# Human Movement from the Semiotics and the Synechism of Charles S. Peirce*

*[English Version]*

## El movimiento humano desde la semiótica y el sinequismo de Charles S. Peirce

## O Movimento humano a partir da semiótica e o sinequismo de Charles S. Peirce

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## Abstract

**Objective**: to analyze the theory of "Human Movement as a Complex System" (MHSC-UAM), proposed by the Body Movement academic community of the Universidad Autónoma de

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Manizales, from the semiotics and the synechism postulated by Charles Sanders Peirce (1839-1914). **Methodology**: from a conceptual analytical approach, the Body-Movement dyad is analyzed from the continuum theory, as well as the MHSC-UAM model from Peirce's semiotic triangle. **Results**: it is possible to show the triadic relationship between body-mind, world, and movement, in terms of sign, object, and interpretant. The firstness corresponds to the body-mind, the secondness to the world of life, and the thirdness to the human movement. Supported by synechism, it is shown that human movement is a continuum, that body-mind and movement are not discrete phenomena. In this way, there is no measurable difference between movement and posture, between objective and subjective body, between action and activity, between motor control and motor capacity. **Conclusions**: consequent to Peircean theory, the visible and the invisible, it is worth saying, the macroscopic and the microscopic, the contextual and the molecular, the body and the spirit, the world and the mind, movement and cognition, movement and motor control, the objective and the intersubjective body, the firstness and the secondness, the object and the interpretant, among many, are interdependent aspects of a continuous, fluid, changing process, semiotic dyads, never Cartesian dualisms.

**Keywords**: Human body movement; Semiotics; Synechism; Peirce.

## Resumen

**Objetivo**: analizar la teoría del "Movimiento Humano como Sistema Complejo" (MHSC-UAM), propuesta por la Comunidad Académica Cuerpo Movimiento de la Universidad Autónoma de Manizales, desde la semiótica y el sinequismo postulados por Charles Sanders Peirce (1839-1914). **Metodología:** desde un enfoque analítico conceptual se analiza la diada Cuerpo-Movimiento desde la teoría del continuum, así como el modelo de MHSC-UAM desde el triángulo semiótico de Peirce. **Resultados:** se logra evidenciar la relación triádica entre cuerpo-mente, mundo y movimiento, en tanto signo, objeto e interpretante. La primeridad corresponde al cuerpo-mente, la segundidad al mundo de la vida, y la terceridad al movimiento humano. Apoyado en el sinequismo, se muestra que el movimiento humano es un continuum, que cuerpo-mente y movimiento, no son fenómenos discretos. De esta manera, no hay diferencia inconmensurable entre movimiento y postura, entre el cuerpo objetivo y el subjetivo, entre acción y actividad, entre control motor y capacidad motora. **Conclusiones:** en consecuencia con la teoría peirceana, lo visible y lo invisible, valga decir, lo macroscópico y lo microscópico, lo contextual y lo molecular, el cuerpo y el espíritu, el mundo y la mente, el movimiento y la cognición, el movimiento y el control motor, el cuerpo objetivo y el intersubjetivo, la primeridad y la segundidad, el objeto

y el interpretante, entre muchos, son aspectos interdependientes de un proceso continuo, fluido, cambiante, diadas semióticas, nunca dualismos cartesianos.

**Palabras-clave**: Movimiento corporal humano; Semiótica; Sinequismo; Peirce.

## Resumo

**Objetivo**: analisar a teoria do "Movimento Humano como Sistema Complexo" (MHSC-UAM), proposta pelo Organismo do Movimento Comunitário Académico da Universidad Autónoma de Manizales, a partir da semiótica e sinequismo postulado por Charles Sanders Peirce (1839-1914). **Metodologia:** a partir de uma abordagem analítica conceptual, o díad Movimento Corporal é analisado a partir da teoria do continuum, bem como o modelo MHSC-UAM do triângulo semiótico de Peirce. **Resultados:** é possível mostrar a relação triádica entre corpo-mente, mundo e movimento, como signo, objeto e intérprete. A primeira corresponde ao corpo-mente, a segunda ao mundo da vida, e a terceira ao movimento humano. Com base no sinequismo, mostra-se que o movimento humano é um contínuo, que o corpo-mente e o movimento não são fenómenos discretos. Desse modo, não há diferença incomensurável entre movimento e postura, entre o corpo objetivo e subjetivo, entre ação e atividade, entre controle motor e capacidade motora. **Conclusões:** conseqüentemente com a teoria peirciana, o visível e o invisível, vale dizer, o macroscópico e o microscópico, o contextual e o molecular, o corpo e o espírito, o mundo e a mente, o movimento e cognição, movimento e controle motor, o corpo objetivo e intersubjetivo, o primeiro e o segundo, o objeto e o interpretante, entre muitos, são aspectos interdependentes de um processo contínuo, fluido, em mudança, díades semióticas, nunca dualismos cartesianos.

**Palabras-chave**: Movimento corporal humano; Semiótica; Sinequismo; Peirce.

## Introduction

Humans, and in general all animals, have only two ways of responding to internal and external stimuli that come from their own body and from the world: secreting substances and moving (Guyton, Hall, 2006; Purves et al, 2018). This premise can be generalized in reference to the plant kingdom and other animal kingdoms (fungi, protista and monera). Plants, as autotrophs, require movement for their processes of nutrition (photosynthesis), respiration and reproduction, among others. In this way, all animal body systems such as digestive, circulatory, endocrine, cardiovascular, genitourinary, musculoskeletal, and nervous systems, are at the body's disposal to produce and optimize movement. Additionally, the secretion of substances is due to the demands of these systems as required inputs or wastes from body movement, meaning, hormones, neurotransmitters, gastric juices, saliva, sweat, urine, sexual lubricants, among others. Sexual activity, a device for maintaining the species, requires body movement.

