Revista Bioética
Print version ISSN 1983-8042 | On-line version ISSN 1983-8034

Rev. Bioét. vol.33 Brasília 2025

Bioethics in human motricity sciences

María Morera-Castro [1], *Sara Mora Ugalde* [1]

1. Universidad Nacional, Heredia, Costa Rica.

Abstract

This study investigated the relation between bioethics and human motricity sciences. A literature review established central disciplinary areas. Evidence found in scientific publications reveals that each area was analyzed and cataloged based on four bioethical dimensions. From the analysis, relations were established between all disciplinary areas with one or several of the bioethical dimensions. A taxonomic divergence emerged at the global level on how to encompass all scientific disciplines that seek to study movement in humans. From the complexity, diversity, and breadth of human motricity sciences, this article contributes to a more comprehensive understanding of bioethical considerations by area.

Keywords: Bioethics. Ethics, professional. Motor activity. Biomedical research.

Resumo

Bioética nas ciências da motricidade humana

O objetivo deste estudo foi realizar uma análise da relação entre a bioética e as ciências da motricidade humana. Foi realizada uma revisão bibliográfica que levou ao estabelecimento de 13 áreas disciplinares centrais. As evidências encontradas em publicações científicas revelam que cada área foi analisada e catalogada com base em quatro dimensões bioéticas. A partir da análise, foram estabelecidas relações entre todas as áreas disciplinares com uma ou várias das dimensões para aplicar as considerações bioéticas. Além disso, foi encontrada uma divergência taxonômica em âmbito global sobre como abranger todas as disciplinas científicas que buscam estudar o movimento em humanos. A partir da complexidade, diversidade e amplitude das ciências da motricidade humana, este artigo contribui com uma compreensão mais abrangente das considerações bioéticas por área.

Palavras-chave: Bioética. Ética profissional. Atividade motora. Pesquisa biomédica.

Resumen

Bioética en las ciencias de la motricidad humana

El objetivo de este estudio fue efectuar una revisión de la relación entre bioética y las ciencias de la motricidad humana. Se efectuó una revisión bibliográfica que condujo al establecimiento de 13 áreas disciplinares básicas. De acuerdo con la evidencia encontrada en publicaciones científicas, cada área fue revisada y catalogada en función de cuatro dimensiones bioéticas. A partir del análisis se establecieron relaciones entre todas las áreas disciplinares con una o varias de las dimensiones para la aplicación de consideraciones bioéticas. Además, se encontró una divergencia taxonómica a nivel mundial de cómo englobar todas las disciplinas científicas que tienen como objetivo de estudio el movimiento en seres humanos. Desde la complejidad, diversidad y amplitud de las ciencias de la motricidad humana, este artículo contribuye con una comprensión más integral de las consideraciones de la bioética por área.

Palabras clave: Bioética. Ética profesional. Actividad motora. Investigación biomédica.

Research

The authors declare no conflict of interest.

Bioethics is a very broad field of knowledge, which allows the confluence of several disciplines. The Royal Spanish Academy (RAE) Dictionary [1] defines bioethics as the scientific discipline that studies the ethical aspects of medicine and biology in general, as well as the relations between human beings and other living beings. The term "bioethics" comes from the Greek roots *ethike* (moral), *bio* (life) and *ethos* (manner of doing things, customs or habits). It is an area of philosophy that studies human customs in relation to making decisions about what is right and what is considered wrong.

The first mention of this word was proposed by German educator Fritz Jahr in an article on life and moral sciences, *Bioethics: an analysis of the relation between humans, animals and plants*, in which he proposed a bioethical imperative: to *respect on principle every living being as an end in itself and to treat them, if possible, as equals* [2]. Subsequently, American biochemist Van Rensselaer Potter popularized the term and referred to a bridge between the sciences, which would enable us to face the challenges of the future [3].

Although bioethics was initially introduced as a proposal for ethics applied to life in general, it was later channeled for several years into the areas of human health and research with human beings: "*In many European centers, the old scholars or institutes of history of medicine and science reorient their activity towards bioethics, which thus becomes the fundamental discipline of the so-called medical humanities* (...) *the extension to all countries of the American continent has been rapid, finding various forms of expression and inclusion in research and education institutions*" [3].

In the late twentieth century, past events such as the experimentation with people in concentration camps during World War II and the Tuskegee case of untreated syphilis, among others, caused concerns about the implications of conducting research that did not take into consideration the principles of autonomy, non-maleficence, beneficence and justice. As a result, international instruments were created to prevent the repetition of this type of practice. Key instruments include the *Nuremberg Code*, the *Belmont Report*, the *Declaration of Helsinki*, and the international ethical guidelines for health-related research involving human subjects issued by the Council for International Organizations of Medical Sciences.

Currently, bioethics maintains this interest in biomedical practices and research with human beings, but it also refers to addressing challenges related to the lives of living beings (not just human beings) and the environment, since problem-solving and decision-making in dilemmatic situations are the subject of bioethics [4]. Therefore, bioethical analysis can refer to issues involving animal welfare, community health, natural resource management, and climate change, among others.

This implied revising the principles initially formulated based on the *Belmont Report*, with the preparation of new proposals that include the principle of precaution, the principle of responsibility, the inclusion of human rights, and the use of other methods, such as casuistry and the application of various ethical theories.

It is important to note that, while bioethics has been broadly developed in human health areas, such as clinical practice and research involving human subjects, the second part of the definition is of primary relevance to people's relations with the world and life.

Therefore, this article analyzes the relation between bioethics and human movement sciences from a pragmatic perspective, in order to understand the importance of integrating disciplines and knowledges proposed by Jahr and Potter, based on the recognition of the value of life in all its expressions [5]. In this case, the disciplinary relation is established with human movement sciences and, to understand this relation, it is important to first understand the epistemology of the word "movement."

