

SCIENCE OF HUMAN MOVEMENTS – MEANING, NAME, DIRECTIONS OF DEVELOPMENT

by

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Movement is the biological need of every living organism. The human, by creating modern civilization, somehow has forgotten about his genetic code. Man started to lead a sedentary life style, which causes many civilization diseases. In such a case an alternative appears: either man makes an effort to care about his physical development, or the number of disabled people will start to grow. Then the theory and practice in the movement science will become more significant. For ages, movement has been a subject of interest for many representatives of different scientific disciplines. Its meaning was shortly defined by Aristotle: "Movement is life". The multiplicity and the variety of terms proposed to name the movement science demonstrates how intensive is the interest of the teams of specialists from other field of knowledge, in this developing scientific discipline, and especially in the 20th century. The multitude of terms proposed shows how extensive is the topical scope of the movement science. Movement science has and will always have a universal meaning, since it refers to every human being regardless of: sex, age, race, occupation etc. Movement performance of a man is extremely rich and complex and mastering the conditions and regulations of its development, requires versatile and interdisciplinary studies. 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.

Key words: genetic code, kinesiology, definitions development

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 the societies of various nations is being observed. The human being when creating the modern civilization which released him from performing hectic physical labor, apparently did not notice

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that operating technical devices that gets the work done for him, require high level of motor abilities, and particularly co-ordination abilities. This depends highly on the efficient functioning of the central nervous system. This system is 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 the motor education, or the increasing number of disabled people will require physiotherapeutic treatment. Within this context, the theory and practice in the science of movement will become extremely relevant.

About the meaning of movement in human life

The orthopedist A.Senger has defined the meaning of the 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 life style is and the longer the human life is- the bigger the ocean is. 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”.

The entire creative and reproductive activity, independently of its character –whether productive, professional, artistic, daily or sportive (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).

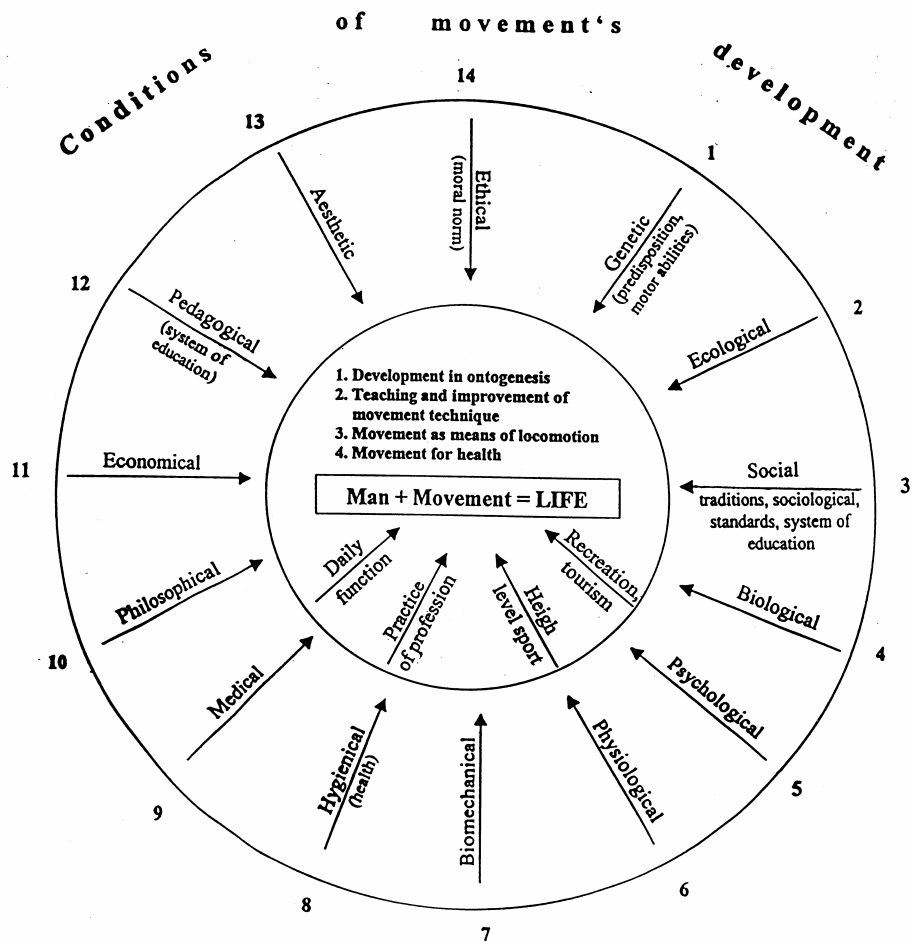


Fig. 1. Movement sciences (Kinesiology) in human's life and selected conditions of his development

