

A European Perspective on Kinesiology in the 21st Century

Benoît G. Bardy

A collection of information about kinesiology around the world is given in this article. Institutions, societies, and journals that have contributed to the emergence of the field are indicated to illustrate the richness of current places where research on movement is conducted. The particular case of kinesiology in the European Union is detailed.

Research in Kinesiology in the 21st Century: An International Perspective

In silence and movement, you can show the reflection of people.

—Marcel Marceau, 1923–2007

The American Academy of Kinesiology and Physical Education (AAKPE) has witnessed fundamental and applied research on *movement* conducted in the United States of America since its creation in 1926. In this article, complementary information is given about the status of kinesiology as an academic research discipline mostly outside the United States to present a more-international picture of the field at the beginning of the 21st century. The international perspective should not be taken as an exhaustive survey of all countries (194), of all subdisciplines in the field (many), or of all criteria by which an academic field is traditionally called mature (existence of institutions, journals, societies, conferences, funding programs, etc.). More modestly, it aims at presenting an instantaneous picture (September 2007) of a few actions that have been envisaged here and there, proving, if necessary, the richness of kinesiology as an academic field around the world, its maturity, and its legitimacy on all continents. The first section is a nonexhaustive picture of what can be called institutionalized actions in the field. The second part examines in more detail the current situation of kinesiology in the European Union.

The author (AAKPE International Fellow) is with the Institut Universitaire de France and Université Montpellier-1, 34090 Montpellier, France. E-mail: benoit.bardy@univ-montp1.fr This is the Lynn Vendien International Lecture.

Kinesiology Around the World

Generally speaking, *kinesiology* can be defined as a discipline devoted to the study of physical activity in its many forms (American Academy of Kinesiology and Physical Education [AAKPE]). According to the AAKPE, the term is used to describe a multifaceted field of study in which movement or physical activity is the intellectual focus. Physical activity includes exercise for improvement of health and physical fitness; activities of daily living, work, sport, dance, and play; and involves special population groups such as children and the elderly, persons with disability, injury, or disease, and athletes. Areas include exercise and sport biomechanics, history, philosophy, physiology, biochemistry and molecular/cellular physiology, psychology, and sociology, neurosciences and motor behavior, measurement, physical fitness, and sports medicine, to name just a few. These areas are often grouped in disciplinary or multidisciplinary departments, schools, faculties, and societies, sometimes with associated journals or internal publications.

Institutions

Use of the word *kinesiology* to label research on movement in higher education is primarily a North American concept. In the United States, most institutions dealing with the study of human movement have progressively changed their names during the second part of the 20th century and have adopted the consensus name *kinesiology* over the recent years (e.g., the Department of Kinesiology at Penn State University, the School of Kinesiology of the College of Education and Human Development at the University of Minnesota, etc.). Canada has followed the same track, even in French-speaking provinces such as Quebec in which the word *kinesiology* has been translated into the French *kinésiologie*¹ (e.g., the *Département de Kinésiologie* at the University of Montreal). Other prominent faculties, departments, or higher education programs around the world have occasionally used the label *kinesiology* or *movement science(s)*,² including Australia (e.g., the School of Human Movement Studies at the University of Queensland), Belgium (e.g., the Faculty of Kinesiology at the University of Leuven), Croatia (the Faculty of Kinesiology at the University of Zagreb), France (e.g., the doctoral programs in Human Movement Science at the Universities of Montpellier, Marseille, and Paris), the Netherlands (e.g., the Faculty of Human Movement Sciences at the Free University in Amsterdam), Norway (e.g., the Human Movement Science program at the Norwegian University of Science and Technology in Trondheim), Portugal (e.g., the Faculty of Human Motricity at the University of Lisbon), or South Africa (e.g., the Human Movement Science program at the Nelson Mandela Metropolitan University in Eastern and Southern Cape). However, outside North America (and Australia to a certain extent), the use of the label *kinesiology* or *movement sciences* is still more the exception than the rule. Table 1 illustrates the labels used in various countries to name institutions doing basic and applied research in kinesiology and its subdisciplines. Not surprisingly, the keywords used to capture the scientific activities in the field are still *physical education* and *sport sciences*.