According to the RAE [1], movement is the action and effect of moving. This verb derives from the Latin term *movēre* (*to transfer, to move* or *to change*); its participle is *motus* and is associated with the Indo-European root *meu̯ə* (*to move, to move away*) [6]. In the case of the word "motricidade" [movement], the RAE [1] defines it as

a body's ability to move or produce movement, which also derives from the Latin term *movēre* and is formed by the female agent *trix* plus the suffix *dad* (quality) [6].

Thus, the focus will be on *Homo sapiens sapiens*. Records indicate their emergence as dating back approximately to 120-100 thousand years. The main characteristics that distinguish it from the other animals include cultural processes, notably not only vocal-auditory communication, but also kinesic and proxemic language that enables the construction and deconstruction of reality [7]. The term "kinesic" derives from the Greek root kinetic "κίνησις (*kinesis*=movement)" and refers to all body movements or body language that *Homo sapiens sapiens* uses to interact with their surroundings [1].

The first records of the study of these words were provided by four great exponents: Plato, Aristotle, Galen and Galileo Galilei. According to Greek philosopher Plato, the State should be legislated through the education of its guardians. But what kind of education? An easy answer would be gymnastics to educate the body and music to educate the soul. Aristotle, in the seventh book of Physics, addressed the main theme of the movement of natural beings. Galen, in turn, may have been the first person to seek a functional understanding of all body organs and parts and how they interrelated, which enabled the interpretation of the bodily structure. And Galileo Galilei contributed toward a method to study motion and the foundation of kinematics.

During the eighteenth century, Rousseau—considered the father of current physical education—introduced in his work, *Emile, or On Education*, a pedagogical proposal on the education of the body. In turn, the nineteenth century saw the rise of different currents on gymnastics: Francisco Amorós in France, Thomas Arnold in England, Guts Muths in Germany, and F. L. Jahn and Pehr Henrik Ling in Sweden. The latter author founded the first higher education institution focused on training gymnastics teachers.

In the twentieth century, physical education rose as a form of education of movement that continues to this day. In the same century, Jean Le Boulch, in France, proposed the philosophy of education through movement; José María Cagigal, in Spain, exposed the tendency of the human being in movement as an element of knowledge [8]. In turn, Manuel Sérgio [9] speaks of an epistemological rupture towards a new paradigm of human motor activity, considering it a complex phenomenon in which several professions converge; which enables, from a macro, critical, reflective and global perspective, addressing the person in movement in the act of transcendence as a more integral being, as well as an element of a less stereotyped human life and a phenomenon of integration between the soul-body and animus-anima dualisms or the brain-body-mind triad.

After this historical milestone, another key element to answer the question "what are human movement sciences (HMS)?" is the word science. According to Kerlinger [10], this word is not easy to define and can traditionally be studied from two main perspectives: the static and the dynamic. The first characterizes science as an activity that systematically provides the world with information, based on a set of facts observed by a scientist, with a major focus on current knowledge.

The second focuses on a science with a heuristic view, in which the explanation of natural phenomena and previous or current knowledge contribute to subsequent theories and research, with a major focus on discovery and problem-solving. Therefore, in general terms, science could be encompassed in a systematic and conscious extension of conceptual schemes and theoretical structures of common sense.

Therefore, a clear and robust definition of the HMS is still premature, as they are still perceived according to a paradigm of complexity as an area in constant evolution. In the 21st century, a variety of terms are used to define this field of knowledge, such as kinesiology or kinanthropometry, remaining in use terms such as sports science, exercise science, physical culture, recreation, physical education, sports, human movement science, and physical activity and sports sciences, among others. In turn, Manuel Sérgio [9] notes that the HMS study the human being who moves intentionally, through

their corporeality, with the latter being the main component of motor skills.

It is evident in history that, regardless of the word used as a major umbrella term for a whole set of disciplines, all have human motor skills as their subject of study [11]. Therefore, the objective of this research was to review the bioethical considerations that concern human movement sciences.

It should be noted that this article is not intended to be exhaustive, but rather to stimulate reflection on the need to broaden the approach to the interaction between bioethics and HMS, and how both disciplines converge and require a joint and permanent interdisciplinary work that ensures a moral approach to doing things based on the study of human life in movement.

Method

This systematic review was carried out in different stages. First, after a literature search, the 13 main disciplinary areas of the HMS were established: sports performance, sports and exercise psychology, exercise and sports physiology, sports medicine, sports kinesiology, exercise biomechanics, motor behavior, physical health promotion, recreation, physical education, adapted physical activity, sports and recreational management, and sports sociology.

Based on their understanding, we searched for studies that met the inclusion criteria and that could show the professional practices or relation in any of the four selected bioethical dimensions: research with humans, community care, impact on the natural environment and research with non-human animals.

Information search

The literature search was performed during 2023 in the following databases: EBSCOHost, SCOPUS, Web of Science, SportDiscus, Academic Search Ultimate, ScienceDirect, Sociology Source Ultimate, SocINDEX with Full Text and Veterinary Source. If the full article was not found in the indicated databases, the ORCIDs of the authors were searched on Google Scholar or ResearchGate, or help was requested from information centers to locate them.

As search keywords, we used the names of the main disciplinary areas plus the name of the bioethical application dimension in English and Spanish, for example: "educación física" OR "physical education" AND "seres humanos" OR "human beings" OR "humans."

Eligibility criteria

The eligibility criteria defined *a priori* were: original scientific studies with experimental or quasi-experimental design, correlational, descriptive, case studies, systematic reviews, meta-analyses, qualitative or systematization of professional experience related to the disciplinary area and the corresponding bioethical dimension. In addition, the time of the publication process was defined as more than two months, in English, Spanish or Portuguese, published between 2022 and 2024.