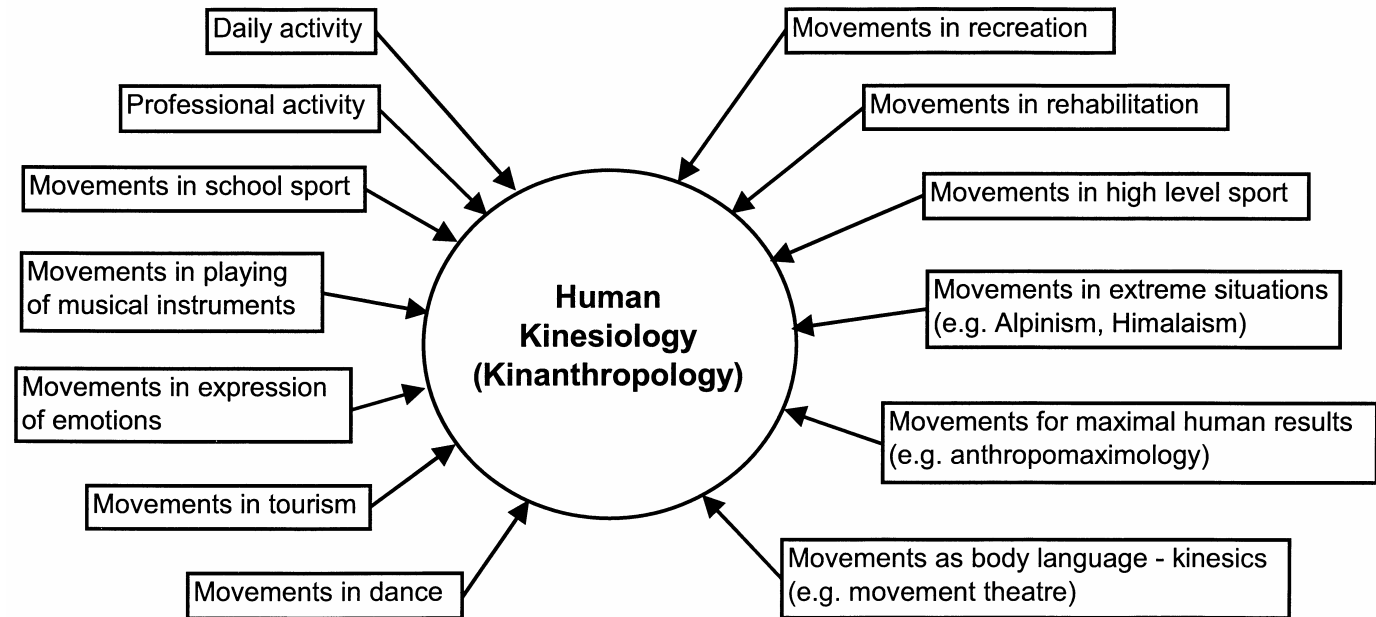


Fig. 2. Different kinds of movements in human life as elements of human kinesiology

