DEVELOPMENT OF HUMAN MOVEMENT SCIENCE – THE MEANING, HISTORY, NAME, CONNECTION WITH OTHER SCIENCES, ORGANIZATIONS, PERSPECTIVES

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Introduction

The paradox of our times lies in the fact that many of our professional activities demand higher and higher motor competence, while at the same time the lowering of its level among various countries' societies can be observed. Human beings, when creating the modern civilization which released them from performing hectic physical loads, apparently did not notice that operating technical devices, which do the work for him, requires a high level of motor abilities, and particularly co-ordination abilities. This depends much on the efficient functioning of the central nervous system. The system has been developed thanks to the performance of movements, which many inhabitants of our globe try to abstain from. The growing inconsistency of the two tendencies must find an eventual solution: either the human will take up the efforts of motor education, or an increasing number of disabled people will require physiotherapeutic treatment. Within this context, the theory and practice in the science of movement/*kinetics* will become extremely relevant.

About the meaning of movement in human life.

The orthopaedist A. Senger has defined the meaning of human activity in a very synthetic way: "Movement is life - life is movement." (Fig.1) In this brief definition he has demonstrated the outstanding importance of movement – human life commences with it and comes to an end with it. An entire ocean is created between the very first movement and the last one. The more active the lifestyle and the longer the human life, the bigger the ocean. A. Schopenhauer expressed a similar thought earlier: " Life consists of movement and movement is its essence". It is quite possible that the great philosopher of the ancient times - Aristotle-served as an example when formulating the meaning of movement. He himself expressed the relationship between life and movement very briefly: "Movement is life".

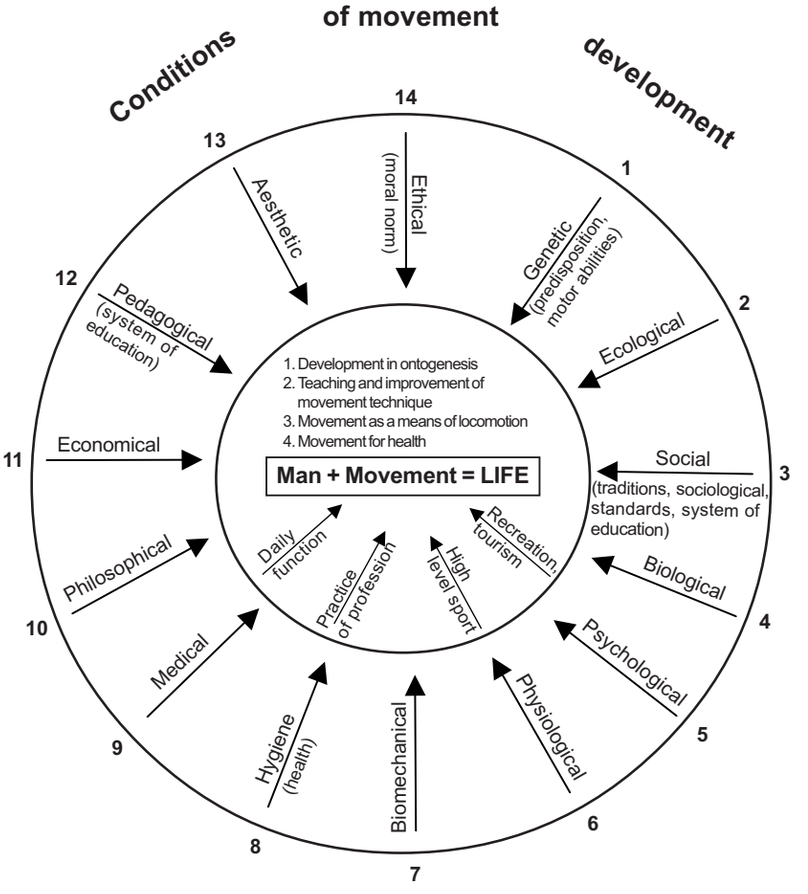

Figure 1. Movement sciences (kinesiology) in human life and a selection of development. (Starosta, 2001)

The entire creative and reproductive activity, independently of its character – whether productive, professional, artistic, daily or sporting (Fig.2) – is always manifested through movement! Movement occurs also in situations where its external forms of manifestation are less visible, that is, during breathing, blood circulation, metabolism, digestion, etc. Movement accounts for the universal aspect of every living organism! Without this aspect there is no life! Movement is indispensable for: relocating, expressing emotions, creating and for every other activity (Fig.3).

A short history of the science dealing with movement.

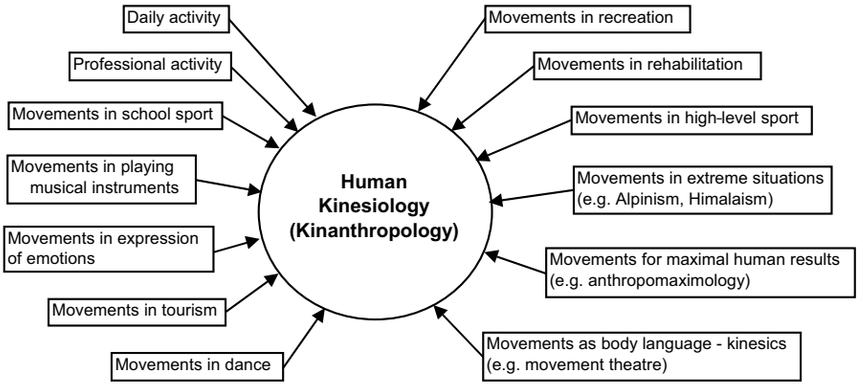

Figure 2. Different kinds of movements in human life as elements of human kinesiology. (Starosta, 2001)

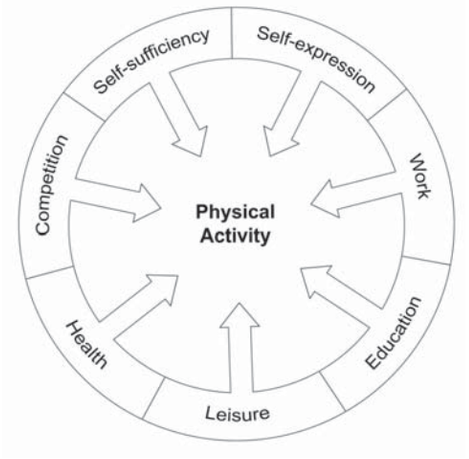

Figure 3. Self-expression as a sphere of physical activity experience. (Hoffman & Harris: Introduction to Kinesiology, 2000)