Selection of studies and coding of information

An initial selection was carried out by one of the authors, which included, for each article, the full reading of the research so that it was possible to evaluate the relevance of one of the 13 main disciplinary areas of human movement sciences and its relation with one of the four dimensions of bioethics created: research with humans, community care, impact on the natural environment and research with non-human animals.

This was then validated through a discussion with the other researcher to corroborate the relevance and suitability of the selections. In case of divergence, the research was replaced with another on which both parties agreed.

Variables

During the literature review, we found a thesaurus specialized in human movement sciences that integrates 16 major disciplinary areas—sports performance, sports psychology, health promotion, biomechanics, sports, exercise physiology, physical education, sports nutrition,

recreation, sports and recreational management, adapted physical activity, sports medicine, sports kinesiology, motor behavior, sports sociology and sports infrastructure and equipment—which resulted in 3,873 thematic descriptors [12].

However, in this article, 13 main disciplinary areas of the HMS were established as study variables. These areas are presented below with a description of the focus of the professional work and its scope.

- *Sports performance*: focused on the work and guidance of the athlete or group of athletes to achieve specific goals defined for them, over a period of time, in highly competitive sports. This disciplinary area is usually composed of a technical team, which works together to achieve these goals and may vary depending on the sport. Generally, this technical committee is composed of a set of professionals with different functions, such as: technical management and assistance, physical preparation, goalkeeper training, sports nutrition, sports medicine, sports kinesiology, performance analysis, technical and tactical strategy, among others. It should be noted that the technical committee also includes support professionals, the massage therapist and people responsible for mechanical engineering or career maintenance, among others. In addition, as part of the collaboration to optimize the athlete's performance, other professionals in exercise physiology, biomechanics, sports psychology, recreation, physical-sport rehabilitation, motor learning, motor control, veterinary medicine or other professionals are also consulted, which can contribute to the learning, improvement or enhancement of performance to achieve the established goal. It should be noted that this area also includes the processes of sports initiation and search for sports talent or sports *scouting* .
- *Sports and exercise psychology*: psychology branch that studies emotional, mental, perceptual, behavioral processes, among others, continuously seeking optimal mental health during practice or performance in physical activity, physical exercise or sports that a person or group of people practice throughout life.
- *Exercise and sports physiology*: a physiology branch focused on the impact of regular exercise on the tissues, cells and systems of a being [13]. Similarly, professionals in this area collaborate in the promotion, prevention, treatment or rehabilitation of the health of people with acute diseases, chronic-degenerative diseases, disabilities or healthy people through the practice of physical exercises. In addition, they study the underlying physiological mechanisms to which the human body is subjected during physical activity or in high-level competitions to optimize individual performance.
- *Sports medicine*: medical specialty focused on the prevention, care and treatment of various medical conditions associated with sports practice, physical activities or exercises, such as sports injuries or the elimination of existing asymptomatic diseases to prevent sudden death. In turn, these medical specialists are responsible for monitoring and controlling the various skills, indicators, changes and other aspects of an athlete, enabling them to optimize their sports performance.
- *Sports kinesiology:* studies the interaction between the musculoskeletal system and physiological processes with movement, for prevention, recovery, rehabilitation and monitoring of persons after an injury or by the sports practice of a professional or amateur athlete.
- *Exercise biomechanics*: studies the mechanical laws and principles that determine human movement and the functioning of biological systems, through the analysis of forces and how they interact with the body inside and outside tissues, organs, fluids, cells, among others. In addition, professionals in this area, by studying movement patterns, establish the most effective methods to improve well-being, health, sports performance, as well as to reduce the risk of injury and disease.
- *Motor behavior*: studies three disciplines, namely motor learning, control and development. Motor learning studies the processes involved in learning, performing, enhancing, and perfecting a skill or movement through practice or experience,

as well as the factors that inhibit or enhance these processes. Motor control analyzes how movement is organized and controlled in humans and animals and the underlying mechanisms and processes. And motor development studies changes in motor behavior throughout life and the processes related to these changes.

- *Physical health promotion*: studies how individuals or groups can improve their healthy lifestyles through physical activity. In addition, professionals in this area contribute toward the promotion, prevention and rehabilitation of health, by prescribing physical activities and exercises for healthy people or for people with chronic non-communicable diseases.
- *Recreation*: studies leisure as a human right, in addition to education and optimization of free time for individuals or groups of people. These professionals also manage recreational facilities and services in various organizations, and plan, organize, implement and evaluate recreational events, programs, projects and activities, with social and environmental responsibility, that promote the integral well-being and health of people throughout life, according to individual and collective needs.
- *Physical education:* studies the processes of teaching and learning the body culture of movement in human beings from a pedagogical perspective. These professionals, through structured and safe environments, instruct, educate and evaluate the development, maturation and improvement of the movement of a person or a group of people through physical, sporting and playful activities. In turn, they can incorporate health education to promote adherence to active and healthy habits and lifestyles.
- *Adapted physical activity*: interdisciplinary study of everything related to physical activity, sports, recreation and active lifestyles for the benefit of people with disabilities. In turn, it encompasses adaptations or modifications in the infrastructure or in any sports and recreational practice that aim to foster participation and support the acceptance of the differences and particular needs of each human being, to improve their well-being and provide a more active and healthy life.
- *Sports and recreational* management: studies the business management, marketing and administration of sports and recreational organizations. This is another multidisciplinary field that focuses on sports law, sports policy management, sports communication, sports marketing, sports management, sports or recreational management, facilities operations management, sports finance and economics, sports agent, personnel management, public relations, sports data and results analysis, event management, sports and recreational programs and projects, among others.
- *Sports sociology*: studies the phenomena, relations and changes in socialization processes through the understanding of sports over time. The professionals delve into the role, function and meaning of sports and physical activity for people and in different societies. And, through the internal, external and sports-based socialization processes, the dominant, emerging and residual social realities, values, economy, politics and cultural norms are identified as an expression of the human condition.