Even language is an expression of body movement (Baquero, Segovia, 2018), without movement none of the manifestations of language would be possible: speech, gestures, writing, mathematics, and other symbolic expressions. Thought, which in itself can be considered as action, would be innocuous, useless and sterile, without the possibility of expressing it through bodily movement. Other ways of expression – out of the physical order – are not evidenced, such as telepathy or telekinesis. Perhaps in the not-too-distant future, artificial intelligence will promote communication between people without human body movement; engineers predict that this can happen before the end of the 21st century (Urban, 2015). However, eventually, human body movement will be required to develop, program, activate, and control such artificial intelligence, of course, if it does not get out of human control.

It is concluded then, that the human body, and many other animal kingdoms, if not all, are *organisms ready to move*. As Manuel Bedia and Luis Fernando Castillo state: "knowledge is the product of the peculiarities of human design and includes aspects of our body, brain and mind" (2010, p. 118, [Author's translation]).

Everything is done with corporal movement: religion, art, crafts, sports, education, science, technology, professions, occupations, jobs, and any other daily life activities; there is no other way. As Hanne De Jaegher, Ezequiel Di Paolo, and Ralph Adolphs claim: "Interacting is giving the body a voice" (2016, p. 5, [Author's translation]), and interaction is movement. The human cognitive self is literally co-determined in interaction with the other (Di Paolo, 2013).

This highlights the preponderance of body movement in the brain/body-in-the-world system, that is the cognitive sciences' object of study proposed by Alejandra Rossi, Aitana Grasso-Cladera, Nicolas Luarte, Antonella Riillo, and Francisco Parada from the Universidad Diego Portales (Laboratory of Cognitive and Social Neuroscience) and the Universitá Degli Studi Di Firenze (2019). When talking about body movement, reference is not made to the physical displacement of the body in space, but to *human movement as a complex system*, that is a conceptual model proposed by the Universidad Autónoma de Manizales' (UAM) Body-Movement academic community (Agámez *et al.*, 2002). This model is quite compatible with the object of study proposed by Alejandra Rossi, Aitana Grasso-Cladera, Nicolas Luarte, Antonella Riillo, and Francisco Parada, which, in turn, is based on *the 4E theory in Cognitive Sciences* which postulates that: "Cognition is an Embedded, Extended, Embodied phenomenon and that must be understood within the Enactive position"[1] (Rossi, Grasso-Caldera, Luarte, Riillo, Parada, 2019, p. 377, [Author's translation]).

## Methodology

In this conceptual analytical article, the theory of "Human Movement as a Complex System" proposed by the UAM's Body Movement academic community (MHSC-UAM) (Agámez, et al., 2002) is analyzed from the semiotics and the synechism postulated by Charles Sanders Peirce (1839-1914). First, from the perspective of speculative grammar, speculative criticism, and speculative rhetoric, analyzed according to the Peircian categories expressed in their semiotic triangles (firstness, secondness, and thirdness) (Liszka, 1996). In the second instance, the theory of continuous movement is analyzed from Peircian synechism and its implications for the sciences, additionally the professions of human body movement are established.

In this way, the Body-Movement dyad is analyzed from the continuum theory, as is the MHSC-UAM model from Peirce's semiotic triangle. Reference will also be made to the *4E theory in Cognitive Sciences* (Rossi, Grasso-Caldera, Luarte, Riillo, Parada, 2019). Both theories – MHSC-UAM and 4E – are quite compatible, the latter conceives of the cognitive sciences' object of study as the *brain/body-in-the-world system*. For its part, the UAM community, from a

1. Enaction is a concept coined by Francisco Varela, Eleanor Rosch, and Evan Thompson (1991), which understands the body as a complex and autonomous system, dependent on its experience, and whose operation is constitutive for the emergence of cognition.

phenomenological perspective, addresses the concept of the *body being in the world*. This category gives meaning to the theoretical construct of "movement as a complex system."