Table 1 Nonexhaustive List of Labels Used Around the World to Capture Research in Kinesiology in Higher Education

Algeria: Physical education	Argentina: Sport sciences
Brazil: Physical education, Physiotherapy	Bulgaria: Sport sciences
Chile: Sport, Recreation, Physical education	China: Sport sciences, Physical education
Denmark: Exercise and sport sciences	Estonia: Exercise and sport
Finland: Biology and Physical education	France: Physical activity and sport, Physical education
Germany: Sport sciences, Physical education	Greece: Sport sciences, Physical education
India: Sport sciences, Physical education	Ireland: Sport sciences
Italy: Sport sciences, Physical education	Korea: Sport sciences, Physical education
Mexico: Sport sciences, Physical education	Morocco: Physical education
New Zealand: Sport and exercise sciences	Spain: Sport sciences, Physical education
Sweden: Exercise and sport	Tunisia: Physical education
UK: Exercise, Sport sciences	Ukraine: Physical education, Sport sciences
Venezuela: Physical education	

Societies and Journals

Academic fields are characterized not only by higher education programs or department names but also by structured scientific societies and journals. The field of kinesiology does not escape this basic rule and exhibits several tribunes in which basic and applied contributions are discussed and published. Table 2 illustrates a sample of national and international societies visible in the field and/or related journals. Obviously, it is incomplete, and many groups, associations, or journals can be added to the list. It has no other aim than to illustrate the internationality of the field of movement sciences across continents and countries and the representativeness of the main subdisciplines that compose it.

Kinesiology in the European Union

The situation in Europe is worth mentioning. “Making Europe the most competitive and dynamic knowledge-based economy in the world by the year 2010” has been announced at the Lisbon European Council in March 2000, and the “knowledge triangle”—research, education, and innovation—has been considered as a core factor in European efforts to meet the ambitious Lisbon goals (see Figure 1). Numerous programs, initiatives, and support measures are carried out at the European Union (EU) level in support of knowledge, among which are the Seventh Framework Program devoted to research and technology (FP7), the Competitiveness and Innovation Framework Program (CIP), the Education and Training program. In the following paragraphs, the main actions of the Seventh Program are detailed, and one example in the field of kinesiology is given.

Table 2 Nonexhaustive List of Societies, Conferences, and Journals Around the World Devoted to Kinesiology and Its Subdisciplines

Countries	Societies	Conferences	Journals
Asia	Asian Council of Exercise and Sports Science (ACCESS)	Asian-Pacific Conference on Exercise and Sports Science	
Australia	Australian Association for Exercise and Sports Science (AAESS)		
Australia			<i>Australian Journal of Science and Medicine in Sport (AJSMS)</i>
Belgium	Flemish Society for Kinesiology (VK)		
Canada	Canadian Society for Psychomotor Learning and Sport Psychology (SCAPPS)	Annual SCAPPS conference	
Canada	Canadian Society for Exercise Physiology (CSEP)	Annual CSEP conference	<i>Canadian Journal of Applied Physiology (CJAP)</i> and from 11/2004, <i>Applied Physiology, Nutrition, and Metabolism (APNM)</i>
China	Macao Society of Sport Science and Physiological Education		
Europe	European College on Sport Sciences (ECSS)	Annual ECSS conference	<i>European Journal of Sport Sciences (EJSS)</i>
Europe	European Society of Movement Analysis in Adults and Children (ESMAC)	Annual ESMAC conference	
Europe		Biannual EWOMS meeting (European Workshop on Movement Sciences)	
Europe		Annual ESB workshop	<i>Clinical Biomechanics (CB)</i>
Europe	European Society of Biomechanics (ESB)		
Finland	The Finnish Society of Sport Sciences		
France	French Society for Movement and Sport Sciences (ACAPS)	Biannual ACAPS conference	<i>Science & Motricité (S&M)</i>
International	International Society of Motor Control (ISMC)	Biannual ISMC conference	<i>Motor Control (MC)</i>