And, to analyze the relation between the various disciplinary areas of the HMS and the bioethical recommendations, we selected four dimensions that served as a basis for identifying the element with which the human movement professional relates:

- Human research: covers all disciplinary areas in which professionals conduct research or work with human beings; establishes the foundation for understanding and applying best practices when conducting activities with people. This field is particularly extensive, given the extensive work carried out after World War II in normative terms, both internationally and domestically.
- Community care: addresses the impact that the actions of HMS professionals have on communities and that, therefore, require ethical considerations that encompass this social dynamics.
- Impact on the natural environment: addresses the impact of activities on the surrounding

nature from the perspective of human movement sciences.

- Research with non-human animals: expresses the relation between some areas of these sciences that require bioethical considerations as to the conduct of this type of research.

Results and discussion

Chart 1 presents several types of scientific research: original, systematic reviews, meta-analyses, qualitative or systematization of professional experience, which enable establishing the relation between the main disciplinary areas of the HMS and the dimensions of bioethics. It is important to note that there are cells without studies, which indicates that this study found no scientific research relating the disciplinary area with the bioethical dimension according to the defined inclusion criteria. Therefore, this gap should be interpreted with caution, as this does not mean that there is no relation or that there cannot be a relation between them.

Chart 1. Research of the main disciplinary areas of the HMS related to the dimensions of bioethics

Bioethical application/ main disciplinary areas	Human research dimension	Community care dimension	Impact on the natural environment dimension	Animal research dimension
Sports performance	Maudrich [14]	Book [15]	Lee [16]	Kent [17]
Sports psychology	Mansell [18]		Wicks [19]	
Sports nutrition	Wegierska [20]	Yamanaka [21]	Shen [22]	
Exercise and sports physiology	Iannetta [23]	Manferdelli [24]	Oyama [25]	Ko [26]
Sports and exercise medicine	Darroch [27]			Semis [28]
Sports kinesiology	Anderson [29]			
Sports and exercise biomechanics	Nebel [30]		Mitchell [31]	Becker [32]
Motor behavior	Johnson [33]	Adams [34]	Dettweiler [35]	Henshall [36]
Physical health promotion	Telford [37]	Tao [38]	Teixeira [39]	
Recreation	Sandseter [40]	Evans [41]	Colley [42]	Salvaroti [43]
Physical education	Wolfe [44]	Kahan [45]	Kurtzman [46]	
Adapted physical activity	Fleming [47]	Bassett-Gunter [48]	Darcy [49]	
Sports and recreational management	Strode [50]	Behnam [51]	Wanless [52]	Gruas [53]
Sports sociology	Vanzella-Yang [54]	Reid-Hresko [55]	Zuo [56]	

Source: prepared by the authors. HMS: human movement sciences

The findings presented in Chart 1 show the links between the disciplinary areas and the dimensions in which the activities are expressed, which denotes links with the dimensions of bioethics. These dimensions provide bases for making ethical decisions and encouraging the development of future research or professional work actions that combine both fields of knowledge, in favor of respect for human and non-human life, and the improvement of quality of life and health.

Chart 2 presents the relation between the main disciplinary areas, the dimensions and the articles of bioethics in which considerations related to these dimensions are expressed. It should be noted that these articles constitute only a small sample of this relation, given the large amount of bibliographic

material in the area of bioethics, being referenced, due to their specificity in international and national regulations, to the relation established in research involving human beings.

Chart 2. Relation between areas and dimensions

Dimensions	Example of studies of bioethical considerations	HMS disciplinary areas
Human research dimension	Häyry [57] Valdés [58]	All
Community care dimension	Teixeira [59] Correa [60]	Sports psychology, sports nutrition, exercise and sports physiology, motor behavior, physical health promotion, recreation, physical education, adapted physical activity, sports and recreational management, and sports sociology
Impact on the natural environment dimension	Vanda [61] Lolas [62]	Sports performance, sports psychology, sports nutrition, exercise and sports physiology, sports and exercise biomechanics, motor behavior, physical health promotion, recreation, physical education, adapted physical activity, sports and recreational management, and sports sociology
Animal research dimension	Kottow [63] Díaz [64]	Sports performance, sports nutrition, exercise and sports physiology, sports and exercise medicine, motor behavior, recreation, and sports and recreational management

Source: prepared by the authors. HMS: human movement sciences

This analysis highlights the importance of respecting the autonomy of participants in the field of research involving human beings, which implies an adequate informed consent process (taking into account the specificities that imply respect for the protection of people with reduced autonomy), the protection of their confidentiality and the maximization of benefits and the minimization of damages.

In addition, it should be taken into account the valid design of the protocols, the competence and suitability of the people participating in the process (researchers, evaluators, consultants and personnel of the institutions involved) and the prohibition of causing deliberate damage (including avoiding conducting research with potential harm to human beings). Without leaving aside the requirement of not abandoning the participating people, the equitable distribution of burdens and benefits, the unfair non-discrimination, the attempt of the research to meet the health needs and priorities of the populations in which it is carried out.

In addition, the reasonable availability of results and products to the participants, the consideration of compensation for damages, the dissemination of results, avoiding extractivism or the appropriation of knowledge of communities, in which it is also necessary to respect their self-determination and promote informed participation. The above is regulated both at the international level (e.g. *Unesco Universal Declaration on Bioethics and Human Rights and the Guidelines of* the Council for International Organizations of Medical Sciences) and in the national normative frameworks of different countries, e.g. in Costa Rica in the Regulatory Law for Biomedical Research 9234 [65], Decree 39061. Regulation of the Biomedical Research Regulatory Law [66] and Decree 39061-S Reform Regulation of the Biomedical Research Regulatory Law [67].

