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Article

Challenge to the Supremacy of the Nervous System: An Invitation to a New Integrative Perspective

João Carlos Orquiza [1]

[1] 4º ano de Psicologia, Centro Universitário Filadélfia – UNIFIL. Londrina/PR/Brasil E-mail: joao.carlos.orquiza@edu.unifil.br

Abstract: This paper proposes a reconceptualization of the hierarchical understanding of the human organism, challenging the conventional idea of the supremacy of the nervous system. We argue that symbiotic coexistence and functional interdependence among all systems provide the human body with remarkable resistance to the universal tendency of entropy. We first examine the basis of cellular life, referring to ATP and DNA, essential substances that resist the entropic tendency through complex energy mechanisms. Next, we analyze the collaboration between the body's systems, highlighting the critical role of erythrocytes, which constitute 83.9% of the total cells (24.9 trillion), in the context of energy maintenance and homeostasis. We challenge the conventional view that the nervous system, composed of neurons and glial cells, which together make up 0.6% of the total cells (0.17 trillion), occupies the apex of a biological hierarchy, arguing that the nervous system is merely a component of a broader, interdependent mechanism. Finally, we provide a detailed description of human cellular composition, emphasizing the importance of each cell type in the functional context, thus contributing to the totality of the organism. With this, we present a vigorous appeal for the realization of critical reassessments of fundamental premises in human biology.

Keywords: human organism; entropy; ATP; DNA; nervous system; body systems; biological hierarchy; cellular composition

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1. Introduction:

"Uncontested dominion," "absolute power," and "supreme command" - these are terms frequently applied to the nervous system (NS) in descriptions of its stewardship over the human body. We propose a question: to what extent is this supremacy biologically justified?

The human body is a complex of systems whose fundamental purpose is to resist the universal tendency of entropy. In this paper, we explore a more integrative and interdependent view of how these systems, including the nervous system, work together to achieve this goal. The nervous system, although essential in communication and coordination between these systems, is only one among many. Its role, though crucial, is complemented and dependent on countless other cells and systems that are essential for survival and biological function.

In this paper, we begin the analysis with the base cells of biological energy, the erythrocytes, which group an impressive 83.9% of the total cells in the human body, an aggregate total of 24.9 trillion. These are the workhorses of the circulatory system, transporting necessary oxygen for the ATP energy cycle in every living cell. In comparison, the neurons and glial cells in the nervous system make up only 0.6% of the total cells, or 0.17 trillion, undeniable evidence of interdependence and cellular distribution in our body.

By underlining this cellular portrait of the human body and the interdependence between systems, we challenge the traditional hierarchical concept that places the nervous system at the apex. Instead, we press for a more integrated and synchronized inclusion of the body as a whole, accepting that each cell, each system, uniquely and vitally contributes to the common goal of the organism: preserving life against the disorder of entropy.

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We invite you, the reader, to examine with us this broad tapestry of human life, not just from the limited perspective of the cell-brain dichotomy but to appreciate the complex system of interrelated biological functions that is the human body. This paper intends to serve not only as a challenge to accepted conventions but also as an invitation to a more integrated understanding of human biology. We prepare to redefine our understanding of human body biology from a simplistic perspective to a view that truly honors and appreciates the complexity and interconnection of the human organism. Welcome to the new perspective.

2. The Nervous System: Master or Companion?

The fascinating complexity of the human nervous system has undoubtedly attracted much of the focus and admiration of scholars, scientists, and laypeople alike throughout history. Often described as the undisputed 'maestro' of the body, the nervous system is hailed as the supremacy of human systems. However, this selectively myopic perspective, which places the nervous system on an absolute pedestal of predominance, needs to be reexamined and questioned (Milo, R, Phillips, R, 2015).

Indeed, the role of the nervous system as a communication coordinator, a messenger between different parts of the body, and a conductor of infinite cellular symphonies is essential. Its importance can be perceived in simple day-to-day activities - from the blinking of eyes to the beating of the heart, illustrating the essential role they play in coordinating various functions.

However, pedestals are, by nature, solitary and isolating - they elevate while separating. And, in the case of the nervous system, this separation is a potentially harmful illusion. The nervous system, despite its extraordinary complexity and unquestionable function, does not operate in isolation - it is, quite the contrary, inexorably embedded in the fabric of life, depending on and interacting with the multiple other systems of the human body.