International	International Council of Sport Science and Physical Education (ICSSPE)		
International	International Society for Comparative Physical Education and Sport (ISCPES)		
International	International Society for Posture & Gait Research (ISPGR)	Biannual ISPGR conference	<i>Gait & Posture (G&P)</i>
International	International Society of Electrophysiology and Kinesiology (ISEK)	Biannual ISEK conference	<i>Human Movement Science (HMS)</i> <i>Journal of Electromyography and Kinesiology (JEK)</i>
International			<i>Journal of Motor Behavior (JMB)</i>
International			<i>Experimental Brain Research (EBR)</i>
International			<i>Journal of Experimental Psychology: Human Perception and Performance (JEP: HPP)</i>
International			<i>European Journal of Applied Physiology (EJAP)</i>
International	German Society of Sports Medicine		<i>International Journal of Sport Medicine (IJSM)</i>
International	Association for Applied Sport Psychology (AASP)		<i>Journal of Applied Sport Psychology (JASP)</i>
International	International Sports Engineering Association (ISEA)	Biannual ISEA conference	<i>Sports Engineering (SE)</i>
International	Japan Society of Physiological Anthropology (JSPA), International Association of Physiological Anthropology (IAPA)	Biannual JSPA meeting	<i>Journal of Physiological Anthropology (JPA)</i>
International	International Ergonomics Association (IEA), The Ergonomics Society		<i>Applied Ergonomics, Ergonomics</i>
International	International Society of Biomechanics (ISB)	Annual ISB meeting	<i>Journal of Biomechanics (JB)</i>

(continued)

Table 2 (continued)

Countries	Societies	Conferences	Journals
Italy	Italian Society of Clinical Movement Analysis (SIAMOC)	Annual SIAMOC meeting	
Italy		Biannual CeBiSM meeting (Centro interuniversitario di ricerca in Bioingegneria e Scienze Motorie)	
Japan	Japan Society of Physical Education, Health and Sport Sciences (JSPEHSS)		
Japan	Japanese Society of Biomechanics (JSB)		
Japan	Japanese Society of Physical Fitness and Sports Medicine (JSPFSM)		
North America	North American Society for the Psychology of Sport and Physical Activity (NASPSPA)	Annual NASPSPA meeting	<i>Journal of Sport & Exercise Psychology (JSEEP)</i>
Norway	Norwegian Society for Sport Research		
The Netherlands	Netherlands Society for Movement Sciences		
United Kingdom	British Association of Sport and Exercise Sciences (BASES)	Annual BASES conference	<i>Journal of Sports Sciences (JSS)</i>
USA	American College of Sports Medicine (ACSM)	Annual ACSM conference	<i>Medicine & Science in Sports & Exercise (MSSE)</i>
USA	American Kinesiology Association (AKA)		
USA	American Academy of Kinesiology and Physical Education (AAKPE)	Annual AAKPE conference	
USA	American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD)		<i>Research Quarterly for Exercise and Sport (RQES)</i>
USA	American Physiology Society (APS)	Annual APS conference	<i>Journal of Applied Physiology (JAP), The American Journal of Physiology (AJP)</i>

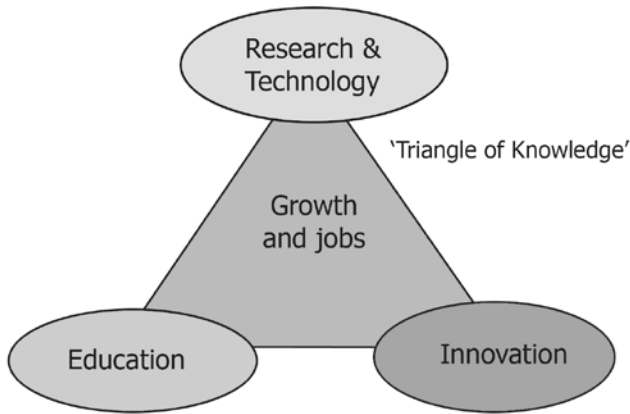


Figure 1 — The triangle of knowledge promoted by the Lisbon European Council in March 2000. *Source:* the European commission.

