyi, M. (1973). *Personal knowledge*. London: Hutchison.
- Popper, K.R. (1959). *The logic of scientific discovery*. London: Hutchinson.
- Renson, R. (2000). New insights into the biography and science background of Nicolas Dally (1795-1862), father of kinesiology (1857). *Kinesiology* 32(1), 5-14.
- Renson, R. (2002). Kinesiologists: raiders for the lost paradigm? In D. Milanović & F. Prot (Eds.), *Proceedings of the 3rd International Conference on Kinesiology: Kinesiology–New Perspectives* (p. 67). Zagreb: Faculty of Kinesiology, University of Zagreb.
- Riggs, C. (1981). Endorphins, neuro-transmitters and/or neuromodulators and exercise. In M.N. Sacks & M.L. Sacks (Eds.), *Psychology of running*. Champaign, IL: Human Kinetics.
- Siann, G. (1985). *Accounting for aggression: Perspectives on aggression and violence*. London: Allen and Unwin.
- Simon, R. (1985). Good competition and drug-enhanced performance. *Journal of the Philosophy of Sport*, 9, 6-13.
- Slowikowski, S., & Newell, K.M. (1990). The philosophy of kinesiology, *Quest*, 42(3), 279-296.
- Smith, M. (1983). *Violence and sport*. Toronto: Butterwoiths.
- Starosta, W. (2001). Science Of Human Movements – Meaning, Name, Directions Of Development. *Journal of Human Kinetics*, 6, 1-20.
- Talbot, M. (1989). *Gender and sport science*. Paper presented at the British Association of Sport Sciences Conference, Sociology of Sport Symposium, University of Birmingham, England.
- Thomas, J.R., & Nelson, J.K. (1990). *Research methods in physical activity* (2nd ed.). Champaign: Human Kinetics.
- Turner, B. (1984). *The body and society*. Oxford, England: Blackwell.
- Vallerand, R. (1984). Emotion in sport. In W. Straub & J.M. Williams (Eds.), *Cognitive sport psychology* (pp. 65-78). Lansing, MI: Sport Science Associates.
- Vincent, W.J. (1991). Kinesiology, The proper name for the discipline. *Physical Educator*, 48(3), 119-123.
- Vincent, W.J., Winningham, S.W., & Caldwell, S.F. (1988). Department name change: A rationale for kinesiology. *Journal of Physical Education, Recreation and Dance*, 59(7), 109-110.
- Wilson, B. (1970). *Rationality*. Oxford, England: Blackwell.
- Wuest, D.A., & Bucher C.A. (1991). *Foundation of physical and sport*, 11th ed. St. Louis: Mosby Inc.

## KINEZILOGIJA – SYSTEMATSKI PREGLED

### Sažetak

Odsutnost kretanja, kao biološke potrebe svakog živog bića, ima teške posljedice po zdravlje ljudi. Ova činjenica je iznimno važna u suvremenom svijetu obilježenom rastućom tendencijom da se zanemari kretanje. To je prepoznato od strane znanstvenika koji su generirali ogromnu količinu istraživanja za rješavanje ovog problema. To je općenito vrlo napredno područje istraživanja s obzirom na kompleksnost ljudskog pokreta i činjenicu da studija razvoja načela pokreta zahtijeva interdisciplinarni pristup. Pokret se studirao u cijeloj ljudskoj povijesti, a tu je i dugogodišnja potreba za generiranjem naziva za znanstveno proučavanje pokreta u područjima obrazovanja, sporta, rekreacije i kineziterapije. Najadekvatniji izraz za znanost o kretanju je kineziologija. Riječ "kineziologija" je nastala u Europi sredinom 19. stoljeća. U Hrvatskoj, samo je došla u širu uporabu od 1967.g. U Europi prevladava uporaba riječi "sport" u smislu sportskih znanosti (i) ili sportskih studija što je vjerojatno posljedica društvenih, ekonomskih i povijesnih čimbenika koji su oblikovali značenje riječi "sport" u Europi. Termin 'kineziologija' sve je priznatiji i prihvaćen je kao adekvatan termin za znanost koja se u opsežnom okviru multidisciplinarnog studija bavi ljudskim pokretom, redovitim tjelesnim aktivnostima različitog trajanja, intenziteta, namjene i sadržaja, kao i njezin učinak na tijelo i život pojedinca i društva u cjelini. Situacija u kineziologiji ne mora nužno utjecati na širu akademsku zajednicu, međutim, taj problem odnosi se na položaj kineziologije u široj znanstvenoj zajednici i borbi za priznavanje identiteta. U strukturi znanosti, kineziologija pripada skupini društvenih znanosti. Sve ove znanosti međusobno se prepliću, pri čemu se rezultati jedne znanosti usvajaju od druge u drugom obliku. Nema neovisne znanosti. Kineziologija i njene discipline tvore homogeni istraživački prostor i odražava različite i stvarne ljudske potrebe koje se ne mogu riješiti bez usvajanja znanstvenog pristupa (Mraković, 1997).

**Ključne riječi:** kineziologija, definicija, sadržaj, integracija, terminologija, svrha

---

Received: July 18, 2012

Accepted: June 10, 2013

Correspondence to:

Assoc.Prof.Goran Sporiš, Ph.D.

Faculty of Kinesiology

University of Zagreb

10000 Zagreb, Horvaćanski zavoj 15, Croatia

Phone: 00385 (0)99 21 21 220

E-mail: gsporis@kif.hr