## Results

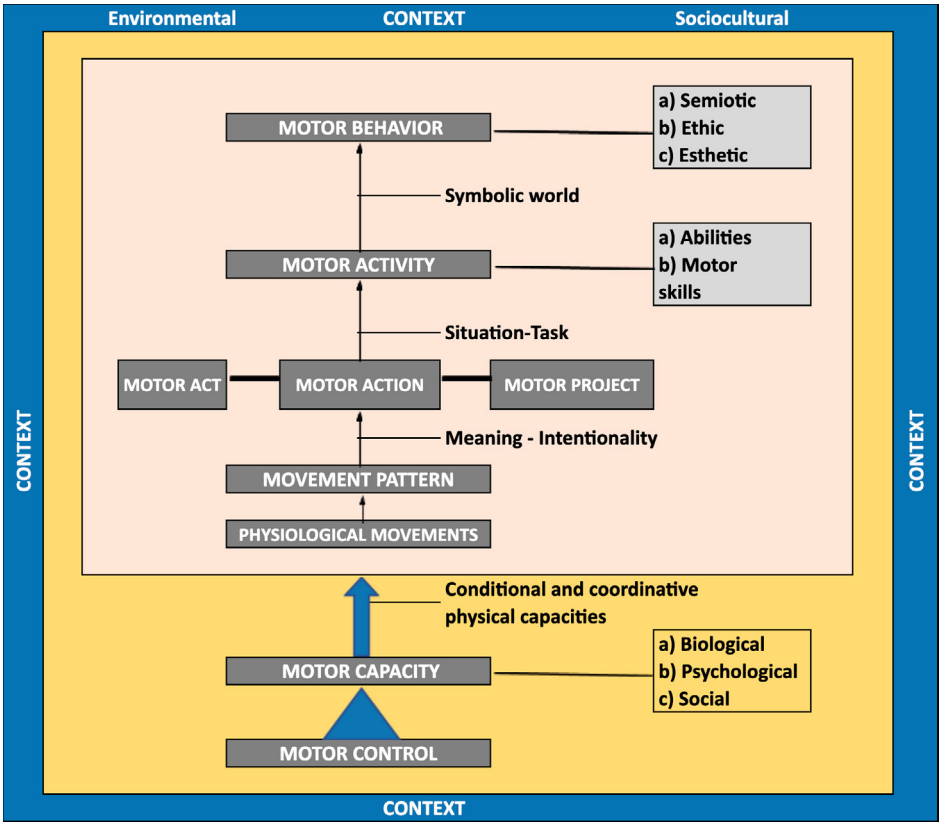
### 1. Analysis of the "Human Movement as a Complex System" Theory from the Semiotics of Charles Sanders Peirce

Peirce, a pioneer of Semiotics, defined human movement as "the doctrine of the essential nature and the fundamental varieties of possible semiosis" (Peirce, 1973, p. 9, [Author's translation]).

He maintains that semiotics does not investigate a specific field as a factual extension or empirical domain, but rather a scientific understanding, and that there are no semiotic objects prior to their theoretical determination (Peirce, 1973, p. 11). In this way, the purpose of semiotics is "the analysis of the significant dimension of every fact from the moment its relevance is assigned: the regime of objective determinations that makes the real significant" (Peirce, 1973, p. 12, [Author's translation]). From this perspective, the semiotic analysis of Human Movement as a Complex System (MHSC) will be carried out, as it has a theoretical determination that aims at a real fact: human body movement.

Figure 1 summarizes the proposal for movement as a complex system of the Body Movement academic community of the Universidad Autónoma de Manizales, Colombia (UAM). The main components of the model, which are presented in three levels of interaction, are: 1) The objectification of the movement; 2) Motor control and motor ability; and 3) The context. The first level includes the motor pattern, motor action, motor activity, and motor behavior; and the third level comprises the social and cultural context.

**Figure 1.** The Movement as a Complex System According to the UAM's Body-Movement Academic Community




**Note.** Levels of interaction with their components, Peircean categories: 1. The objectification of the movement, in pink; 2. Control and motor skills, in yellow; and 3. The context, in blue.

Assuming the sign as a triadic unit, the MHSM-UAM model can be considered as a sign, that is, a triadic reality in which the three exposed elements are incorporated. On the one hand, movement is a semiosis that can be analyzed in its components: the body-mind[2] that performs it (first); the world that determines it (second) and the effect produced (third). Additionally, movement is the interpretant in which the body-mind and the world are intertwined, clarifying that every interpretant can become a sign for another interpretant.

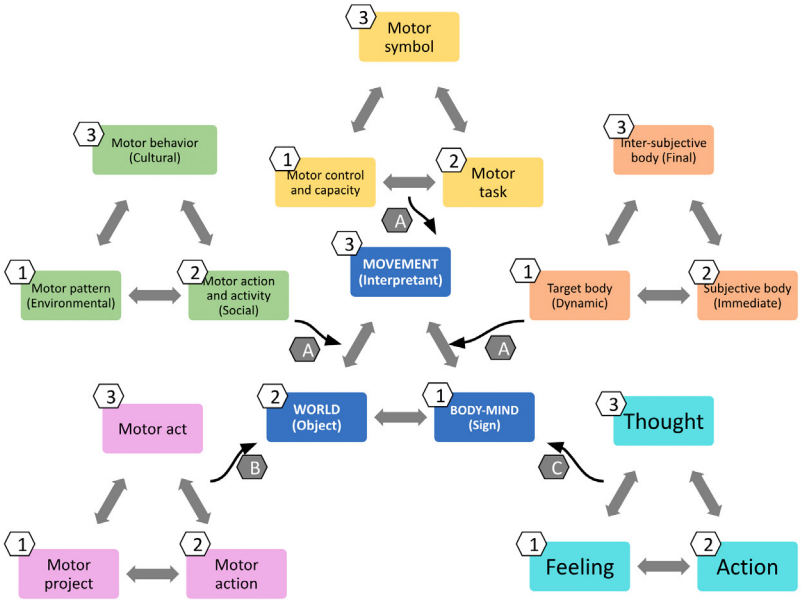
Humans live in the sign and, thanks to its triadic nature, reference is made to the object and interpretants (cognitive, emotional, movement) are produced, but always and inexorably mediated by the sign (Flórez, 2017). "Everything we know or think we know it or think about it through signs and our own knowledge is a sign" (Peirce, 1903a, p. 1, [Author's translation]), and everything we know and think we express it through movement.

Figure 2 illustrates the analysis of the MHSC-UAM model through the logic or semiotics of Charles S. Peirce to provide a complete general theory of its meaning and its representations[3]. This work shows the triadic relationship between body-mind, world, and movement. The body-mind (sign) represents the world (object) and produces movement (interpretant). Seen this way, the object is known by its representation in the sign.