A long time ago movement and its aspects were dealt with. The first discoveries related to the essence of movement are associated with the name of the Roman doctor – Galen (129-199 A.D.). In his work he demonstrated experimentally that muscle contractions are formed due to movement impulses, which run along the nerves. Also, Leonardo da Vinci (1452-1519), one of the greatest scientists of Renaissance times became interested in selected issues related to movement. He was one of the first who attempted to solve the problem of subordinating the human body to the rules of mechanics. An important role in the studies on kinetics was also played by a natural scientist, mathematician and doctor G. A. Borelli who conducted research studies on the classification of the locomotion movements of animals and humans, as well as on the location of the center of gravity in the body (Donski, 1963; Meinel, 1962; 1967). One should also mention the orthopaedist H. Bayer, who formulated the so-called theory of kinetic chains. The theory was developed then by D. Schmidt (Meinel, 1967). One of the first investigations, which dealt with the fundamentals of the development of movement abilities was carried out by R. S. Woodworth at the end of the 19th century. He sought the basic principles which ruled the performance of brisk movements of the arm and hand (Osinski, 2000). The discoveries of E. L. Thorndike (1914) also had a crucial impact on the development of new trends in the research studies. They dealt with the processes which were the roots of the phenomenon of learning and of other behaviors. He defined the substance of the relationship that exists between the reward and the motivation to repeat exercises. He was the pioneer of research concerning individual differentiation of results of people who take exercise.

Some consider Aristotle as the father of science on movements (Celikovsky, 1987), others (Renson, 1999) mention N. Dally - the author of the first course-book entitled "Cinesiologie" published in 1857 as the father of this science. However, the scientific definition of movement became possible only in the 20th century. A lot of novelty was introduced into the knowledge on the essence of movement by N. A. Bernstein (1897-1966) with his fundamental works entitled: "On Building Movement" (1947), "An Outline of Physiology of Movement and Physiology of Activity" (1966), and then "On Agility and its Development" (1991). His

work was much ahead of the times in which the author lived. That is why it actually became recognized worldwide only after many years, and the versatile scientist N. Bernstein (he graduated from three faculties) was recognized as one of the founders of the contemporary science dealing with movement, and one of the outstanding 20th century researchers who investigated the brain.

Many new findings were introduced into the science on movement by K. Meinel, who worked out a synthesis of the hitherto existing scientific output in the field of human kinetics. The fruit of his many years' efforts was the work "Bewegungslehre" or "The Teaching of Movement" published in Berlin in 1962 (40 years ago). K. Meinel has supplemented this laconic title with a slightly longer subtitle: "The Attempt to Form Theories of Sport Movements in Pedagogical Aspects". The work of K. Meinel was translated in 6 countries, first in Poland (1967). The work presented an enormous and yet little penetrated area of the various manifestations of human kinetics. In the synthesis mentioned above, K. Meinel turned out to be an extremely versatile scientist who, despite a humanistic education, was able to handle other scientific disciplines. His work was full of texts that appeared in publications of other outstanding scientists (I. P. Pavlov; N. A. Bernstein, 1947; 1966; 1991; I. M. Sjetshenov; P. K. Anochin et al.).

Calendar of selected most important facts of movement science development.

Plato (427-347 B.C.) – an opponent of the sensualism (sensu – impression) according to which the only source of learning is the sensual impression (sensual - recognized through senses).

Aristotle (384-322 B.C.) – "*Movement is life"*; the source of learning is the impression produced by the effect of external organs on the sensory organs. By some of the authors treated as the father of science on movement (Celikovsky, 1979). His opinions concerning movement were based on observation and life experience (Zukow, Kotelnikova & Siemionov, 1963).

K. Galen (129-199) – a doctor in a school of gladiators, ascertained that movements are produced thanks to muscle tone and contractions produced by impulses running from the brain. He introduced such notions as: muscle tonus and antagonistic muscles (Zukow et al., 1963) and demonstrated experimentally that muscle contraction is produced thanks to the movement stimulus running along the nerves. He stated that: "… *without a nerve there is not a single movement that could be called optional"* (Iwanicki, 1956:20).

Awicenna – Abuła Ibn-Sina (980-1037) – the author of the *Canon of Medicine* (1954 in Russian), studied human muscles; applied physical exercises for the purposes of curing and considered them as the main factor of keeping healthy; elaborated a classification of these exercises; indicated specific properties of various exercises and the necessity of individualisation in their use (Zukow et al., 1963:8).

Leonardo da Vinci (1452-1519) – was the first who attempted to subordinate human body to the laws of mechanics. Originator of the science on body movements, that is - *dynamic anatomy or kinesiology,* described human gait and drew attention to the co-ordination of the movements of the extremities. His *Treaty,* like other works, was not published for three centuries (Iwanicki, 1956:22).

R. Descartes (1596-1650) – founded the basis of the theory of reflexes, demonstrating that the cause of movement was a definite factor of the external environment affecting sensory organs. By this he explained the origins of the only kind of movement – reflex.

G. A. Borelli (1608-1679) – wrote his first book on biomechanics *On the Locomotion of Animals in* which he presented a classification of locomotion movements of animals and of humans. He was the first one to define the centre of the body's gravity (Iwanicki, 1954; Donski, 1963; Zukow et al., 1963; Meinel, 1967).

J. Locke (1632-1704) – *"... the entire real knowledge comes from experience, that is from the perception of the surrounding environment, with the aid of sensory organs".*

D. Diderot (1713-1784) – *"Impression is the only of the properties of the translocating matter".*

M. W. Lomonosow (1711-1765) – the source of impressions is the impact of external objects on the sensory organs.

J. B. Lamark (1774-1828) – in his work *Philosophy of Zoology* he demonstrated, in a convincing way, "the importance of exercises and external conditions for the development and forming of organs" (Iwanicki, 1956:24).