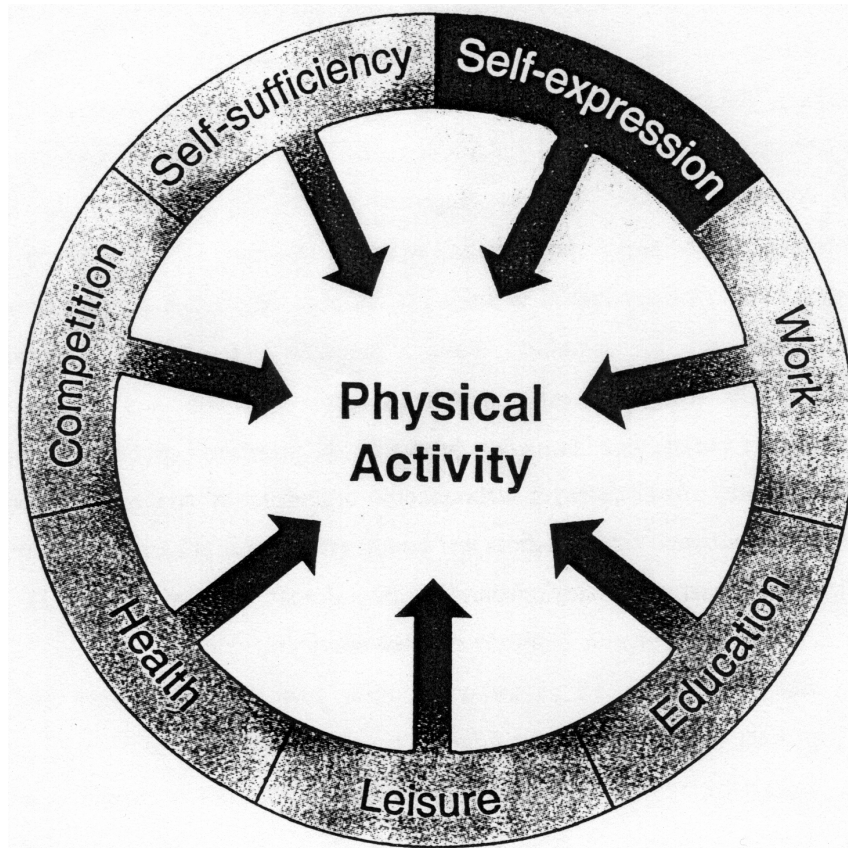


Fig. 3. Self-expression as a sphere of physical activity experience [Hoffman, Harris, 2000: Introduction to Kinesiology]

A short history of the development of movement science

A long time ago movement and its conditions were already dealt with. The first discoveries related to the essence of movement are associated with the name of the Roman doctor – Galen [approx. 130-200]. In his works 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 the Renaissance times became interested in selected issues related to movement. He was one of the first who attempted to solve the problem of subordinating 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 on the classification of locomotive movements of animals and humans, as well as on the location of the center gravity in the body [Donski 1963; Meinel 1962, 1967]. One should also mention the orthopedist H.Bayer, who formulated the so-called theory of kinetic chains. This theory was further developed then by D.Schmidt [Meinel 1967]. One of the first investigations, which dealt with the fundamentals of the development of movement abilities were carried out by R.S. Woodworth at the end of the 19th century. He sought basic principles which ruled the performance of brisk movements of the arm and hand [Osiński 2000]. The discoveries of E.L. Thorndike [1914] had also crucial impact on the development of new trends in the researches. They dealt with the processes which were the roots of the phenomenon of learning and of other behaviors. He defined the substance of relationship that exists between the reward and the motivation to repeat exercises. He was the pioneer of researches concerning individual differentiation of results of people who perform exercises.

Some consider Aristotle as the father of science on movements [Celikovski et al. 1987], others [Renson 1999] mention N.Dally - the author of the first course-book entitled “Cinesiologie” published in 1957 as the father of the science. However, scientific definition of the movement became possible only in the 20th century. A lot of novelty was introduced in 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] (Fig.4). The works were much ahead of the times in which the author lived. That is why they 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 scientists who investigated the brain.