On the other hand, in the case of the community care dimension, the autonomy of each person living in the community must be respected, although with particular attention to respect for the community's self-determination as such. In this case, the protection of people with reduced autonomy, respect for privacy, promotion of voluntary informed participation,

formulation of valid designs, review of the competence and suitability of the people who carry out and evaluate the processes, prohibition of causing deliberate damage, application of the precautionary principle, the adequate response to the needs of the communities, avoiding extractivism and providing the means to share the results with the community.

In outdoor processes, the protection of the location of the environments should be considered according to the level of risk involved in the dissemination of data, promoting the protection of nature, ensuring the sustainability of the activities, not causing deliberate damage to the natural environment, considering the conditions of the location in the formulation and execution of each activity.

In research involving non-human animals, there are regulations that should be considered depending on the species with which work is conducted and considerations such as reducing the number of animals to the minimum necessary to obtain reliable information, minimizing harmful effects on non-human animals, replacing them with other methods whenever possible, as well as promoting their well-being, not causing deliberate harm to non-human animals, developing research protocols with scientifically valid designs and reviewing the suitability of the people involved in these processes.

Given that the HMS work with people of all ages, there are specific bioethical considerations, as noted by Berlinger [68], which indicate the importance of respect for people in different conditions, including the experience of an aging process that promotes flourishing at these stages of life, as well as social justice and equity in access to health care. In turn, Celie [69] addresses the application of bioethics in the early stages of health care, in relation to child protection, through collaboration between specialists from different disciplines to achieve an equitable health perspective with a global view of bioethics.

Thus, there are several points of contact between bioethics and human movement sciences, not only in the different dimensions mentioned, but also due to the age groups served by the professional work of those who are dedicated to motor skills.

Final considerations

After showing the relation between bioethics and human movement sciences, this article enables the opening of spaces for the definition of best practices that consider the bioethical foundations, taking into account the specificity of each of the disciplinary areas that constitute the HMS. In turn, the findings of this research enabled us to identify that there is a worldwide taxonomic divergence on the term that encompasses the HMSs, from an ontological, epistemological and political perspective, and that allows the integration of all disciplinary areas that focus on movement in human beings.

In addition, the results of this research lead to the need to continue promoting collaborative work between disciplines, providing a better understanding of the HMSs and their extension, not only in the scope of research, but also in professional work.

As future recommendations, it is important to consider that bioethics also allows work with vulnerable populations; therefore, we suggest future research or collaborative work to identify bioethical needs by HMS area, promoting specialized education in ethics for people in training or for professionals who serve this type of population groups.

Research

References

1. Diccionario de la lengua española [Internet]. Madrid: Real Academia Española; 2023 [acesso 12 abr 2024]. Disponível: https://dle.rae.es/
2. Cassinelli MT. Introducción a la bioética. Rev Urug Cardiol [Internet]. 2017 [acesso 12 abr 2024];32(3):241. DOI: 10.29277/ruc/32.3.4

3. Lolas F. Bioética [Internet]. Santiago de Chile: Editorial Universitaria; 1998 [acesso 12 abr 2024]. p. 14. Disponível: https://uchile.cl/dam/jcr:5bebb400-a969-4b49-b2d7-1444690f62d6/030-bioetica.pdf
4. Kottow M. Bioética relacional. London: Editorial Académica Española; 2012.
5. Heinzmann M. Desde las víctimas. Buenos Aires: Grupo Editorial Parmenia; 2019.
6. Diccionario Etimológico Castellano en Línea [Internet]. Santiago de Chile: De Chile [acesso 12 abr 2024]; 2023. Disponível: https://etimologias.dechile.net/
7. Valdebenito C. Definiendo Homo sapiens-sapiens: aproximación antropológica. Acta Bioeth [Internet]. 2007 [acesso 12 abril 2024];13(1):71-8. DOI: 10.4067/S1726-569X2007000100008
8. Herrara Lozada JH. El movimiento humano como objeto de conocimiento de la educación física. Revista Electrónica Actividad Física y Ciencias [Internet]. 2022 [acesso 12 abr 2024];14(1):11-41. DOI: 10.56219/actividadfsicaycienciasphysicalactivityandscience.v14i1.137
9. Sérgio M. Motricidad humana, ¿cuál es el futuro? Pensamiento Educativo [Internet]. 2006 [acesso 12 abr 2024];38(1):14-33. Disponível: https://pensamientoeducativo.uc.cl/index.php/pel/article/view/23935/19243
10. Kerlinger F, Howard L. Investigación del comportamiento. 4ª ed. New York: McGraw Hill; 2002.
11. Aguirre García JC, Jaramillo Echeverri LG. Somatología: fundamentos epistemológicos de la motricidad humana. Revista Motricidad y Persona. [Internet]. 2012 [acesso 12 abr 2024];10:51-61. Disponível: https://dialnet.unirioja.es/servlet/articulo?codigo=4027615
12. Víquez CE. Tesauro Especializado en Ciencias del Movimiento Humano (TECMH). E-Cienc inf [Internet]. 2018 [acesso 12 abr 2024];8(2). DOI: 10.15517/eci.v8i2.30009
13. Powers SK, Howley ET, Quindry J. Exercise physiology: theory and application to fitness and performance. New York: McGraw Hill; 2021.
14. Maudrich T, Ragert P, Perrey S, Kenville R. Single-session anodal transcranial direct current stimulation to enhance sport-specific performance in athletes: a systematic review and meta-analysis. Brain Stimul [Internet]. 2022 [acesso 12 abr 2024];15(6):1517-29. DOI: 10.1016/j.brs.2022.11.007
15. Book Jr RT, Henriksen K, Stambulova N, Winthereik Mathorne O. "We are their last chance": a case study of a college basketball environment in an American underserved community. J Appl Sport Psychol [Internet]. 2024 [acesso 12 abr 2024];36(1):1-23. DOI: 10.1080/10413200.2023.2183281
16. Lee HY, Kim H, Kim HJ, Na G, Jang Y, Kim SH *et al*. The impact of ambient air pollution on lung function and respiratory symptoms in elite athletes. Sci Total Environ [Internet]. 2023 [acesso 12 abr 2024];855:158862. DOI: 10.1016/j.scitotenv.2022.158862
17. Kent E, Coleman S, Bruemmer J, Casagrande RR, Levihn C, Romo G *et al*. Comparison of an antioxidant source and antioxidant plus BCAA on athletic performance and post exercise recovery of horses. J Equine Vet Sci [Internet]. 2023 [acesso 12 abr 2024];121:104200. DOI: 10.1016/j.jevs.2022.104200
18. Mansell P, Sparks K, Wright J, Roe L, Carrington S, Lock J *et al*. Mindset: performing under pressure – a multimodal cognitive-behavioural intervention to enhance the well-being and performance of young athletes. J Appl Sport Psychol [Internet]. 2023 [acesso 12 abr 2024];36(4):623-42. DOI: 10.1080/10413200.2023.2296900
19. Wicks C, Barton J, Orbell S, Andrews L. Psychological benefits of outdoor physical activity in natural versus urban environments: a systematic review and meta-analysis of experimental studies. Appl Psychol Health Well-Being [Internet]. 2022 [acesso 12 abr 2024];14(3):1037-61. DOI: 10.1111/aphw.12353
20. Wegierska AE, Charitos IA, Topi S, Potenza MA, Montagnani M, Santacroce L. The connection between physical exercise and gut microbiota: implications for competitive sports athletes. Sports Med [Internet]. 2022 [acesso 12 abr 2024];52:2355-69. DOI: 10.1007/s40279-022-01696-x
21. Yamanaka AB, Strasburger S, Chow C, Butel J, Wilkens L, Davis JD *et al*. Food and physical activity environment in the US-Affiliated Pacific Region: The Children's Healthy Living Program. J Nutr Educ Behav [Internet]. 2023 [acesso 12 abr 2024];55(2):96-104. DOI: 10.1016/j.jneb.2022.08.009
22. Shen C, Yin XC, Jiao BY, Li J, Jia P, Zhang X *et al*. Evaluation of adverse effects/events of genetically modified food consumption: a systematic review of animal and human studies. Environ Sic Eur [Internet]. 2022 [acesso 12 abr 2024];34(8). DOI: 10.1186/s12302-021-00578-9