C. Bell (1774-1842) – the author of the *Nervous System of the Human Body* (1930), discovered that muscles are innervated not only by the motor nerves, but also by the sensory nerves. He precisely predicted the importance of the afferent (sensory) innervation of the muscles as a form of a connector carrying information to the centers about occurrences taking place in the peripheries and which are irrelevant for the correction of impulses heading towards the centers – centripetal.

N. Dally (1795-1862) – born in France, author of the first book *Cinesiologie* (1857), a study on the human movements and their relations with education, hygiene and therapy (Renson, 1999).

P. F. Leshaft (1837-1909) – one of the creators of the science of physical culture and of the theoretical foundations of physical education and sport in Russia. He published a work entitled *Foundations of Natural Gymnastics* (1874), which became a foundation of the *Theory of Bodily Exercises,* in which he demonstrated the necessity to select exercises according to the shape and function of the body. He defined the *"alphabet of movements"* of the human body. He also wrote the *Course-book of Physical Education of School Children* (1901) in which he defined: the aims of bodily exercises, various kinds of exercises and the body's balance point. He thought that the *"……organism develops and changes under the influence of the surrounding environment and as a result of exercising its organs"* (Iwanicki, 1956, 29).

I. M. Sjechenow (1829-1905) – the originator of the science dealing with the brain's functions and with the central nervous system as a whole. His works were of a crucial importance in the study of human bodily movements, and for the first time he investigated and described the physiological mechanisms of the inhibition processes in the central nervous system. He also published a monograph *Outline of human working movements* (1901), in which he analyzed complex working movements of the arms and legs. He was the creator of the biomechanics of the working movements. In one of his main works he stated: "The objective world has existed and will exist in every man, preceding his thoughts". He also introduced the notion of *Psychomotorik,* "Life needs to generate will, and the latter produces actions ; the will shall become then the motive or purpose, and the movement – the action or means of achieving the aim. When man performs any optional movement, it appears in the awareness of the same movement. Without the will, as a form of motivation or impulse, movement will become absolutely thoughtless…" (1952:60). He understood the physiological and psychological meaning of muscle sensitivity. He surprised many with his sound statements about the role of movement impressions when steering movements in space and time; about the synergy of movement, optic and hearing impressions which he all presented 125 years ago in his work entitled *Brain Reflexes* (1952). His statements correspond to modern knowledge (Farfel, 1975:5-6).

R. S. Woodworth (1899) – conducted systematic research studies in order to find basic rules of performing rapid movements of the arm and hand (Schmidt, 1988).

E. L. Thorndike (1874-1949) – the author of The *Psychology of Learning* (1916) defined the essence of the dependence that exists between the prize and the tendency to repeat exercises; a pioneer in research studies conducted on the individual differentiation of results of people who exercise.

I. P. Pavlov (1849-1936) – a Nobel prize winner; his works contributed to the development of physiology, biological and medical sciences, as well as of the sciences dealing with physical exercises and sport training; he created the theory of conditioned reflexes and physiology of the higher nerve activity (of the central nervous system). Pavlov's conception of an organism as a whole and of its unity with the surrounding environment, as well as his theory about the first and the second signalling system, constitutes the basis of the theory and the practice of physical education and sport.

The outstanding physiologist included free/optional movements into the conditioned movement reflexes and all the others to the unconditioned ones (Farfel, 1975).

N. A. Bernstein (1896-1966) – led to the integration of movement images with the neurophysiological data, and with the neuro-psychological and biomechanical investigations on the locomotion movements; he is perceived as one of the most important brain research workers of the 20th century; he published several monographs, crucially important for the science of movement: *Basics of the Science of Man's Movements* (1926), *About Movement Building* (1947), *An Outline of Movement Physiology and Activity Physiology* (1966), *About Agility and its Development* (1991). He developed the rule of feedback and introduced the conception of sensorial correction (Bernstein, 1990).

M. O. Gurewicz & N. Ozierecki – wrote a monograph *Psychomotorika,* Moscow 1930.

H. Bayer & D. Schmith – the first one created and the second one developed the so-called *theory of kinetic chains.*

K. Meinel (1898-1973) – published the work *Bewegungslehre (The Teaching of Movement)* (1962), which was translated into 5 languages in 6 countries (Poland 1967; Cuba 1971; Japan 1980; 1991; Brazil 1984; Italy 1984; Argentina 1988). The author wrote in his comprehensive publication: "...the hand has been learning from the head, and the head form the hand." The objective-sensual activity has outdistanced the recognition through the

centuries. The work has been an interdisciplinary synthesis of the hitherto knowledge on motor issues; it has presented its tremendous area and prospects that are particularly important for teaching of movements, focused on everyday activities; on the exertion of various professions, rehabilitation, recreation, physical education and sport. It is necessary to stress the enormous application load and the fundamental importance of the work to nearly all sport disciplines.

Kinesiology (1971) – the international magazine, published in Zagreb in Croatian, from 1996 in Croatian and English and from 2000 in English only. Editors-in-Chief (in chronological order): V. Horvat, M. Mraković, A. Hošek-Momirović, D. Milanović,.

E. N. Surkov (1984) – *Athlete's Psychomotorika* (in Russian); he introduced the notions of simple and complex psycho-motor reaction, of psycho-motor habits, of psycho-motor tests, of psycho-motor indexes, and senso-motor reactions.

A. C. Puni (1898-1986) – introduced the notion of "sensorial culture", the high level of which can be reached not only through the pedagogical methods, but also thanks to the activity of the same competitor who concentrates his conscious efforts on the development of qualitative sport abilities (features), including "time feeling" (Surkov, 1984:47). The author of the: *Problems of Sport Psychology* (1955), *Outlines of Sport Psychology* (1959), *Psychology of Physical Education and Sport* (in co-operation with Dzamgarov) (1979), *Psychological Preparation in Incommensurable Sports* (in co-operation with W. Starosta) (1979), *Psychology* (1984).

K. Kohl – the author of the work "Zum Problem der *Sensomotorik*" ("To the Problem of *Sensomotorik*") (1956) (*Sensomotorik* – based on sensations/impressions).