The Seventh Program—FP7³

Research in the EU is thus newly organized under the umbrella of FP7. The broad objectives of this new program have been grouped into four categories: *Cooperation*, *Ideas*, *People*, and *Capacities*, plus a fifth specific program on nuclear research, *Euratom*, which is not detailed here. For each type of objective, there is a specific program corresponding to the main areas of EU research policy. All specific programs work together to promote and encourage the creation of European poles of (scientific) excellence among EU state members⁴ and, more generally, among countries in Europe. FP7 activities are scheduled for 7 years (2007–2013). Its total budget is €50.5 billion (not including *Euratom*), which represents a 63% increase from the previous EU program (FP6) at current prices. Figure 2 summarizes the main components of FP7 and their associated budgets. It has to be noted that EU projects and their financial support are in addition to and are not replacing national funding. Here we detail the four main categories.

Cooperation. The *Cooperation* program supports all types of research activities carried out by different research bodies in transnational cooperation and aims to gain or consolidate leadership in key scientific and technology areas. FP7 allocates around €32 billion to the program. The budget is devoted to supporting cooperation between universities, industry, research centers, and public authorities throughout the EU and beyond. Typically, 3 to 20 groups of researchers working in public or private institutions across at least three countries (including third, non-European countries) decide to join their research effort to reach a common goal. The *Cooperation* program is subdivided into 10 distinct themes. Each theme is operationally autonomous but aims to maintain coherence within the program and allows for joint activities cutting across different themes, through, for example,

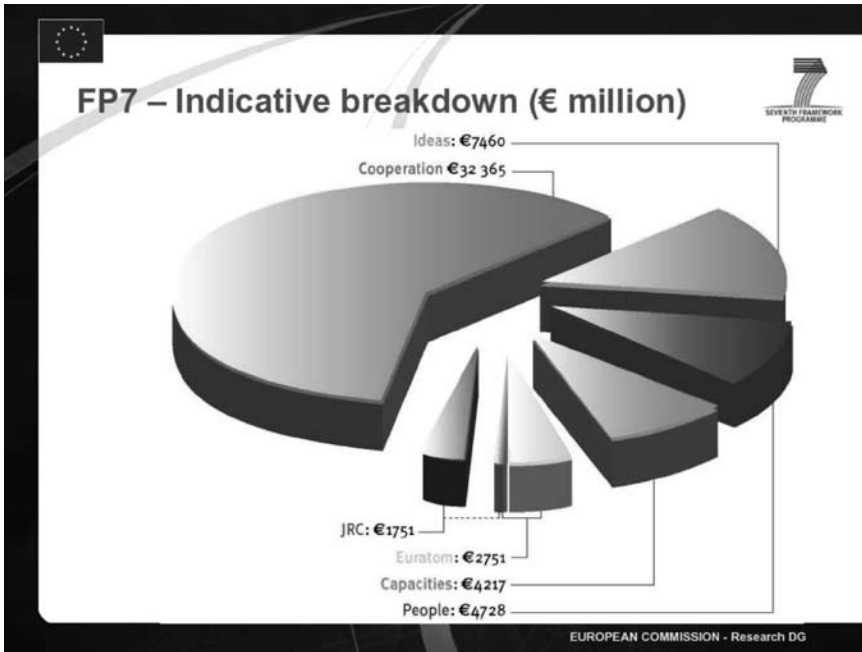


Figure 2 — The budget of the EU 7th Framework Program (FP7). *Source:* the European commission.

joint calls. The 10 identified themes reflect the most-important fields of knowledge and technology in which research excellence is particularly important to improve Europe’s ability to address its social, economic, public health, environmental, and industrial challenges of the future. The 10 themes are the following (see Figure 3 for associated budget):