23. Iannetta D, Mackie MZ, Keir DA, Murias JM. A single test protocol to establish the full spectrum of exercise intensity prescription. Med Sci Sports Exerc [Internet]. 2023 [acesso 12 abr 2024];55(12):2271-80. DOI: 10.1249/MSS.0000000000003249

24. Manferdelli G, Narang B, Bourdillon N, Debevec T, Millet GP. Physiological responses to exercise in hypoxia in preterm adults: convective and diffusive limitations in the O2 transport. Med Sci Sports Exerc [Internet]. 2023 [acesso 12 abr 2024];55(3):482-96. DOI: 10.1249/MSS.0000000000003077

25. Oyama T, Fujii M, Nakajima K, Takakura J, Hijioka Y. Validation of upper thermal thresholds for outdoor sports using thermal physiology modelling. Temperature [Internet]. 2023 [acesso 12 abr 2024];11(1):92-106. DOI: 10.1080/23328940.2023.2210477

26. Ko J, Jang YC, Quindry J, Guttmann R, Cosio-Lima L, Powers SK, Lee Y. Exercise-induced antisenescence and autophagy restoration mitigate metabolic disorder-induced cardiac disruption in mice. Med Sci Sports Exerc [Internet]. 2023 [accesso 12 abril 2024];55(3):376-88. DOI: 10.1249/MSS.0000000000003058

27. Darroch F, Schneeberg A, Brodie R, Ferraro ZM, Wykes D, Hira S *et al*. Effect of pregnancy in 42 elite to world-class runners on training and performance outcomes. Med Sci Sports Exerc [Internet]. 2023 [accesso 12 abril 2024];55(1):93-100. DOI: 10.1249/MSS.0000000000003025

28. Semis HS, Gur C, Ileriturk M, Kandemir FM, Kaynar O. Evaluation of therapeutic effects of quercetin against achilles tendinopathy in rats via oxidative stress, inflammation, apoptosis, autophagy, and metalloproteinases. Am J Sports Med [Internet]. 2022 [accesso 12 abril 2024];50(2):486-98. DOI: 10.1177/036354652110598

29. Anderson LM, Martin JF, Barton CJ, Bonanoo DR. What is the effect of changing running step rate on injury, performance and biomechanics? A systematic review and meta-analysis. Sports Med Open [Internet]. 2022 [acesso 12 abr 2024];8:112. DOI: 10.1186/s40798-022-00504-0

30. Nebel A, Fava A, Bordelon N, Oliver G. Comparison of peak shoulder distraction forces between pain and pain-free youth baseball pitchers. Orthop J Sports Med [Internet]. 2023 [acesso 12 abr 2024];11(6). DOI: 10.1177/23259671231177320

31. Mitchell C, McDonnell S, Oganezova K, Mockler D, Fleming N. The effect of surface compliance on overground running biomechanics. A systematic review and meta-analysis. Sports Biomech [Internet]. 2023 [acesso 12 abril 2024];1-25. DOI: 10.1080/14763141.2023.2236058

32. Becker K, Lewczuk D. Variability of jump biomechanics between horses of different age and experience using commercial inertial measurement unit technology. J Equine Vet Sci [Internet]. 2022 [acesso 12 abr 2024];119:104146. DOI: 10.1016/j.jevs.2022.104146