W. S. Farfel – an outstanding physiologist; he has classified movements according to the three levels of their co-ordination complexity; the author of methodical-prompt information rule; the author of: *Man's Physiology Course* (1941), *Movement Development of School Children* (1959), *Sport Physiology* (1960), *Movements Control in Sport* (1975).

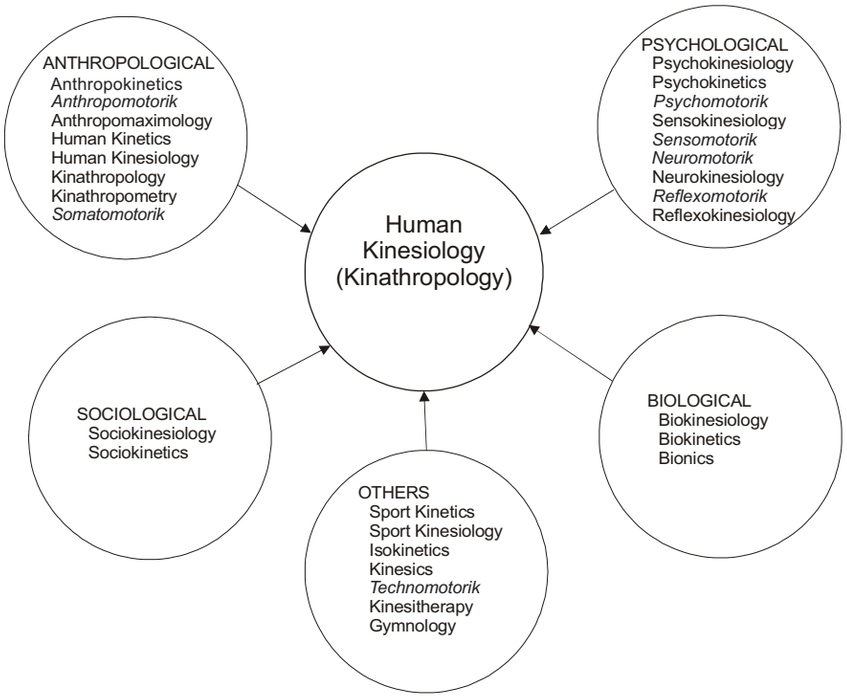

Figure 4. Directions of human movement sciences development (human kinesiology) and its different names. (Starosta, 2001)

In search of a name for the science dealing with movement.

The science dealing with movement possesses a variety of names: starting with kinesiology, *Anthropomotorik,* kinanthropology and ending with *Motorik* or *Psychomotorik* (Fig.4). These are not all names that try to give the most proper definition for the science dealt with here. Some of these names have their origins in other, more general, attempts to define this scientific discipline: Human Movement Science, Physical Activity Science, Anthropokinetics (Blahuš, 1999), *Reflexomotorik, Somatomotorik, Sensomotorik, Psychomotorik, Kinesik, Technomotorik,* Motology, *Anthropomotorik, Sportmotorik* (Hirtz, Kirchner & Pohlmann, 1994). A long time ago instead of the notion of physical education the term 'human movement' was proposed, as well as kinesiology, exercise, sport science, movement science (Thomas & Nelson, 1990). The number and variety of names proves how vast was the interest in this developing scientific discipline and how many specialists from various fields became interested in it. This interest was fully justified, hence the movement science is of universal importance, i.e. it concerns every human being regardless of sex, age, race, occupation, etc. Developing a new scientific discipline opens an enormous and little known research area. Thus, it creates perspectives for long-term interdisciplinary studies. Moreover, the area is so vast that it provides opportunities for specialists of nearly all scientific disciplines.

Looking for the proper term for movement science contains an element of rivalry concering the "super problem" because everyone has a chance to find a place for themselves. The more so because the name given to the science may define a leading discipline. Therefore, the number of names may confirm the extensive scope of the topic, as well as the number of competitors who participate in this rivalry. In some of the terms proposed human movement or its combination with the body structure is stressed (anthropological trend - *Anthropomotorik,* anthropokinetics, kinanthropology, kinanthropometry, *Somatomotorik,* anthropomaximology), and in other names psychological manifestations are exposed (psychomotor trend - *Sensomotorik, Psychomotorik, Reflexomotorik).* In 1989 the American Academy of Physical Education approved the name *kinesiology* as a science that deals with all sub-disciplines oriented to the studying and the use of physical education (Wuest & Bucher, 1991). However, in Central European countries, and especially in Germany, Austria, the Czech Republic, the notion is sometimes related to physiotherapy, functional anatomy, and medical sciences (Blahuš, 1999). The same year R. Renson (1989) proposed the name of kinanthropology, claiming that the name had its origins in the Greek word "kinein" (meaning - to be in motion), "anthropos" (human being) and "logos" (science). One may agree with P. Blahuš (1999) as far as the close relationship of these notions with kinanthropology and kinesiology (Fig. 6) are concerned.

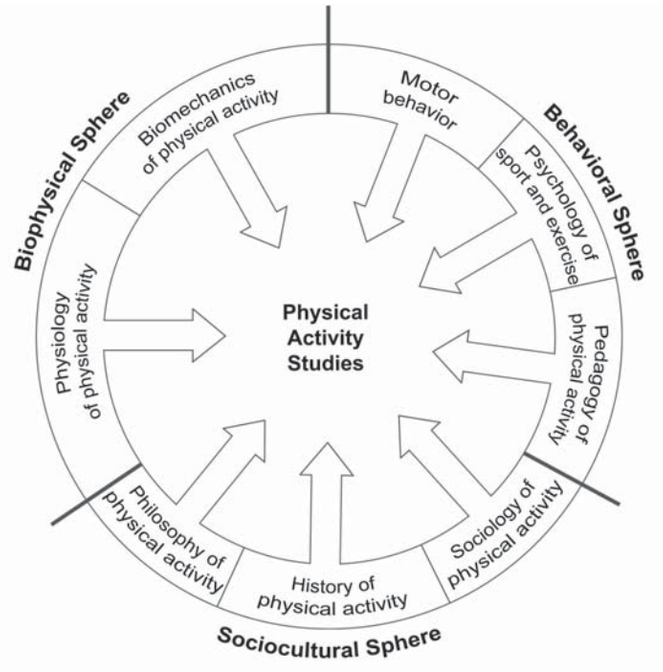

Figure 5. The sphere of scholarly study of physical activity (Hoffman & Harris, 2000: Introduction to Kinesiology)