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О ЛОВКОСТИ И ЕЕ РАЗВИТИИ

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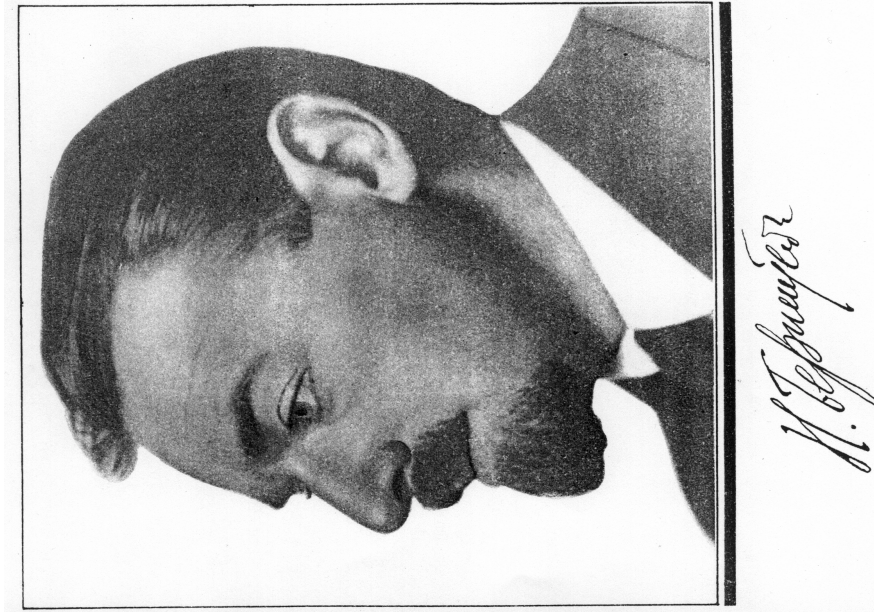


Fig.4

Many new contents were introduced into the science of 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 “ Movement Teaching” published in Berlin in 1962 (over 38 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 various manifestations of the 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 extremely saturated with texts that appeared in publications of other outstanding scientists [I.P. Pavlov, N.A.Bernstein, I.M. Sjetshenov, P.K.Anochin et al.].

In the search of a name for the science of movement

The science of movement possesses a variety of names: starting with kinesiology, anthropomotrics, kinathropology and ending with motorics or psychomotorics (Fig.5). These are not all names that try to give the most proper definition for the science above. Some of these names have their origins in other, more general, attempts to define this scientific discipline: human movement science, physical activity science, anthropokinetics [Blahus1999], reflexomotorics, somatomotorics, sensomotorics, psychomotorics, kinesic, technomotorics, motology, anthropomotrics, sportmotorics [Hirtz et al. 1994]. Long time ago instead of the notion of physical education - 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 penetrated 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 (Fig.6).

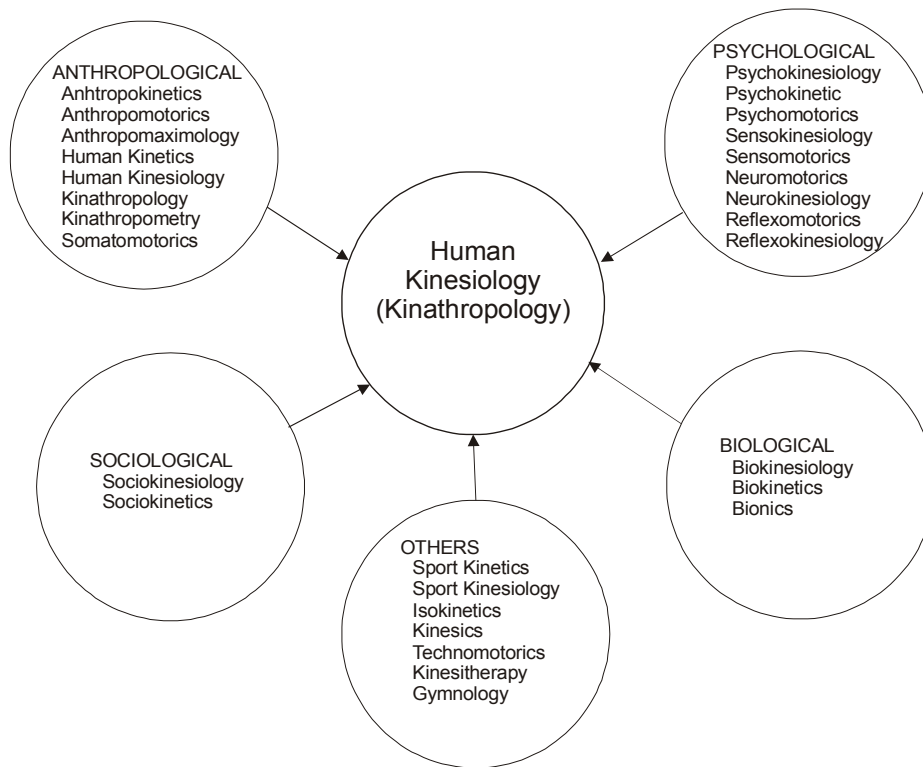


Fig. 5. Directions of human movement sciences development (human kinesiology) and its different names