The truth is that even the most talented of conductors is powerless without an orchestra to lead. Likewise, the nervous system requires the broader functioning of the organism to perform its function successfully. Depending on, for example, the cardiovascular system to provide vital oxygen and nutrition, the endocrine system to enhance and modulate response through hormones, and the immune system to protect against potential intrusive pathogens.

The hypothesis of the supremacy of the nervous system results in a polarized and unbalanced perspective, neglecting the value and influence of the millions of other cells and systems that constitute the complex mosaic of life. It is time to challenge this autocratic view, dispensing with the outdated narrative of domination in favor of a more integrated and equitable perspective.

We understand, therefore, that the nervous system, far more than a distant and authoritarian conductor, is more accurately described as a crucially essential - but equitable - component of a symbiotic band: integrated, interdependent, and coevolutionary. It is a piece of a larger puzzle, a link in a chain, and a friend among many in an intricate, beautifully complex, and interconnected system of life.

Therefore, we propose a new paradigm, where we reject the notion of the supremacy of the nervous system in favor of a more integrative and interdependent view. This is a call to adopt a philosophy that embraces each body system, each cell, as equally vital in the magnificent dynamic and coordinated interaction of biological systems. In this way, we can begin to truly respect and understand the real wonder of human life and its infinite complexity - a symphony not of a single conductor but of an entire orchestra.

3. Symbiosis Instead of Hierarchy:

In the landscapes of academia, there has been a historical predominance of thinking that places the nervous system at the top of the pyramid of human physiology. This trend, as ingrained as the very structure of DNA, has conferred upon the nervous system an unquestionable position of supremacy (Trepel F, 1974). However, we argue that this paradigm must be challenged. Not by a rejection of the importance of the nervous system - that would be a fallacy - but rather by a greater

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understanding that the functioning of the human body is a spectacle of symbiotic interdependence, not a biological autocracy.

The human organism is a myriad of systems working together in the grand dynamic and coordinated interaction of biological systems. Each, in its own ways, contributes to the collective poem that is our existence. Thus, the nervous system, iconic in its ability to orchestrate communication and coordination, is, after all, one among many in the complex network of biological interactions. The conception that it holds an unquestionable position of command is an obsolete notion, a consequence of a partial and limited understanding of physiology.

The nervous system needs the cardiovascular system to provide oxygen and nutrients to carry out its processes. It needs the endocrine system for hormonal regulation, the immune system for defense against pathogens, the musculoskeletal system for physical movement, the digestive system for food energy, and so on. At the same time, each of these systems, in an incredible cyclical return of interdependence, depends on the signals and coordination of the nervous system for their functions.

The nervous system is, without a doubt, a critical and vital conductor of daily life, but it is also a dependent member of the orchestra. This understanding model not only overturns the perception of an oblique hierarchy but also allows for a deeper understanding of how the body's systems cooperate together in symbiosis, supporting each other in a majestic collaboration of functions.

This marks the vital difference between a simplistic and hierarchical view of human physiology and a more integrative and interconnected understanding. This perception feeds a deeper view of medicine, health, and well-being, allowing for a greater appreciation of the complexity, interconnection, and beauty of our physiology.

Challenging the supremacy of the nervous system, we are not downgrading its prominence but recognizing the wonderful diversity of life where each system is invited to play its role. This urges us to look beyond narrow prisms and consider the organism in its incredible totality - a symphony of interdependent functions, an explosion of life negotiated at every moment with imminent entropy. Therefore, let this challenge serve not as a denial but as an invitation to embrace a more complete integrative perspective, as well as a true tribute to the grandeur of life – a marvelous ballet of symbiosis and survival.

4. From Entropy to Complex Order:The Fundamental Ingredients of Life

Even in a universe governed by entropy, which advocates the prevalence of disorder, living organisms are stellar examples of resistance to this principle. Equipped with complex and highly coordinated systems, they stand at the forefront of chaos, establishing a structure of order. ATP, predominantly produced by cellular respiration that utilizes oxygen, serves as the essential energy currency for this maintenance (Bianconi E, et al, 2013).

In this world, DNA plays the role of both architect and conductor. It is within DNA that the plans for the development, functioning, and reproduction of all living organisms and many viruses are inscribed. DNA, above the entropic tendency towards chaos, ensures coordinated development, growth, reproduction, and response to the environment in an organized manner.

This leads us to a frequently glorified system – the nervous system. It is undeniable that it is crucial, but it would be a mistake to consider it as unique or supreme. The nervous system is just one of several interdependent systems that make up the body. It works inseparably with other systems such as the cardiovascular, endocrine, and immune systems. Each of these systems, in turn, depends on the nervous system to receive signals that allow the coordinated exercise of their functions.