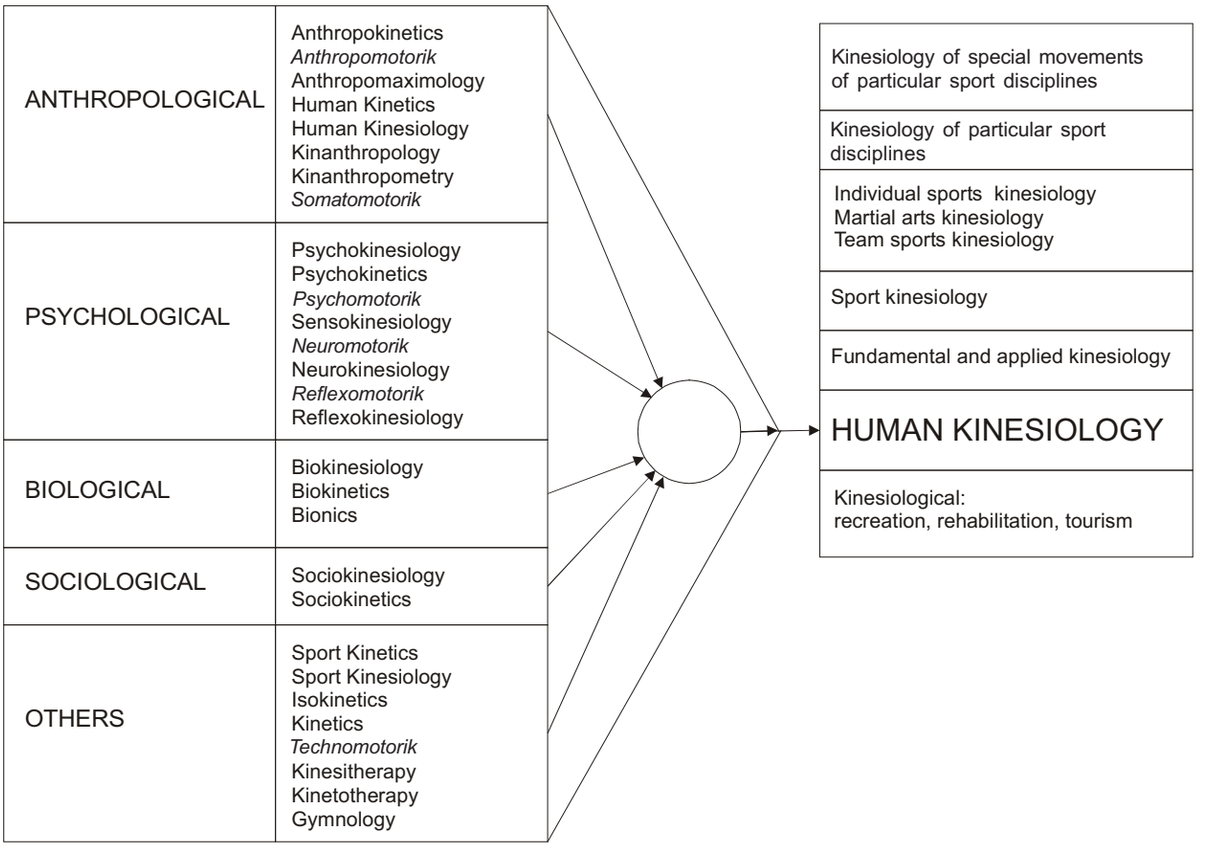

Figure 6. Directions of human movement sciences development (human kinesiology) and its different names. (Starosta, 2001)

Even this brief outline of all the names given to the subject that deals with movement science, shows how vast the interest in it is on the part of representatives of nearly all scientific disciplines. The phenomenon is extremely advantageous, since all the movement performances of a human being are unusually abundant and complex, and getting to know all of their aspects and rules of their development requires very versatile and interdisciplinary studies. Another scientific approach may provide some explanation to just a fraction of the very vast and complex problem of human kinetics. It is unfortunate that such an approach was the most frequent one in this young scientific discipline.

Out of the many proposed names, kinesiology seems to be the most adequate one. It is not only because it stresses the autonomy of this scientific discipline and because it emphasizes its scientific status, but also because it defines the subject it deals with in a very precise and explicit way. The name has a tradition of 145 years, since in 1857 N. Dally entitled his book on movement -"Cinesiologie" (Renson, 1999). The term has gradually started to appear as the name of:

- scientific institutions (i.e. The Institute of Kinesiology of the Department of Sports of the University in Ljubljana); recently the American Academy of Physical Education has changed its name to – the Academy of Kinesiology and Physical Education (Jable, 1997);
- scientific associations (Society for Kinesiology – Belgium, the Croatian Association of Theoretical and Experimental Kinesiology) (Table 1);
- worldwide scientific journals (i.e. *Acta Kinesiologiae Universitatis Tartuensis* – Estonia; a journal which has been regularly published since 1971 – *Kinesiology - International Journal of Fundamental and Applied Kinesiology* – Zagreb; Croatia, *Kinesiologia Slovenica* publication of the Institute of Kinesiology of the Department of Sports in Ljubljana; Slovenia, *Chinesiologia* published in Italy since the year 1982 (Table 2);
- organizational units of sport institutes (i.e. Department of Kinesiology of the Institute of Sports in Warsaw) (Table 3-4). It is worth mentioning that the Faculty of Physical Education (Kinesiology) of the University of Zagreb in Croatia was the host of so far 3 international scientific conferences entitled *Kinesiology – the Present and the Future* (1997), *Kinesiology for the 21st Century* (1999) and *Kinesiology – New Perspectives* (2002) with the participation of representatives from various countries.