33. Johnson JL, Carroll AV, Wadsworth DD, Sassi J, Merritt M, Morris M, Rudisill ME. Towards identifying a dosage effect for improving fundamental motor skills of preschool children with a Mastery Motivational Climate intervention. Perceptual Mot Skills [Internet]. 2023 [acesso 12 abr 2024];130(4):1453-71. DOI: 10.1177/00315125231179591

34. Adams EK, Nathan A, Trost SG, Schipperijn J, Shilton T, Trapp G *et al*. Play Active physical activity policy intervention and implementation support in early childhood education and care: results from a pragmatic cluster randomized trial. Int J Behav Nutr Phys Act [Internet]. 2023 [acesso 12 abr 2024];20(46). DOI: 10.1186/s12966-023-01442-0

35. Dettweiler U, Gerchen M, Mall C, Simon P, Kirsch P. Choice matters: pupils' stress regulation, brain development and brain function in an outdoor education project. Br J Educ Psychol [Internet]. 2023 [acesso 12 abr 2024]; 93(Suppl 1):152-73. DOI: 10.1111/bjep.12528

36. Henshall C, Randle H, Francis N, Freire R. The effect of stress and exercise on the learning performance of horses. Sci Rep [Internet]. 2022 [acesso 12 abr 2024];12:1918. DOI: 10.1038/s41598-021-03582-4

37. Telford RM, Olive LS, Telford RD. The effect of a 6-month physical literacy intervention on preschool children's gross and fine motor skill: the active early learning randomized controlled trial. J Sci Med Sport [Internet]. 2022 [acesso 12 abr 2024];25(8):655-60. DOI: 10.1016/j.jsams.2022.04.009

38. Tao Y, Ma J, Shen Y, Chai Y. Neighborhood effects on health: a multilevel analysis of neighborhood environment, physical activity and public health in suburban Shanghai. Cities [Internet]. 2022 [acesso 12 abr 2024];129:103847. DOI: 10.1016/j.cities.2022.103847

39. Teixeira A, Gabriel R, Martinho J, Santos M, Faria A, Oliveira I, Moreira H. Pro-environmental behaviors: relationship with nature visits, connectedness to nature and physical activity. Am J Health Promot [Internet]. 2023 [acesso 12 abril 2024];37(1):12-29. DOI: 10.1177/08901171221119089
40. Sandseter EB, Storli R, Sando OJ. The dynamic relationship between outdoor environments and children's play. Education 3-13 [Internet]. 2022 [acesso 12 abr 2024];50(1):97-110. DOI: 10.1080/03004279.2020.1833063
41. Evans KE, Plunkett D. Engaging students in community-based projects: the integration of a University Research Institute and Core Leisure Curriculum. SCHOLE [Internet]. 2023 [acesso 12 abr 2024];38(3):212-23. DOI: 10.1080/1937156X.2022.2080129
42. Colley K, Irvine KN, Currie M. Who benefits from nature? A quantitative intersectional perspective on inequalities in contact with nature and the gender gap outdoors. Landsc Urban Plan [Internet]. 2022 [acesso 12 abr 2024];223:104420. DOI: 10.1016/j.landurbplan.2022.104420
43. Salvatori M, Oberosler V, Rinaldi M, Franceschini A, Truschi S, Pedrini P, Rovero F. Crowded mountains: long-term effects of human outdoor recreation on a community of wild mammals monitored with systematic camera trapping. Ambio [Internet]. 2023 [acesso 12 abril 2024];52(6):1085-097. DOI: 10.1007/s13280-022-01825-w
44. Wolfe AM, Pessman MA, Laurson KR, Brown DD, Brown RA. The effects of COVID-19 school closures on physical fitness in adolescents. J Teach Phys Educ [Internet]. 2023 [acesso 12 abr 2024];42(4):705-9. DOI: 10.1123/jtpe.2022-0062
45. Kahan D, McKenzie TL, Satnick M, Hansen O. Tracking district and school physical education time policies after legal adjudication: a case study in California. J Teach Phys Educ [Internet]. 2023 [acesso 12 abr 2024];43(2):302-9. DOI: 10.1123/jtpe.2023-0015
46. Kurtzman AE, Beddoes Z, Gaudreault KL. Social-emotional learning through adventure education in PETE: strategies for PETE Faculty. J Phys Educ Recreat Dance [Internet]. 2023 [acesso 12 abr 2024];94(6):13-20. DOI: 10.1080/07303084.2023.2221714
47. Fleming RK, Eliasziw M, Dittrich GA, Curtin C, Maslin M, Must A, Bandini LG. Changes in physical activity associated with a multicomponent weight-loss randomized controlled trial for youth with intellectual disabilities. Adapt Phys Activ Q [Internet]. 2023 [acesso 12 abr 2024];41(2):287-305. DOI: 10.1123/apaq.2023-0030
48. Bassett-Gunter R, Tomasone J, Latimer-Cheung A, Arbour-Nicitopoulos K, Disimino K, Larocca V *et al*. Evidence-informed recommendations for community-based organizations developing physical activity information targeting families of children and youth with disabilities. Adapt Phys Activ Q [Internet]. 2023 [acesso 12 abr 2024];40(4):707-22. DOI: 10.1123/apaq.2022-0130
49. Darcy S, Maxwell H, Edwards M, Almond B. Disability inclusion in beach precincts: beach for all abilities – a community development approach through a social relational model of disability lens. Sport Managem Rev [Internet]. 2023 [acesso 12 abr 2024];26(1):1-23. DOI: 10.1080/14413523.2022.2059998
50. Strode JP, Parker HM, Kerwin S. Organizational-level factors that influence women coaches' experiences. Journal of Sport Management [Internet]. 2023 [acesso 12 abr 2024];38(2):110-21. DOI: 10.1123/jsm.2022-0077
51. Behnam M, Sato M, Baker BJ, Jalili M. Interactive mechanisms to improve service innovation among sports clubs: a consumer perspective. Journal of Sport Management [Internet]. 2023 [acesso 12 abr 2024];38(1):26-39. DOI: 10.1123/jsm.2022-0360
52. Wanless L, Seifried C, Kellison T. Renewable energy source diffusion in professional sport facilities. Journal of Sport Management [Internet]. 2023 [acesso 12 abr 2024];38(1):40-52. DOI: 10.1123/jsm.2023-0081
53. Gruas L, Loison A, Ba M, Perrin-Malterre C. "If we really disturbed them, they would leave": mountain sports participants and wildlife disturbance in the northern French Alps. J Outdoor Recreat Tour [Internet]. 2023 [acesso 12 abr 2024];42:100610. DOI: 10.1016/j.jort.2023.100610
54. Vanzella-Yang A, Domond P, Vitaro F, Tremblay RE, Bégin V, Côté S. Sports attitudes in childhood and income in adulthood. Sociol Sport J [Internet]. 2023 [acesso 12 abr 2024];41(3):298-305. DOI: 10.1123/ssj.2023-0029
55. Reid-Hresko J, Warren JR. "A lot of what we ride is their land": white settler Canadian understandings of mountain biking, indigeneity, and recreational colonialism. Sociol Sport J [Internet]. 2022 [acesso 12 abr 2024];39(1):108-17. DOI: 10.1123/ssj.2020-0161
56. Zuo Y, Qiu Q, Hu T, Zhang J. How natural environments influence traditional sports and games: a mixed methods study from China. Int Rev Sociol Sport [Internet]. 2023 [acesso 12 abr 2024];58(2):328-48. DOI: 10.1177/10126902221096233