- Health
- Food, Agriculture, and Biotechnology
- Information and Communication Technologies
- Nanosciences, Nanotechnologies, Materials and New Production Technologies
- Energy
- Environment (including climate change)
- Transport (including Aeronautics)
- Socioeconomic Sciences and Humanities
- Security
- Space

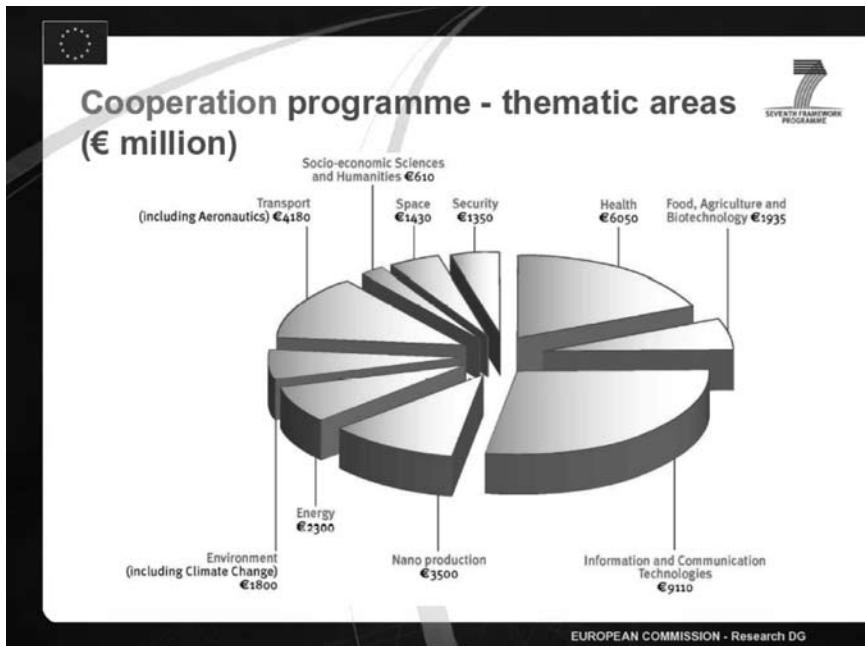


Figure 3 — Categories of the *Cooperation* program in FP7 with budget indications. *Source:* the European commission.

The bulk of EU research funding in FP7 thus goes to collaborative research with the objective of establishing excellent research projects and networks. This is to be achieved through a range of funding schemes: collaborative projects, networks of excellence, coordination/support actions, etc.

Ideas. The objective of the specific *Ideas* program is to reinforce excellence, dynamism, and creativity in European research and improve the attractiveness of Europe. Communication and dissemination of research results are important aspects of this program. For its implementation, the Commission has established a European Research Council (ERC). The ERC operates according to scientific excellence and supports investigator-driven projects in “frontier research” carried out by individual teams competing at the European level within and across all fields of research. The ERC has an overall budget of €7.5 billion and complements other funding activities in Europe such as those of the national research funding agencies. ERC grants are awarded through open competition to projects headed by young and established researchers, irrespective of their origins, who are working in Europe—the sole criterion for selection is excellence. The first ERC call closed on April 2007. It revealed a massive interest from EU researchers, with more than 9,000 first-stage applications. After a very competitive evaluation, 250 projects were selected, for a total budget of €289.5 million.

People. The “Marie Curie Actions” have long been one of the most popular and appreciated features of the Community Framework Programs for Research and Technological Development. They have developed significantly in orientation over time, from a pure mobility fellowships program to a program dedicated to stimulating researchers’ career development. In FP7, the “Marie Curie Actions” have been regrouped and reinforced in the *People* program, which is entirely dedicated to human resources in research. It has a significant overall budget of €4.7 billion.