Looking for the proper term for movement science contains an element of rivalry about the “super problem” thanks to which everyone has a chance to find a place for himself. The more so that the name given to the movement 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 connection with the body structure is stressed (anthropological direction - anthropomotorics, anthropokinetics, kinanthropology, kinanthropometrics, somatomotorics, anthropomaximology), and in other names psychical manifestations are exposed (psychomotoric direction - sensomotorics, psychomotorics, reflexomotorics). In 1989 the American Academy of Physical

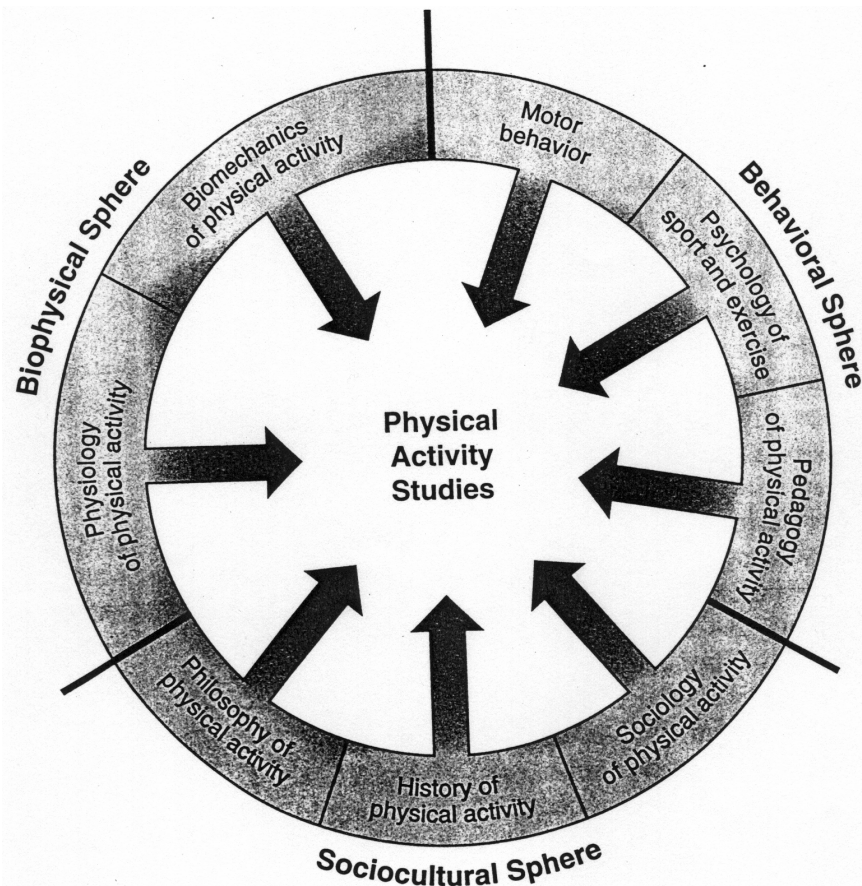


Fig. 6. The sphere of scholarly study of physical activity [Hoffman, Harris, 2000: Introduction to Kinesiology]

Education approved the name – kinesiology as 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, Czech Republic, the notion is sometimes related to physiotherapy, functional anatomy, and medical sciences [Blahus 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 movement), “anthropos” (human being) and “logos” (science). One may agree with P.Blahus [1999] as far as the close relationship of these notions with kinanthropology and kinesiology (Fig.7).