Table 1. National and international scientific organisations connected with movement (Starosta, 2001)

Nº	Name of organisation	Country
1.	AUSTRALIAN ASSOCIATION FOR EXERCISE AND SPORT SCIENCE [Northfield]	Australia
2.	SOCIETY OF KINESIOLOGY (UNIVERSITEIT GENT)	Belgium
3.	CZECH KINANTHROPOLOGICAL SOCIETY [Prague, 1993]	Czech Republic
4.	UNIONE NAZIONALE CHINESIOLOGIA	Italy
5.	INTERNATIONAL ASSOCIATION OF SPORT KINETICS (IASK) [Warsaw, 1990]	Poland
6.	INTERNATIONAL SOCIETY FOR THE ADVANCEMENT OF KINANTHROPOMETRY (ISAK) [San Diego]	USA
7.	EUROPEAN ISOKINETIC SOCIETY (EIS) [Assenede]	Belgium

Table 2. National and international journals connected with movement sciences (Starosta, 2001)

Nº	Name of journal	Country
1.	ZEITSCHRIFT FUR MOTOPÄDAGOGIK UND MOTOTHERAPIE MOTORIK (Lemgo, 1977)	Austria
2.	REVISTA BRASILEIRA de CIENCIA e MOVIMENTO	Brazil
3.	ACTA UNIVERSITATIS CAROLINAE KINANTHROPOLOGICA (Prague, 1993)	Czech Republik
4.	PRAXIS DER PSYCHOMOTORIK (1975)	Germany
5.	JOURNAL OF HUMAN MOVEMENT STUDIES (Edinburg, 1960)	Great Britain
6.	ACTA KINESIOLOGIAE UNIVERSITATIS TARTUENSIS (Tartu, 1996)	Estonia
7.	ANNALES de KINESITHERAPIE (Saint-German, 1973)	France
8.	HUMAN MOVEMENT SCIENCE (1980)	Holland
9.	CHINESIOLOGIA (Cunea)	Italy
10.	HUMAN KINETICS - ANTHROPOMOTORIC (Katowice-Kraków, 1989)	Poland
11.	JOURNAL OF MOTOR BEHAVIOUR - ENGLEWOOD	USA
12.	HUMAN PERFORMANCE	USA
13.	MOTOR CONTROL	USA
14.	PERCEPTUAL AND MOTOR SKILLS	USA
15.	KINESIOLOGY – INTERNATIONAL JOURNAL OF FUNDAMENTAL AND APPLIED KINSIOLOGY (Zagreb, 1971)	Croatia

Table 3. Institutions in different countries connected with the name movement sciences (Starosta, 2001)

No	Name of Institution	Country
1.	The Department of Human Movement and Exercise Science [University Western Australia]	Australia
2.	School of Human Movement Studies [University of Queensland, Brisbane]	Australia
3.	School of Human Movement, Recreation and Performance [Victoria University Melbourne]	Australia
4.	School of Human Movement Studies [Queensland University of Technology]	Australia
5.	Department of Movement and Sport Sciences [Ghent University]	Belgium
6.	Department of Sport and Movement Sciences [Katholieke Universiteit Leuven]	Belgium
7.	Human Performance Laboratory [University of Calgary]	Canada
8.	Laboratory of Sport Movement Science [Charles University, Prague]	Czech Republic
9.	Laboratory of Movement Sciences [Charles University, Prague]	Czech Republic
10.	Muscle Research Centre [National University Hospital]	Denmark
11.	Institute of Exercise and Sport Science [University of Copenhagen]	Denmark
12.	Centre for Sensory-Motor Interaction [University of Aalborg]	Denmark
13.	Psychobiology of Motor Behaviour and Sport Sciences Laboratory [University, Strasbourg]	France
14.	Laboratoire d'Etudes de la Motricite Humaine [Universite de Lille]	France
15.	Movement & Perception [CNRS&Universite de la Mediterrane, Marseille]	France
16.	Institute for Theory and Practice of Training and Movement [German University Cologne]	Germany
17.	Institute for Movement and Training Science [University of Leipzig]	Germany
18.	Institute for Sport and Movement Science [University Essen]	Germany
19.	Institute for Movement Sciences [University of Muenster]	Germany
20.	Department of Systematic Movement- and Sportpedagogy [University of Hamburg]	Germany
21.	Department of Exercise and Sport [University of Exeter]	Great Britain
22.	Department of Exercise and Sport Science [Manchester Metropolitan University]	Great Britain
23.	School of Sport and Exercise Sciences [University of Birmingham]	Great Britain
24.	Laboratory of Motor Behaviour and Sport Psychology [University of Athens]	Greece

25.	Institute of Motor Sciences [University of Rome]	Italy
26.	Institute of Movement Sciences [IUSM University Rom-Foro-Italico]	Italy
27.	Faculty of Motor Sciences [University of Urbino]	Italy
28.	Facolta di Scienze Motorie [University of Milano]	Italy
29.	Facolta di Scienze Motorie [University of Bologna]	Italy
30.	Dipartimento Scienze Motorie [Universita di Medicina di Udine]	Italy
31.	Centro di Bioignegneria e Scienze Motorie [Rovereto, CeBiSM]	Italy
32.	Facoltá di Scienze Motorie [University of Verona]	Italy
33.	Exercise and Sport Science – Department of Environmental Science [Yokohama City University]	Japan
34.	The Graduate School of Human and Environmental Studies [Kyoto University]	Japan
35.	Biodynamic and Human Performance Laboratory [Kokushikan University]	Japan
36.	Laboratory of Human Motorics [Lithuanian Academy of Physical Education, Kaunas]	Lithuania
37.	Department of Human Movement Science [University of Groningen]	Holland
38.	Department of Movement Sciences [Maastricht Univeristy]	Holland
39.	Institute for Fundamental and Clinical Movement Sciences – Faculty of Movement Sciences [Vrije Universiteit Amsterdam]	Holland
40.	Faculty of Human Movement [Technical University, Lisbon]	Portugal
41.	Human Movement Laboratory [Higher Education Institute of Maia, Porto]	Portugal
42.	School of Life Sciences [Dundee University, Scotland]	Scotland
43.	Department of Human Performance [Physical Education Institute, Madrid]	Spain
44.	Human Performance Laboratories [Texas A&M University]	USA
45.	Human Performance Laboratory [Ball State University, Muncie, IN]	USA
46.	Department of Human Performance [University of Alabama]	USA