“Strengthening, quantitatively and qualitatively, the human potential in research and technology in Europe, by stimulating people to enter into the profession of researcher, encouraging European researchers to stay in Europe, and attracting to Europe researchers from the entire world, making Europe more attractive to the best researchers” is the objective of the *People* program. This objective is implemented by putting into place a coherent set of “Marie Curie” actions under five headings:

- Initial Training of Researchers, which aims to improve mostly young researchers’ career perspectives in both public and private sectors by broadening their scientific and generic skills, including those related to technology transfer and entrepreneurship;
- Life-Long Training and Career Development, which supports experienced researchers in complementing or acquiring new skills and competencies or in enhancing inter/multidisciplinarity or intersectoral mobility, in resuming a research career after a break, and in (re)integrating into a longer-term research position in Europe after a transnational mobility experience;
- Industry–Academia Pathways and Partnerships, which stimulates intersectoral mobility and increases knowledge sharing through joint research partnerships in longer-term cooperation programs between organizations from academia and industry, in particular SMEs and including traditional manufacturing industries;
- International Dimension, which contributes to the lifelong training and career development of EU researchers, attracts research talent from outside Europe, and fosters mutually beneficial research collaboration with research actors from outside Europe; and
- Specific Actions that support removing obstacles to mobility and enhancing the career perspectives of researchers in Europe.

Capacities. The Commission’s proposals for the FP7 *Capacities* program aim to enhance research and innovation capacities throughout Europe and ensure their optimal use. The *Capacities* program is provided with a budget of about €4 billion to operate in seven broad areas:

- Research infrastructures
- Research for the benefit of SMEs
- Regions of knowledge and support for regional research-driven clusters
- Research potential of Convergence Regions
- Science in society
- Support for the coherent development of research policies
- International cooperation

Kinesiology in FP7

As evidenced in the specific programs and categories just mentioned, kinesiology is not an independent topic of FP7. However, because of its interdisciplinary nature, it is present in various forms in at least six *Cooperation* themes: Health, Information and Communication Technologies, Transport, Socioeconomic Sciences and Humanities, Security, and Space. This article will not detail all actions in FP6 of FP7 including kinesiology research programs or institutions. A single example will be taken to illustrate how movement science can find its way in European projects in conjunction with other disciplines.

The SKILLS Integrated Project

SKILLS⁵ is an Integrated Project (Figure 4) obtained in response to the last call of FP6 (theme Information and Communication Technologies, strategic objective “Multimodal Interfaces”) and deals with the acquisition, interpretation, storing, and transfer of human skill by means of multimodal interfaces, robotics, virtual environments (VE) technologies, and interaction design methodologies. The research in SKILLS addresses the fundamental aspects of skill analysis from movement sciences and interaction design points of view. Cognitive and perceptuo-motor aspects of skilled behaviors are modeled, analyzed, captured, digitized, and rendered through digital technologies. SKILLS involves fundamental research in various domains (neurosciences, motor control, robotics, etc.) and takes three different application domains into consideration for demonstrators: sport and entertainment, surgery and rehabilitation, manufacturing and industry (see Figures 5 and 6). Interaction design methodologies are implemented in these contexts to address the design of novel interfaces focused on skill transfer and being able to improve task performances or generate innovative processes.

As an outcome of the project, specific interfaces in the three application domains will be developed that will boost the human perception-action channels and the learning of new skills. Interfaces will be technologically as invisible as possible—not to decrease the human performance—and capable of “understanding” the user’s intentions, his or her current behavior and purpose, both in a task-specific context and following “what you see is what you get” principles.

Of interest for the current purpose is the structure of the SKILLS consortium. Fifteen institutions are involved (see Table 3), nine public research institutions and six private companies. Eight different countries are represented (with eight different native languages), seven EU countries and one third country (Israel). The research and development activities take advantage of the multidisciplinary expertise of the consortium, in terms of both fundamental research and technological developments. The total funding of the consortium is €10 million, over a period of 5 years (2006–2010).

SKILLS is thus an example in the domains of perception-action research and the development of human–machine interfaces that exploits the multidisciplinary knowledge available in kinesiology and related fields. It is not *stricto sensu* a research program in kinesiology; nor is it *stricto sensu* a program in robotics or interface design. It is truly at the intersection of several fields, and its main theoretical ideas and applicative technologies have been submitted and are now under investigation.