Thus, instead of being merely commanded by the nervous system, it is realized that the body is, in fact, the synthesis of interdependent systems that function in harmonious consensus. This leads us to the second key point of this article - the intricate and interdependent relationship of the cells that structure each organism and the share that each cell type contributes to this overall picture, a perspective that offers a more holistic view of life. These issues will be addressed in detail in the subsequent section.

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5. Unraveling the Cellular Landscape: Quantities, Functions, and Interconnections

Our exploration now aims at the specific quantification of various types of human cells. By analyzing this cellular census, we perceive a massive presence of some cell types compared to others, each surfacing their individual stories of evolution, function, and survival. Here we present a summary of the results, highlighting the essential interconnection and balance between each cell type.

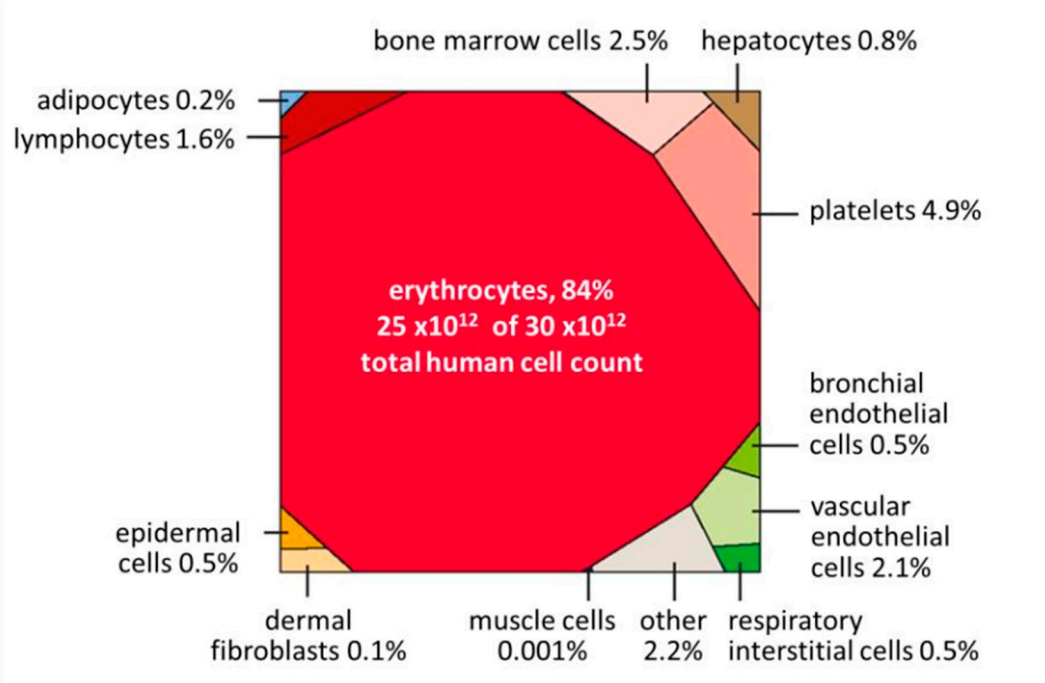

Figure 1. The distribution of number of cells by cell type. Note that muscles cells and fat cells, each comprising about 20 kg of tissue, have a small contribution to the total number of cells (0.2% or less) due to their large cell size.

- Erythrocytes (red blood cells) represent an impressive 83.9% of total cells, with an estimate of 24.9 trillion cells. They are the crucial element of the circulatory system, transporting oxygen from the lungs to the rest of the body (Azevedo F a C, et al, 2009).
- Platelets, constituting 1.45 trillion cells, or 4.9% of the total, play a fundamental role in blood clotting, a process that prevents excessive blood loss in case of injury.
- Bone marrow cells, making up 2.5% of the total, or 0.75 trillion cells, are the barns where the next generations of blood cells are continually produced.
- Endothelial cells, approximately 0.6 trillion, or 2.1% of the total, form an inner layer in our blood vessels, playing an indispensable role in maintaining blood pressure and regulating blood flow.
- Lymphocytes, 0.5 trillion cells or 1.6%, make up the task force of our immune system, protecting the body against foreign invaders.
- Hepatocytes, 0.24 trillion cells or 0.8% of the total, are the cells present in the liver. They coordinate the body's detoxification, bile production, and sugar metabolism regulation.
- Glia cells, originating in the brain, constitute only 0.085 trillion cells or 0.3% of the total, where they nourish and protect neurons, allowing them to function correctly.
- Neurons, also located in the brain, comprise a further 0.086 trillion cells, still 0.3% of the total. Despite being few in volume, they play a critical role in transmitting information throughout the body.
- Each subsequently added cell type, whether dermal fibroblasts, bronchial endothelial cells, epidermal skin cells, interstitial cells in the lungs, adipocytes, or muscle cells, plays its specific and crucial role in the different systems of the body.