2. The term "body" could simply be used, since the mind is implicit in it, but it is preferable to use the term "body-mind" to make explicit, at least for now, its indivisible unity, and to avoid misunderstandings with the Cartesian categories as different dimensions of being.

3. For Peirce, representing is "being in the place of the other, that is, being in such a relationship with another that, for certain purposes, is treated by certain minds as if it were that other [...] When you want to distinguish between what represents and the act or relationship of representing, the first can be called the *representamen* and the second the *representation*" (Peirce, 1973, p. 43, authors' translation)

**Figure 2.** Analysis of the "Human Movement as a Complex System" Theory from the Semiotics of Charles Sanders Peirce




**Note**. Peircian categories in their semiotic triangles: 1: Firstness; 2: Secondness; 3: Thirdness A: Analysis from speculative grammar; B: Analysis from speculative criticism; C: Analysis from speculative rhetoric. In blue, the triadic relationship between body-mind, world and movement, in terms of sign, object and interpretant.

From the Peircian categories, this triad or semiotic triangle is expressed from the categories of firstness, secondness and thirdness (Liszka, 1996):

1. **Firstness:** corresponds to the *body-mind*, that is, the *sign* in the triad, thus, it is a category without reference, without antecedents, undetermined, original, present and immediate. "The firstness is completely separate from any conception or reference to something else" (Barrena, Nubiola, 2007, [Author's translation]). "It is the realm of pure quality, this is nothing more than possibility, since it is not yet in relation to anything; it is a pre-reflective and immediate element" (Mendoza, 2021, [Author's translation]). In Peircean perspective, the body-mind occurs without any reference to something else, it is the closest and purest thing that one has (the ego).

In the framework of the MHSC-UAM model, the body is assumed as a unified conception between the cognoscente subject and the spatial physical object (instrument body); being as the symbolic self that names and determines what exists in its environment. In this way, the body being in the world is mind and body as a single identity in the world of life, that is, it is the intersubjective, subjective and objective intertwining. "The body is a kinetic expression of consciousness; a normative, ethical, aesthetic expression. The body is language, it is communication, it is a vital expression" (Agámez et al., 2002, p. 83, [Author's translation]).

2. **Secondness:** "it is the field of brute facts, that is, of dyadic relationships as typical relational encounters of factual existence" (Mendoza, 2021, [Author's translation]). "This category always implies an idea of dependence, action and reaction" (Barrena, Nubiola, 2007, [Author's translation]). It concerns the world of life, the object in the triad, thus, in interaction with the body-mind (sign). The world is that against which the body reacts or confronts (firstness), it appears as that which is not me (the non-ego), it reacts against me, limits or restricts my desires or my actions.

In the MHSC-UAM model, the world is the dwelling of a man and the context that is formed with all the manifestations of being: "construction is always open to all the possibilities of the unveiling of being in the environment" (Agámez et al., 2002, p. 77-78, [Author's translation]). In this way, the world or context in the model is the "temporal-spatial setting that is determined by social norms and rules. These condition the motor capacity where action, activity, and motor behavior are performed and transformed" (Agámez et al., 2002, p. 90, [Author's translation]) This world comprises:

- Environment: a natural setting or habitat, a spatiotemporal territory.
- Socio-cultural environment: a setting where an individual interrelates with others in different forms of participation. Symbolic construction of men as a group that is expressed through the historically constructed set of rules and norms, and the social systems that condition and determine motor activity and legitimize such construction as a socially accepted behavior (Agámez et al., 2002, p. 90).

3. **Thirdness:** concerns the "sphere of law and of the general. It is the relationality of objects, but not in the sense of secondness, but in the sense of mediating intelligibility; as a sphere of universality that regulates factual relations" (Mendoza, 2021). It is "the richest, the most complex, and the most important category for the self-creative life and for the developing universe" (Barrena, Nubiola, 2007). This proposal involves *human movement* which is the interpretant in the triadic model. Therefore, body movement mediates between the world and the body-mind, and although depending on these, it cannot be reduced to either of them. The relational force turns the body/being in the world dyad into a higher form of rationality. Thus, movement is a response (mediation, signification and interpretative effect) of the interaction between the body-mind and the world.

The UAM's body and movement community assumes analytically and comprehensively human body movement from a functional and a phenomenological perspective that is a system with levels of interaction, subsystems, and components. A system is understood as "a set of elements maintaining certain relationships among themselves, which are separated from a given environment" (Luckhman, 1996, as cited in Agámez et al., 2002, p. 88 [Author's translation]) and whose main characteristics are the interaction of elements, self-referentiality, autopoiesis and differentiation. According to these features, this community proposes that:

Human movement does not exist as the sum of physical, motor and cognitive areas. On the contrary, as a complex system, it exists to the extent that it is possible to read the interweaving between the subjective and the objective, the historical and the cultural, the particular and the collective, the qualitative and the quantitative, the analytical and the comprehensive, for which the complex system is self-structured in relation to levels, subsystems and components that establish multiple relationships in different degrees of complexity (Agámez et al., 2002).

Understanding body movement as a semiosis implies recognizing its capacity of mediation and entailing the idea or "representation" of the world of the body-mind; thus, movement is the one favoring the interaction between the body and the world. According to Peirce's definition of semiosis, human movement is through the body-mind for the world.