57. Häyry M. Roles of justice in bioethics. Cambridge: Cambridge University Press; 2022.

58. Valdés E, Lecaros JA. Handbook of bioethical decisions. Volume II. Berlin: Springer; 2023.

59. Teixeira L, Hellman F, Oliveira G, Marinho A. Recursos del cine y enseñanza de la bioética en las ciencias del movimiento humano. Rev. bioét. (Impr.) [Internet]. 2022 [acesso 12 abr 2024];30(4). DOI: 10.1590/1983-80422022304566ES

60. Correa F. Fundamentos y principios de bioética clínica, institucional y social. Acta Bioeth [Internet]. 2009 [acesso 12 abr 2024];15(1):70-8. DOI: 10.4067/S1726-569X2009000100009

61. Vanda Cantón B, Téllez Ballesteros E. Naturaleza y vulnerabilidad: ensayos en bioética. Ciudad de México: Universidad Autónoma de México; 2020.

62. Lolas F. Naturaleza y humanidad: desafíos de la ecobioética. Acta Bioeth [Internet]. 2019 [acesso 12 abr 2024];25(2). DOI: 10.4067/S1726-569X2019000200151

63. Kottow M. Bioética e investigación con seres humanos en animales. Santiago de Chile: Conicyt; 2006.

64. Díaz L, Zambrano E, Flores M, Contreras M, Crispín J, Alemán G *et al*. Ethical considerations in animal research: the principle of 3R´s. Rev Invest Clin [Internet]. 2021 [acesso 12 abril 2024];73(4):199-209. DOI: 10.24875/RIC.20000380

65. Costa Rica. Ley n° 9234. Ley Reguladora de Investigación Biomédica. Diario Oficial La Gaceta [Internet]. San José, 25 abr 2014 [acesso 6 jun 2025]. Disponível: http://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=77070&nValor3=96424&strTipM=TC

66. Costa Rica. Decreto Ejecutivo n° 39061-S. Reglamento a la Ley Reguladora de Investigación Biomédica. Diario Oficial La Gaceta [Internet]. San José, 17 jul 2015 [acesso 6 jun 2025]. Disponível: http://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=79779&nValor3=101025&strTipM=TC

67. Costa Rica. Decreto Ejecutivo n° 39533. Reforma Reglamento a la Ley Reguladora de Investigación Biomédica n° 39061-S. Diario Oficial La Gaceta [Internet]. San José, 4 mar 2016 [acesso 6 jun 2025]. Disponível: http://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=81213&nValor3=103450&strTipM=TC

68. Berlinger N, Medeiros K, Girling L. Bioethics and gerontology: the value of thinking together. Gerontologist [Internet]. 2022 [acesso 12 abr 2024];62(8):1097-103. DOI: 10.1093/geront/gnab186

69. Celie K, Mocharnuk J, Kanmounye U, Ayala R, Banu T, Lakhoo K. The importance of global bioethics to paediatric health care. Lancet Child Adolesc Health [Internet]. 2024 [acesso 12 abril 2024];8(5):379-84. DOI: 10.1016/S2352-4642(23)00317-6

María Morera-Castro – PhD – mmore@una.ac.cr

0000-0003-2218-179X

Sara Mora Ugalde – Master – sara.mora.ugalde@una.ac.cr

0000-0002-3051-4139

Correspondence

María Morera-Castro – Universidad Nacional. Campus Presbítero Benjamín Núñez. Calle 9, Avenida 0 y 9 CEP 86-3000. Heredia, Costa Rica.

Participation of the authors

María Morera-Castro contributed to the conceptualization, methodological design, analysis and conduction of the research and visualization process; and collaborated in the drafting of the article. Sara Mora Ugalde carried out the conceptualization, methodological design, analysis of the research process and visualization; and contributed to the drafting of the article.

Editor in charge: Dilza Teresinha Ambrós Ribeiro

Received: 10.11.2024
Revised: 2.27.2025
Approved: 4.7.2025

Research