Table 4. Institutions in different countries connected with the names kinesiology and kinetics (Starosta, 2001)

Nº	**Departments of Kinesiology**	**Country**
1.	Department of Kinesiology - Institute for the Study of Youth Sports [Michigan State University]	USA
2.	Department of Kinesiology [West Chester Univeristy]	USA
3.	Department of Kinesiology [University of Illinois, Urbana]	USA
4.	Department of Kinesiology, Anatomy and Physiology [Kansas State University]	USA
5.	Department of Kinesiology - and Health Education [University of Texas at Austin]	USA
6.	Department of Kinesiology [University of North Texas, Denton]	USA
7.	Biokinetics Laboratory [Temple University, Philadelphia]	USA
8.	Department of Kinesiology [University of Pennsylvania]	USA
9.	Department of Health and Kinesiology [Texas A&M University]	USA
10.	Academy of Kinesiology and Physical Education	USA
11.	Department of Kinesiology [University of Lethbridge]	Canada
12.	School of Human Kinetics [University of Ottawa]	Canada
13.	Departement de Kinesiologie [Universite de Montreal]	Canada
14.	School of Kinesiology [University of British Columbia, Vancouver]	Canada
15.	Faculty of Kinesiology [University of Calgary]	Canada
16.	Department of Kinanthropology [Charles University Prague]	Czech Republic
17.	Institute of Kinesiology [Semmelweis University]	Hungary
18.	Department of Kinesiological Anthropology [University of Zagreb]	Croatia
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Establishment of an international organization dealing with movement science.

The motor activity of a man has been the subject of innumerable publications, countless numbers of scientific meetings (congresses, conferences, symposia). In the majority of them the essence of movement was treated as a secondary problem. The primary subject was usually the determinant of movement – frequently detached from what is of the greatest importance. In this way, something that is crucial became marginal. Even during international scientific congresses devoted to the movement activity of a man in a specific sport discipline (i.e. "Science and Football"), all the work that dealt with the techniques of specific exercises and their training receded into the background. This clash between the various forms of movement and their determinants became more and more evident. Some called it a hiatus between theory and practice. Conferences gathered mainly the specialists of particular sport disciplines, who very often attempted to solve problems without associating them with practice. Hence, the isolation of many of the theoreticians has become more noticeable.

Acknowledging the fact that such a disintegration is unfavorable for both sides, and at the same time observing the increasing interest in movement and its significance in the various forms of human activity, it has been decided to look for a platform of agreement. The platform was to integrate not only theoreticians and practitioners around the problems of kinetics, but particularly to integrate the specialists of different scientific disciplines. In order to achieve this aim, specialists of human kinetics decided to create a separate international organization. The decision was made during an international conference on "Movement Co-ordination in Sports" on the 28th April, 1990 in Rogi in the vicinity of Gorzow (Poland). An International Association of Sport Kinetics (IASK) was established, and its official registration took place on 29th November, 1991.

The establishment of IASK (Starosta, 1991) gave rise to many aspects.

1. In the last quarter of the 20th century the scientific recognition of various elements of kinetics in sports developed enormously.
2. Elements distinguishing sport kinetics from within general human kinetics have become more evident.
3. An interdisciplinary approach to solving the different problems of sport kinetics is taking place, which means that more and more frequently the representatives of different scientific disciplines participate in research studies. This testifies to the fact that sport kinetics may be the subject of research for many specialists and moreover, it may integrate them.
4. As a result of this interdisciplinary cooperation, broad foundations of sport kinetic theory are developed, in which the ideas of N. A. Bernstein are highly recognized. These foundations serve, first of all, human kinetics.
5. Slowly, specific research methods, adequate to the needs of sport motor issues' investigations are separated. An intensification of efforts of some scientists from different countries is evident.
6. A very dynamic development of sciences dealing with sports is recorded, among them much importance is attributed to sport kinetics, which is named in various ways (i.e sport kinesiology).
7. Parallel to the above, during different international scientific events, the issues of motor manifestations and particularly sport motor issues are treated marginally and disproportionately to its significance (The Pre-Olympic Congress 2000, held in Brisbane, exposed medical sciences in a very disproportionate way, despite the fact that the title of the congress anticipated subjects related to sports and physical education).
8. Among the existing international scientific organizations, none have ever managed to gather a large number of specialists in human kinetics, and specifically in sport motor behaviour. The closest to our subject seems to be the International Society for the Advancement of Kinathropometry – which puts, however, stress on anthropometry, and that accounts only for a fraction of the movement science.
9. The observed dynamic development of sports, both of the Olympic and non-Olympic sports (which is manifested in forms of World Games), exerts pressure on the experts who deal with sport motor issues and who are expected to provide assistance in the field of diagnosing and predicting the course of development of sports disciplines and athletes. Simultaneously, technical progress in nearly every discipline is recorded (the number of complex exercises is growing), and consequently the number of practicing individuals also increases.

In such a situation specialists in human kinetics, and particularly specialists in sport motor issues, felt obliged to undertake some competent efforts and, following the example of representatives from the other disciplines of science, decided to associate with each other. After nearly 10 years of existence IASK proves how necessary the organization has been. IASK members (there are more than 300 of them from 40 countries of the world) have managed to organize, in this short span of time, over 30 international scientific venues, including the cyclic conferences *Sport Kinetics*.

Final remarks

1. Movement is the biological need of every living organism. The human, by creating modern civilization, somehow has forgotten his/her genetic program. Acting unhelpfully to his/her organism, a human started to lead a sedentary life style, which causes many civilization diseases.

2. In such a case an alternative appears: either the human will make an effort to the care of his/her physical development or the number of disabled people will start to increase. Then the theory and practice of movement science will become more significant.

3. For ages, movement has been a subject of interest for many representatives of various scientific disciplines. Its meaning was briefly defined by Aristotle: "Movement is life".

4. The multiplicity and the variety of terms proposed to name movement science demonstrates how intensive the interest of the teams of specialists is from other fields of knowledge, in this developing scientific discipline and especially in the 20th century. The multitude of terms proposed shows how extensive the topical scope of the movement science is.