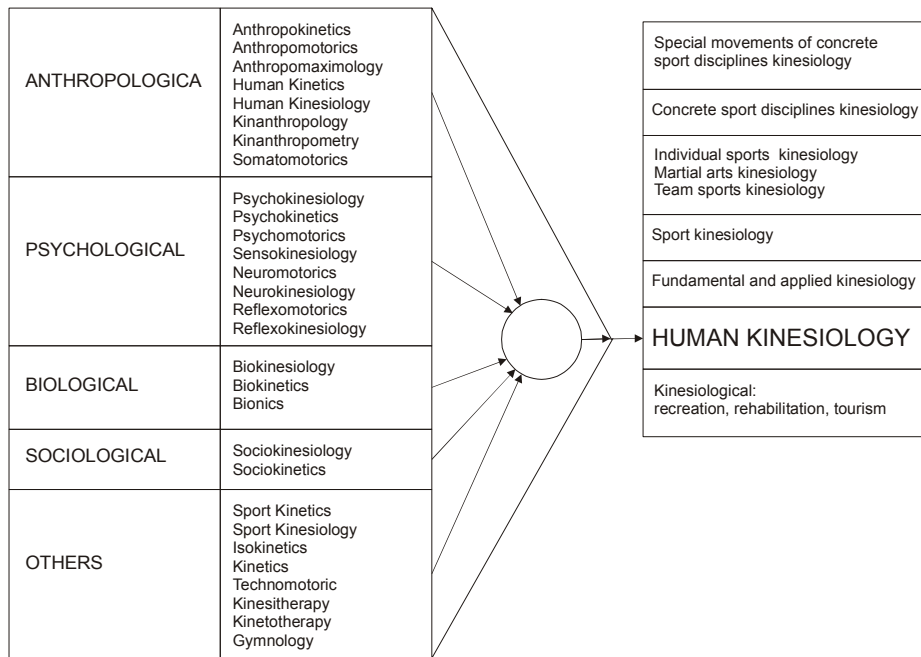


Fig.7. Directions of human movement sciences development (human kinesiology) and its different names

Even this brief outline of all the names given to the subject that deals with movement science, shows how vast is the interest in it from the part of representatives of nearly all scientific disciplines. The phenomenon is extremely advantageous, since all movement performances of a human being are unusually abundant and complex, and getting to know all of their conditions 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 already a tradition of 144 years, since in 1857 N.Dally already entitled his book on movement -"Cinesiologie" [Renson 1999]. The term has gradually started to appear as a name of: ► scientific institutions (i.e. Institute of

Kinesiology of the Faculty of Sports of University in Ljubljana); recently the American Academy of Physical Education has changed its name into – Academy of Kinesiology and Physical Education [Jable 1997].; ► scientific associations (Society for Kinesiology – Belgium, Croatian Association of Theoretical and Experimental Kinesiology) (Tab.1);

Table 1

NATIONAL AND INTERNATIONAL SCIENTIFICS ORGANIZATIONS RELATED WITH MOVEMENT SCIENCES

N°	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 KINANTHRPOMETRY (ISAK) [San Diego]	USA
7.	EUROPEAN ISOKINETIC SOCIETY (EIS) [Assenede]	Belgium

► scientific journals of worldwide reach (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; “Kinesiologia Slovenica” publication of the Institute of Kinesiology of the Faculty of Sports in Ljubljana; “Chinesiologia” published in Italy (Tab.2);

Table 2

NATIONAL AND INTERNATIONAL JOURNALS CONNECTED WITH
MOVEMENT SCIENCES

Nº	Name of journal	Country
1.	ZEITSCHRIFT FUR MOTOPADAGOGIK 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-Germain, 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 KINESIOLOGY (Zagreb, 1971)	Yugoslavia- Croatia

► organizational units of sport institutes (i.e. Department of Kinesiology of the Institute of Sports in Warsaw) (Tab.3-4). It is worth mentioning that the Department of Physical Education (Kinesiology) of the University of Zagreb was the host of an international scientific conference entitled “Kinesiology for the 21st Century” [1999] and is planning another one in 2003, entitled “Kinesiology – New Perspectives” with the participation of representatives from various countries.