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Our deeper analysis of these numbers in the next section will focus on comparisons between cells that, at first glance, seem disproportionate in their numbers, but that, in fact, form a harmonious concert to orchestrate the miracle of life.

6. Humility in Cellular Composition: The Testimony of Numbers

Our egalitarian approach leads us to a meticulous analysis of the human body's cellular composition, where each cell type illustrates a unique narrative of resilience and essentiality. When we look at cellular distribution, we find a humility that challenges the tradition of the nervous system's (NS) eminence. Each cell type, from the most abundant to the scarcest, plays an integral role in maintaining life, transgressing usual perceptions of supremacy.

Consider, for example, erythrocytes, which are by far the most numerous, dominating the cellular landscape with an estimate of 24.9 trillion cells, representing an impressive 83.9% of the total. Alongside this, neurons, often considered the elite of cells, total only 0.086 trillion, equating to a mere 0.3% of the total.

This perspective becomes even more intriguing when we add glial cells, the tireless workers of the NS, known primarily for providing support and nourishment to neurons. These cells, often not receiving the recognition they deserve, represent only 0.3% of the total, with an estimate of 0.085 trillion cells.

In contrast, in an even more modest position, we find muscle cells. Despite constituting only 0.001% of the total cellular count, or 0.0003 trillion cells, our body's survival depends immensely on each contraction and relaxation they perform - a humble yet essential service.

This analysis helps us understand that no cell type, however small its presence, is less important than another, and that a cell's proportion does not necessarily determine its predominance or superiority. All of this reinforces the idea of symbiotic interdependence and the rejection of a hierarchical view in human biology.

7. Discussion: A New Perspective on Biological Hierarchy

This paper has provided a contemporary and contrasting argument against the view of the nervous system's (NS) supremacy, proposing a reassessment of the traditionally accepted hierarchical structure in human biology. We suggest a more integrative understanding, where all human body systems, and all cells, are seen as equally important partners in a symbiotic and interdependent functioning of biological systems and interdependent life.

The evidence presented in the paper portrays the human organism as a web of interdependence, with the NS fundamentally rooted in it. We recognize that the NS is essential for communication and coordination in our bodies, but we argue that it is far from being the supreme or independent system. We explain that the NS is, instead, interwoven with all other body systems, contributing to the maintenance of homeostasis and normal body functioning.

Supporting this viewpoint, we provide a detailed analysis of the human cellular survey. Erythrocytes, for example, dominate the cellular landscape with an estimate of 24.9 trillion cells, constituting 83.9% of the total. On the other hand, neurons, often considered the elite of cells, total only 0.086 trillion or 0.3% of the total. These statistics provide a new perspective that challenges the traditional view of NS supremacy.

We analyze that human life is a manifestation of various forms of cellular and systemic collaboration, not the result of a unilateral hierarchical domination of one system over others. Therefore, we support a new perspective for human biological understanding, which puts the supremacy of a single system in the background, focusing on a model of interdependence and collaboration.

This discussion aims to engage academics and researchers in the validity of a more integrative and holistic view of the human organism. It proposes an approach that could give rise to a deeper understanding and open new avenues of research across various fields of knowledge. An integrative perspective could potentially offer new and comprehensive solutions to challenges in the fields of medicine, psychology, biomedical innovation, and many others.

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By advocating a broader focus on the interdependence of human body systems and cells, we highlight the role of the human organism in a biological context - a vehicle for life that seeks to preserve its existence against entropic tendencies. This organism operates not through a single dominant force but through the orchestration of a concert of cellular and systemic activities - each contributing to the maintenance of life.

Each cell and each system, from the most abundant to the scarcest, is an essential participant in this dynamic and coordinated interaction of biological systems. Together, in remarkable collaboration, they form the magnificence of human existence, integrated in the continuous struggle against entropy. This is a call not only to rethink hierarchy but also to rediscover the wonders of life and the miracle of existence.

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Figure 1 - Reference table added:https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.1002533