A sign or representamen is something that stands for something and for someone in some aspect or capacity. It addresses someone, that is, it creates in that person's mind an equivalent sign, or perhaps a more developed sign. This new sign becomes the first sign interpretant. The sign is there for a purpose: its object (Peirce, 1897).

### *1.1. Analysis of the MHSC-UAM from Speculative Grammar*

Speculative grammar is a branch of semiotics that "studies how an object becomes a sign: its foundation (*ground*)" (Restrepo, 2012, p. 117 [Author's translation]). It is concerned with the logical analysis and classification of non-logical signs (Belluci, 2016), those kinds of signs that: "are absolutely essential for thought to be embodied" (Peirce, 1903b), beyond the conventional signs of language.

Table 1 summarizes the three Peircian categories' perspectives of signs that represent the three components of the semiotic process. The three different ways in which a sign can express itself, the three ways in which a sign relates to its object, and the three ways in which a sign affects an interpretant.

Table 1. Analysis of the MHSC-UAM from Speculative Grammar.

| **Peircian Categories** | **Firstness** | | **Secondness** | | **Thirdness** | |
|---|---|---|---|---|---|---|
| | Relation of the Sign with Itself | | Relation of the Sign with the Object | | Relation of the Sign with the Interpretant | |
| | Relation of the Movement with Itself | | Relationship of the Movement with the World | | Relation of the Movement with the Body-Mind | |
| **Firstness** | Qualisign | Motor control and capacity | Icon: | Motor pattern (internal and environmental contexts) | Rhema: | Objective body (dynamic interpretant) |
| **Secondness** | **Sinsign:** | **Motor task** | **Index:** | **Motor activities and actions (social context)** | **Dicisign:** | **Subjective body (inmediate interpretant)** |
| **Thirdness** | Legisign: | Motor behavior (motor symbol) | Symbol: | Motor behavior | Argument: | Intersubjective body (final interpretant) |

### *1.1.1 Relation of the Movement with Itself (Relation of the Sign with Itself)*

1. **Firstness-Qualisign:** a quality that functions like a sign, but it cannot function as such until it is incarnated (Peirce, 1903c). In the model, it is the quality of body movement and aptitude. It is a mere possibility until it is expressed through an optimal movement performance. Firstness is defined as a potentiality regarding current or existing secondness (motor task). UAM's model corresponds to motor control and motor ability (Table 1).

   The first is the regulatory process that allows planning, structuring and reorganizing motor activity, and is necessary and essential for motor capacity to be objectified in motor action (Agámez et al., 2002). Newton (2003) defines it as the "process by which the central nervous system receives, assimilates, and integrates sensory information with experience to plan and perform optimal postural and motor responses" (p. 31) [Author's translation].

   Motor capacity is the "potentiality of individuals to bring into play the biological, psychological and social components when performing a motor action. It is a possibility of manifestation of individuals' functional capacity" (Agámez et al., 2002, p. 91. [Author's translation]). Motor capacity includes physical capacity that is understood as "physical-physiological faculties aiding in learning and performing motor actions" (Agámez et al., 2002, p. 105, [Author's translation]).

2. **Secondness-sinsign**: "it is a thing or event of actual existence which is a sign" (Peirce, 1903c). It is a concrete reality, an optimal movement performance, whether static (posture) or dynamic (displacement). In this particualr case, it materializes motor control and motor ability (firstness). It concerns *Motor task* (Table 1) that is defined by Agámez, Arenas, Restrepo, Rodríguez, Arenas, and Vidarte as the "organized set of material conditions, of particular and collective needs which determine the objective, the intentions and the motivation that condition the performance of different motor actions" (2002, p. 96) [Author's translation]. It includes motor skill that is assumed as the "acquired ability through learning to achieve previously set results with a maximum of success and often a minimum of time, energy, or both" (Guthrie 1957).

3. **Thirdness-Legisign**: a conventional law or sign that "acquires significance by means of an instance of its application, which may be called a *replica* of it" (Peirce, 1903c). As a generality or law established by humans, they determine the qualities of body movement; thus thirdness or sign referred to the general and integrated system of the MHSC-UAM.

   In Table 1, it corresponds to the motor behavior that is also explained as tertiality in the topic of the relation of movement with the world of life, and it is closely related to the concept of *motor symbol* which is a sensorimotor representation of associations between contextual stimuli and concrete motor actions, and between thoughts and motor acts (Landmann, Landi, Grafton, Della-Maggiore, 2011; Mangione, 2016).

The gesture of a military salute can be an example of these categories' analysis from the relation of movement with itself. The gesture has physical-physiological and conditional and coordinative faculties representing the *qualisign* (motor control and motor capacity). The former refers to organic-muscle capacities such as strength, endurance, speed and flexibility; the latter refers to body control and regulation capacities (orientation, balance, differentiation, coupling, and rhythm). In turn, in a military context, this movement refers to a particular motor task (*sinsign*), in this case with the purpose of saluting fellow soldiers. Finally, this culturally accepted motor activity occurs in a specific spatio-temporal context (e.g., a military base) and in a comprehensive explanatory system given by a social group (e.g., a military regiment) to this activity under processes of normality and abnormality. This behavior represents *legisign*.

### *1.1.2 Relation of the Movement with the World (Relation of the Sign with the Object)*

1. Firstness-Icon:

   It refers to the object it denotes [...] by virtue of its own characters, which it possesses whether or not that object actually exists. [...] Anything, whether it be a quality, an existing individual or a law, is an icon of something insofar as it resembles that thing and is used as a sign of it. (Peirce, 1903c; Peirce, 1893-1903).