Table 3

Institutions in different countries connected with the name movement sciences

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 Sciences [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 Mediterranee, 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 Bioingegneria e Scienze Motorie [Rovereto, CeBiSM]	Italy
32.	Facoltà 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 Sciences [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 name kinesiology and kinetics

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 Republik
17.	Institute of Kinesiology [Semmelweis University]	Hungary
18.	Department of Kinesiological Anthropology [University of Zagreb]	Croatia
19.	Faculty of Kinesiology [University of Zagreb]	Croatia
20.	Faculty of Human Kinetics [Technical University of Lisbon]	Portugal
21.	Faculty of Human Kinetics [University Lisbon]	Portugal
22.	Department of Kinesiology [Katholieke Universiteit Leuven]	Belgium
23.	Department of Kinesiology and Physical Education [University of North, Sovenga]	South Africa
24.	Department of Kinesiology [Institute of Sport, Warsaw]	Poland
25.	Department of Sport Kinetics [University School of Physical Education in Poznań-Gorzów]	Poland
26.	Department of Kinesiotherapy [University School of Physical Education, Wrocław]	Poland
27.	Department of Kinetics Theory [University School of Physical Education, Katowice]	Poland

Establishment of an international organization of movement science

The motor activity of 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 determinants of movement – frequently detached from the main essence. In this way, something that was crucial became marginal. Even during international scientific congresses devoted to the movement activity of man in a specific sport discipline (i.e. “Science and Football”), all works that dealt with the techniques of specific exercises and their teaching receded into the background. This clash between various forms of movement and their determinants became more and more evident. Some called it a hiatus between theory and practice. Conferences gathered mainly specialists of particular sport disciplines, who very often attempted to solve problems without connecting 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 kind 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 was to integrate 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 Gorzów (Poland). An International Association of Sport Kinetics (IASK) was established, and its official registration took place on 29th November 1991.

The creation of IASK [Starosta 1991] gave rise to many determinant. 1. In the last quarter of the century the scientific recognition of various elements of kinetics in sports has developed enormously. 2. Elements distinguishing sport kinetics from within general human kinetics have become more evident. 3. Interdisciplinary approach to solving different problems of sport kinetics takes place, which means that more and more frequently representatives of different

scientific disciplines participate in the researches. 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 co-operation, broad foundations of sport kinetic theory are being developed, in which 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 kinetics, are being separated. An intensification of efforts of some scientists from different countries is being observed. 6. A very dynamic development of sciences dealing with[of] sports is being recorded, among them much importance is being 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 motorics, and particularly – sport motorics is treated marginally and disproportionately to its significance (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 larger number of specialists in human kinetics, and specifically in sport kinetics. The closest to our subject seems to be the International Society for the Advancement of Kinanthropometry – which puts, however, stress on anthropometry, and that accounts just for a small part of the movement science. 9. The dynamic development of sports which is being observed, both of the Olympic and non Olympic sports (which is manifested in forms of World Games), exerts pressure on experts who deal with sport kinetics 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 rises.

In such situation specialists in human kinetics, and particularly specialists in sport kinetics, felt obliged to undertake competent efforts, and following the example of representatives from other disciplines of science, decided to associate. After nearly 10 years of existence IASK proves how necessary the organization has been. IASK members (there are about 300 of them from 35 countries of the world) have managed to organize, in this short span of time,

over 30 international scientific venues, including cyclic conferences “Sport Kinetics”.

Final remarks

1). Movement is the biological need of every living organism. The human, by creating the modern civilization, somehow has forgotten about his genetic code. Man started to lead a sedentary life style, which causes many civilization diseases. **2).** In such a case an alternative appears: either man makes an effort to care about his physical development, or the number of disabled people will start to grow. Then the theory and practice in the movement science will become more significant. **3).** For ages, movement has been a subject of interest for many representatives of different scientific disciplines. Its meaning was shortly defined by Aristotle: “Movement is life”. **4).** The multiplicity and the variety of terms proposed to name the movement science demonstrates how intensive is the interest of the teams of specialists from other field of knowledge, in this developing scientific discipline, and especially in the 20th. The multitude of terms proposed shows how extensive is the topical scope of the movement science. **5).** Movement science has and will always have a universal meaning, since it refers to every human being regardless : 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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