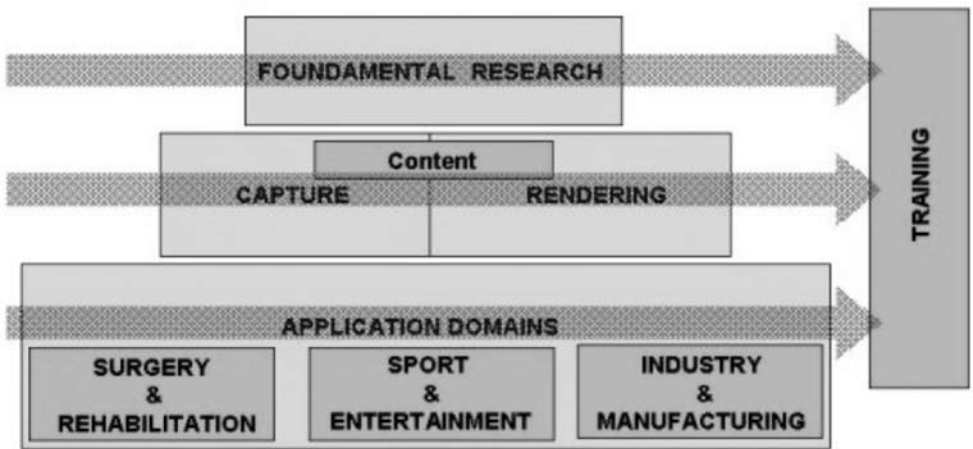


Figure 4 — Architecture of the SKILLS integrated project. *Source:* the SKILLS technical annex (FP6—IST contract 035,005), reproduced with permission.

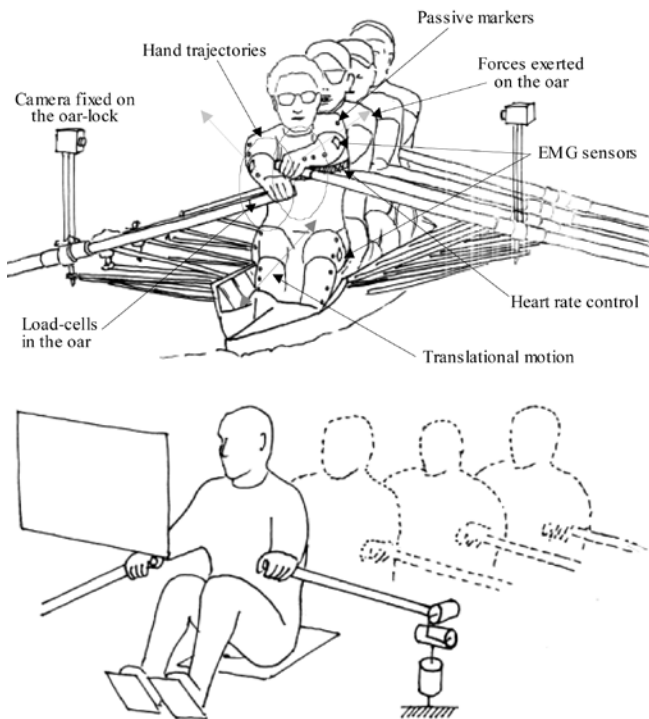


Figure 5 — The Sport and Entertainment domain of demonstration of the SKILLS integrated project, with the capturing module (top) and the rendering module (bottom). *Source:* Personal drawings of Massimo Bergamasco, reproduced with permission.