5. Movement science has and will always have a universal meaning, since it refers to every human being regardless of sex, age, race, occupation, etc.

6. Movement performance of a man is extremely rich and complex and mastering the conditions and regulations of its development requires versatile and interdisciplinary studies.

7. The outstanding activity of the IASK members in the international arena, as well as the increasing prestige of the Association prove how necessary the organization is.

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RAZVOJ ZNANOSTI O LJUDSKOM KRETANJU – ZNAČENJE, POVIJEST, IME, POVEZANOST S DRUGIM ZNANOSTIMA, ORGANIZACIJE, PERSPEKTIVE

Sažetak

Uvod

Gotovo paradoksalna je činjenica našega doba da sve više profesija zahtijeva sve veću motoričku kompetenciju, dok se istodobno, u svim društvima ovoga svijeta, može uočiti njeno drastično sniženje. Upravljanje modernim strojevima, koji su čovjeka oslobodili mukotrpnog fizičkog rada obavljajući ga umjesto njega, zahtijeva visoku razinu motoričkih sposobnosti, osobito koordinacije. A ova potonja naročito ovisi o funkcioniranju središnjeg živčanog sustava koji se razvio zahvaljujući kretanju i izvedbi pokreta, od kojih mnogi stanovnici našeg planeta pokušavaju apstinirati. Teorija i praksa znanosti o kretanju jest i bit će jednako važna bez obzira na to hoće li se čovjek potruditi da se razvije i održava svoje tjelesne sposobnosti ili će se prepustiti nekretanju, pa će mu za opstanak biti potrebni razni rehabilitacijski programi.

Značenje kretanja u ljudskom životu

Mnogi veliki filozofi, znanstvenici i liječnici odvajkada su se slagali u jednome – život je kretanje i kretanje je život. Ukupna kreativna i reproduktivna čovjekova aktivnost – bez obzira radi li se o proizvodnji, profesiji, umjetnosti, svakodnevici ili sportu – manifestira se pokretom. Kretanje se u čovjeku odvija i onda kada se na površini ništa ne vidi (cirkulacija, rad srčanog mišića, disanje…). Kretanje je neizbježno za premještanje u prostoru, za izražavanje emocija, za stvaralaštvo svake vrsti i za mnoge druge aktivnosti.

Kratka povijest znanosti o kretanju

Autor raspravlja o prvim spoznajama o kretanju od Galena, Leonarda da Vincija, Borellija, Thorndike, preko Dallyja do znanstvenog pristupa u 20. stoljeću (primjerice Bernsteina i Meinela). Autor je predstavio izabrane najvažnije činjenice o razvoju znanosti o kretanju.

U potrazi za imenom znanosti o kretanju

Danas se za znanost koja proučava kretanje i vježbanje rabi puno imena koja su stvorena u drugoj polovini 20. st. – od kineziologije, preko antropomotorike, kinantropologije do motorike i psihomotorike. Tu valja još dodati neke nazive: znanost o ljudskom kretanju, znanost o fizičkoj aktivnosti, antropokinetika, refleksomotorika, somatomotorika, senzomotorika, psihomotorika, kinezija, tehnomotorika, motologija, sportmotorika, znanost o sportu i vježbanju … Brojnost i raznolikost naziva svjedoči o velikom zanimanju znanstvenika i stručnjaka iz raznih područja za tu znanost u razvoju. A zanimanje je više nego opravdano budući da su spoznaje o kretanju univerzalno važne i važeće za svako ljudsko biće bez obzira na spol, dob, rasu, zanimanje ili bilo koju drugu podjelu. Razvijanje nove znanstvene discipline uvijek otvara širok, a slabo istražen prostor koji nudi perspektivu za dugoročne interdisciplinarne studije i za sudjelovanje specijalista iz svih drugih znanstvenih polja. Brojnost imena svjedoči i o ekstenzivnom području interesa i problemima koji se proučavaju. Neki nazivi, primjerice, više naglašavaju vezu kretanja i tjelesne građe (antropološki trend), dok drugi u prvi plan stavljaju ljudsku psihu (psihomotorički trend). Taj fenomen raznolikosti, bogatstva i kompleksnosti kretanja donosi mnoge prednosti zato što ga se temeljito može proučiti samo u široko i multidisciplinarno zasnovanim istraživanjima.

Od svih predloženih imena možda je najprihvatljivije ime kineziologija ne samo zato što naglašava autonomiju znanstvene discipline i njen znanstveni status, već i stoga što vrlo precizno i eksplicitno definira predmet svog interesa.

Osnivanje međunarodnih organizacija

Motorička aktivnost bila je i jest predmetom bezbrojnih publikacija i mnogobrojnih znanstvenih susreta (konferencija, kongresa, simpozija). U većini slučajeva je bit kretanja tretirana kao sekundarni problem. Primarni predmet proučavanja u tim radovima bile su determinante kretanja, nerijetko potpuno odvojene od biti kretanja. Taj sraz između raznih oblika kretanja i odrednica kretanja postaje sve očitiji. Neki ga nazivaju hijatom, jazom između teorije i prakse. Tako se na konferencijama okupljaju mnogobrojni specijalisti pojedinih sportskih disciplina koji vrlo često pokušavaju razriješiti probleme ne povezujući ih s praksom, a izoliranost teoretičara postaje sve očiglednijom. Kako bi se prevladale te diobe i razlike, osnivaju se brojne organizacije koje okupljaju i teoretičare i praktičare koji se bave svim aspektima ljudskog kretanja. U tablicama od 1 do 4 navedene su meke međunarodne organizacije i udruge te institucije koje se bave proučavanjem ljudskoga kretanja i vježbanja. U posljednjem desetljeću primjetljiv je porast broja udruga i institucija kojima se u nazivu pojavljuje riječ *kineziologija*. Autor je najviše pozornosti

posvetio udruzi International Association of Sport Kinetics, koje je sam osnivač. Udruga okuplja više od 300 članova iz 39 zemalja diljem svijeta i dosad je uspjela organizirati tridesetak znanstvenih i stručnih sastanaka, među kojima i redovitu konferenciju Sport Kinetics.

Završne napomene

U završnim napomenama autor je naglasio neke misli već izrečene u prijašnjem tekstu.

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