It is related to the internal world of the subject (object and referent of the sign) by its similarity.

In the model, it is the *motor pattern* (Table 1), a biological context in intimate dependence with the environmental context. The motor pattern is largely determined by phylogenic and ontogenetic conditions, and also by conditions of the universe, in particular, gravity and other conditions of the physical environment. It is equated with the world by the movement of things in their environment. It is the biological or organic component of motor action that is considered the structural unit of motor activity.

It is defined as the "combination of controlled movements according to a specific spatio-temporal arrangement, ranging from simple combinations of movements in two segments to highly structured and complex body sequences" (Wickstrom, 1990, p. 19, [Author's translation]).

It is the observable and is nominated in terms of the physiological movements that compose it. These can be described as selective upper and lower limb patterns, as basic mobility patterns or total movement patterns.

**2. Secondness-Index:**

"Refers to the object it denotes by virtue of the fact that it is actually affected by that object. [...] Insofar as the index is affected by the object, it must have some quality in common with it. [...] What makes it a sign [...] is [...] the actual modification which the object causes it" (Peirce, 1903c; Peirce, 1893-1903).

It represents the desires, wills and thoughts of individuals immersed in a world (object).
In the model, it corresponds to *motor action and activity* (Table 1), given its intimate relationship with the social context. The first is constituted by the interweaving of different patterns of movement which take on meaning or intentionality. It is the functional unit of motor activity; therefore, it is defined as the "acting or doing of the man in the world of life" (Agámez et al., 2002, p. 127). Unlike movement patterns, motor action is regulated by learning and is presented as the objective manifestation of motor ability (wha is observable of human movement). It is

closely related to the motor action and the motor project, as described in item 2.2.

Motor activity is:

> The integration of multiple motor actions in a given context and in the function of a task situation that is characterized by motor skill performance. The context is the setting that determines the situation to which the task responds and where the action is performed (Agámez et al., 2002, p. 96). [Author's translation]

Motor task is presented as a sinsign in item 2.1.1

**3. Thirdness-Symbol:**

Refers to the object that it denotes by virtue of a law. [...] Therefore, it is itself a general type or law, that is, a legisign. As such, it acts through a replica. It is not only the general object, but the object it refers to is also general in nature (Peirce, 1903c; Peirce, 1893-1903).

It is a sign represented by means of an attributed or conventional character (Flórez, 2017), for example, a culturally learned gesture.

> "In this case, the symbol corresponds to the *motor behavior* (Table 1) or motor activity that occurs in a specific spatio-temporal context and in a comprehensive explanatory system given by a social group to this activity under processes of normality and abnormality". (Agámez *et al.*, 2002, p. 98) [Author's translation]. It includes motor behavior that is understood as the motor strategies that humans build "as part of a sensitive maturational process, genetically and environmentally determined as a function of the dynamic interaction of qualitative components of motor control, sensory, cognitive, and emotional aspects" (Rodríguez-Sáez, Moraga-Aguilar, Martín-Peñailillo, Solis-Flóres, 2017 [Author's translation]).

Three components can be distinguished in motor behavior:

- **Semiotic or Communicative Component**: possibility of building meanings in relation to motor activity.

- **Ethical or Moral Component**: norms, rules, and limits that determine what is good, what is bad and what is socially and historically legitimate.

- **Aesthetic or Expressive Component**: a parameter of evaluation of a motor activity according to the systemic harmony among movement – body – environment.

These motor behavior components of the MHSC-UAM model can be pragmatically analyzed from the three normative sciences proposed by Peirce: logic (general theory of signs), ethics (practice), and aesthetics (Peirce, 1903d; Peirce, 1906). These normative sciences are the intermediate and most characteristic part of what Peirce calls cenoscopy inquiry (looking at the commonality of everything perceptible). This author considers logic as the theory of deliberate thought, which implies that it is controlled in order to make it conform to a purpose or ideal. Ethics, also called "practice" by Peirce, is defined as a "theory of the conformity of action to an ideal" (1906). While aesthetics is "the theory of the deliberate formation of habits of feeling." In short, logic is related to thought, ethics to action, and aesthetics to feeling (Peirce, 1906).

The motor activity of riding a bicycle can be an example of the semiotic analysis of the relation of movement to the lifeworld. This activity is made up of different motor actions, such as pedaling, gripping the handlebars, braking with the hands, changes in ratio, steering the bicycle, and positions of the trunk, neck and head, among others. Together, motor actions and activity as a whole represent the *index* (secondness). The motor patterns that compose the motor actions represent the *icon* (firstness).

To give an example, the pedaling pattern is described as alternating lower limb gestures of ankle, knee, and hip flexion-extension. In other words, this combination of physiological movements, expressed in biomechanical terms, is the first expression of the activity "riding a bicycle"; it is the basics, structurally, and biologically determined. Finally, the *symbol* (thirdness), in the context of motor behavior, conventionally represents the intentions of the subject. For this case there could be intentions of recreation, sport, physical well-being, transportation or work, among others.

### *1.1.3 Relationship of the Movement with the Body-mind (Relation of the Sign with the Interpretant)*

1. **Firstness-Rhema:** "It is a sign which, for its interpretant, is a sign of qualitative possibility, that is to say that it is understood as representing this or that kind of possible object" (Peirce, 1903c, [Author's translation]). It is a sign interpreted as a simple one (Flórez, 2017).