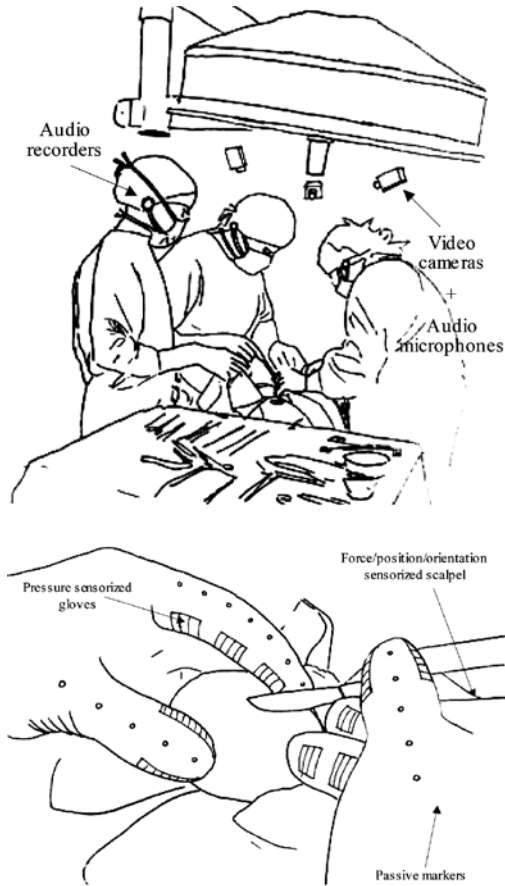


Figure 6 — The Surgery and Rehabilitation domain of demonstration of the SKILLS integrated project, with the capturing module (top) and the rendering module (bottom). *Source:* Personal drawings of Massimo Bergamasco, reproduced with permission.

Conclusion

In this article, international initiatives promoting kinesiology have been described. All over the world, efforts to create, structure, label, or disseminate research activities in the field have been engaged during the last decades of the 20th century and are now flourishing. Because of its multidisciplinary nature, the field of kinesiology seems naturally armed to face the new challenges of the 21st century. This is particularly the case in Europe, where multidisciplinary projects in health and information technology programs are encouraged through EU applications. For this reason, the role played by kinesiology-focused institutions in current EU FP7 projects and non-EU equivalents may be reinforced.

Table 3 Partners Involved in the SKILLS Integrated Project (FP6, #IST-035005)

Institutions	Short name	Country
Scuola Superiore di Studi Universitari e di Perfezionamento Sant'Anna	PERCRO	Italy
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.	FhG	Germany
Commissariat à l'Energie Atomique	CEA	France
Université Montpellier-1	UMI	France
Deutsches Zentrum für Luft- und Raumfahrt e.V.	DLR	Germany
Fundaciòn LABEIN	LABEIN	Spain
Centro de Estudios e Investigaciones Técnicas de Gipuzkoa	CEIT	Spain
Israel Institute of Technology	TECHNION	Israel
University of Tampere	UTA	Finland
Queen's University Belfast	QUB	United Kingdom
KUKA Roboter GmbH	KUKA	Germany
Aalborg University	AAU	Denmark
Haption S.A.	HAPTION	France
OMG	OMG	United Kingdom
SIMONAZZI	SIMONAZZI	Italy

Notes

1. The term *kinésiologie* is used in some French-speaking countries, such as Canada or Belgium, to describe the academic discipline studying movement. In other countries, such as France, it is used in a more-applied way and often relates to physiotherapy.
2. In general, the term *kinesiology* is rarely used in European countries, which favor the use of the term *movement science(s)*. In this article, we use the terms *kinesiology* and *movement science(s)* interchangeably because both of them refer to the basic study of movement and physical activity.
3. http://cordis.europa.eu/fp7/home_en.html
4. The current 27 member states of the European Union: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, the Netherlands, United Kingdom
5. www.skills-ip.eu

Acknowledgments

This article has been written in memory of Lynn Vendien, late fellow of the American Academy who promoted international cooperation throughout her career. The author is thankful to Mike Wade for his sponsorship to enter the Academy, to Jane Clark for her invitation to give the international lecture at the 2007 meeting in Savannah, GA, and to Marcos Duarte,

Mohamed Jarraya, Nam-Gyoon Kim, Kazutoshi Kudo, François-Xavier Li, Stéphane Perrey, Philippe Sarrazin, Dagmar Sternad, and Yuli Toshev for their help during the elaboration of the article. Preparation of this article was supported by SKILLS (EU IST contract #035005) and by the American Academy of Kinesiology and Physical Education.