   It is the target body in the MHSC-UAM model (Table 1), firstness in relation to human movement or a dynamic interpretant. It is conceived as an instrumental body, a biological body, a material substrate, an analogous body of action, a teleological body, a useful body or a means between a motive and a purpose, which is a body being in the world (Agámez et al., 2002). From the firstness, "the body is an object, and the relationship with it and from it is mediated by reflection and sensitive experience" (García-Puello, 2013, [Author's translation]).

2. **Secondness-Dicisign (Dicent Sign):** is a sign that, for its interpretant, is a sign of real existence (Peirce, 1903c). "Proposition that is a sign interpreted as a compound" (Flórez, 2017, [Author's translation]).

   It corresponds to the subjective body or person body in the MHSC-UAM model (Table 1), and arises from the need to include the body in social practices (immediate interpretant). The subjective body refers to "the animated body and the living body in terms of affective (the body for the other), communicative (the body between us) and identity (the body for oneself) dimensions" (Vélez, Vidarte, Agámez, Vanegas, 2006, p. 155, [Author's translation]). It is constituted in the tension between the particular and the collective through an affective process or identification with the appropriate or embodied social and cultural forms (Vélez, Vidarte, Agámez, and Vanegas, 2006).

3. **Thirdness-Argument:** "It is a sign which, for its interpretant, is a sign of law [...] it is a sign understood as a representation of its object in its character of sign" (Peirce, 1903c, [Author's translation]). A sign that interprets two previous signs to infer a third proposition (Flórez, 2017).

   The model concerns the intersubjective body (Table 1), which is defined by the relationships between the valued body, the socialized body and the culturized body (Vélez, Vidarte, Agámez, Vanegas, 2006).

"Intersubjectivity is built in the relationships that subjects establish, so that several subjects can coincide in their judgments. The relationship between several subjects with a view to knowledge gives rise to what has been called 'intersubjectivity' or the 'intersubjective'. Intersubjectivity is a kind of bridge between subjectivity and 'objectivity'" (Vélez, Vidarte, Agámez, Vanegas, 2006, p. 141, [Author's translation]). Hence its thirdness in the relationship between movement and the body-mind (final interpretant).

To exemplify the relationship of the movement with the interpretant (body-mind), envision the scenario of a soccer match. There one can observe the instrumental body, the biological body, the objective body: the subject who runs, stops, rests, hits the ball, gets tired, gets injured, falls and gets up; the one who prepares his material body technically and tactically for the competition and exploits it physically on stage. This instrument body is the firstness (rhema) in relation to the interpretant.

The subjective body (decisign) is the soccer player him or herself, the animated body (secondness) that puts its instrument body into play for a social practice, soccer. That body that becomes a soccer player through its interaction with the other members of the team and the opposing team in the context of a soccer field. It is the person with its affective, communicative and identity dimensions.

Finally, the argument (thirdness) is constituted by intersubjectivity, the result of the values, norms and judgments in which all the actors in this scenario coincide: players, coaches, judges, fans, sponsors, among others. It is the socialized body, immersed in a cultural expression: soccer.

Each of the cases illustrated in this section, i.e., military salute, bicycle riding, and soccer practice, can each be analyzed from the three perspectives of speculative grammar. Alternatively, categories, although they cover specific fields, may be circumstantial; that is, what at one moment is firstness in another circumstance may be secondness and the same for thirdness; which implies that such categories are, more than taxonomic, of a methodological nature (logical path leading to an end) (Mendoza, 2021).

### *1.2 Analysis from Speculative Criticism*

Speculative criticism "studies the ways in which a sign can be related to the object it represents, which is independent of it: the formal conditions of the reality of symbols" (Restrepo, 2012, p. 118, [Author's translation]). That is, it evaluates the way in which a sign represents its object. Criticism is that part of logic which examines arguments and the different elementary ways of attaining truth (Peirce, 1903b).

Beyond deduction as a method to approach truth, Peirce also proposes induction and abduction (Liszka, 1996). The Peircian categories of *abduction*, *deduction* and *induction* are revealed in the MHSC-UAM model (Table 2) as the motor project (possible inference of movement, motor conjecture), the motor action (necessary inference of movement, motor conclusion) and the motor act (probable inference of movement, motor experience), respectively.

Table 2. Analysis of the MHSC-UAM from Speculative Criticism and Rhetoric.

| **Peircian Categories** | **Speculative criticism** | | **Speculative rhetoric** | |
|---|---|---|---|---|
| | **Truthfulness of movement** | | **Effectiveness of movement** | |
| Firstness | Abduction: | Motor project | Emotional: | Feeling |
| Secondness | Deduction: | Motor action | Energetic: | Acting |
| Thirdness | Induction: | Motor act | Logic: | Thinking |

Motor action was already described in item 1.1.2 as an index in the relation of the sign to its object. This differs from the motor act and project, since the motor action is the execution of the movement in the present time, while the motor act is the lived action, the previous experiences that fill the movement pattern with meaning. The motor project is built on the basis of actions, its essential characteristic is given by its feasibility; tension between expertise and experience that is built in the motor planning process. Thus, there is an intertwining of past, present and future in a given context (Agámez et al., 2002).

### *1.3 Analysis from Speculative Rhetoric*

Speculative rhetoric "studies the way signs communicate their meaning and produce effects on the interpretant" (Flórez, 2017, [Author's translation]). Peirce defines it as the study of "the essential conditions under which a sign can determine a sign interpreting itself" (Restrepo, 2012, p. 118, [Author's translation]).

In the MHSC-UAM model, it concerns the emotional, energetic and logical signs of body movement (Table 2), as conditions of feeling, acting and thinking of the interpretant, i.e. human movement, resulting from the interaction between body-mind and world. These conditions summarize motor control,

motor capacity, and the objectivity of movement (motor pattern, action, activity and behavior) charged with emotions, intentionalities and meanings in their interaction with the world of life.

## 2. Analysis of the Human Movement from the Synechism of Charles Sanders Peirce

Synechism is a term derived from the Greek *sinejes*, means continuity. Peirce introduces this term to signify "the tendency to regard everything as a continuum," he argues that "continuity governs the whole domain of experience in each of its elements, [...] except when it relates to an unattainable limit of experience" (Peirce, 1893, p. 1, [Author's translation]).

According to a synechist interpretation, human movement is a continuum, body-mind and movement are not discrete phenomena, therefore, there is a continuum between them, supported by the fact that synechism does not admit a clear division between phenomena and substrates and does not accept dualisms (Peirce, 1893), there is not, nor can there be a sharp distinction between body and mind, between body and movement, between brain and body, between cognition and body, between body and soul. The soul is not a discrete phenomenon that surrounds our body as an external energy halo, it is embodied, biologically possessed.

Synechism rejects that there are incommensurable differences between phenomena, and posits that physical phenomena are not completely different from psychic phenomena, for all phenomena are of one character, "although some are more mental and spontaneous and others more material and regular" (Peirce, 1893, p. 2, [Author's translation]). In this way, there is no immeasurable difference between movement and posture, between objective and subjective body, between action and activity, between motor control and motor capacity. Posture is an infinitesimal moment in the continuum of movement, and movement represents successive and infinite changes of posture.

Paraphrasing Peirce, one could not affirm that "I am my body and not at all the world," since the world in a certain way "is myself." All mind-to-mind communication is through the continuity of being (Peirce, 1893, p. 2, [Author's translation]).

The Movement Continuum Theory (MCT) has been proposed by different authors. Its pioneers, especially for the movement sciences, are Cheryl Cott, Elspeth Finch, Diane Gasner, Karen Yoshida, Scott Thomas, and Molly Verrier, who in 1995 posited that movement is a continuum from micro (molecular) to macro (context) levels that incorporates physical and pathological aspects of

movement with social and psychological considerations. These authors suggest nine principles for MCT; four of supreme order, shared with all movement sciences; and five particular to physical therapy (Cott et al., 1996, p. 89), namely:

1. Movement is essential to human life.
2. Movement occurs as a continuum from the microscopic level to the level of the individual in society.
3. Movement levels in the continuum are influenced by physical, psychological, social and environmental factors.
4. The levels of motion in the continuum are interdependent.
5. At each level of the continuum there is a maximum achievable movement potential (MAMP), which is influenced by the MAMP of other levels and by physical, social, psychological and environmental factors.
6. Within the limits set by the MAMP, each human has a preferred movement capacity (PMC) and a current movement capacity (CMC) that under usual circumstances are the same.
7. Developmental and pathological factors have the potential to change MAMP and/or create a difference between PMC and CMC.
8. The focus of physical therapy is to minimize the potential and/or existing difference between PMC and CMC.
9. The practice of physical therapy involves therapeutic movements, self-therapeutic modalities, education, technology and environmental modifications.

Assuming motion as a continuum does not mean assuming it as constant, invariable or stable. One of the most outstanding characteristics of human movement is its variability, a quality intrinsic to all biological systems, described as the normal variations that occur in motor performance across multiple repetitions of a task (Stergiou, Decker, 2011). Nikolaj Bernstein argued that each repetition of a motor act involves unique, non-repetitive neural and motor patterns, for which he introduced the concept of "repetition without repetition" (Bernstein, 1967).

Nicholas Stergiou and Leslie Decker (2011) argue that these variations in motion have a deterministic origin, therefore, they are neither random nor independent as argued by traditional linear models. In this framework, the authors recommend the use of nonlinear dynamic system analysis for the study of human behavior, to achieve a better understanding of variability and its relationship under pathokinetic conditions. Thus, such behavior, in terms of variability, should be viewed on a continuum (Stergiou, Decker, 2011, p. 3).

## Conclusions

Consequently with the Peircean theory, the visible and the invisible, it is worth saying, the macroscopic and the microscopic, the contextual and the molecular, the body and the spirit, the world and the mind, movement and cognition, movement and motor control, the objective and the intersubjective body, the firstness and the secondness, the object and the interpretant, among many, are interdependent aspects of a continuous, fluid, changing process, semiotic dyads, never Cartesian dualisms.

This work has strengthened the epistemological foundations of a study of interactions in the perspective of embodied cognition. This proposal fully shares the pragmatic and sinequist position of Charles Sanders Peirce. It allows for judging the theory of the MHSC-UAM from its practical effects, as well as articulating it to the theory of continuous movement and providing a perspective that allows for articulating experimental investigations related to movement with the conceptual baggage of Peirce's the theoretical proposal. Understanding human movement as a "sign" reaffirms the thesis that movement is the sine qua non means by which the body-mind expresses itself in the world, it implies recognizing that it has the capacity of mediation and that it carries an idea or "representation" of the world before the body-mind.

Finally, Peirce teaches not to be afraid of the truth, for if one were, one would necessarily have to be afraid of the search for truth. If this were to happen, scientific research would have to be given up. This reflection goes against those who maintain, even in the immediate environment, that "truth does not exist."

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