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Body, Mind and Subjective Experience as a Flow Systems With Configurations and Anticipatory System:

A System Theory Exploration

Körper, Geist und subjektive Erfahrung als Flusssysteme mit Konfigurationen und antizipatorischem System:

Eine systemtheoretische Untersuchung

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Kurzzusammenfassung

In diesem Beitrag wird ein interdisziplinärer Ansatz vorgeschlagen. Dieser integriert das Konstruktionsgesetz, Konfigurationsflusssysteme und antizipatorische Systeme um das komplexe Zusammenspiels zwischen dem menschlichen Körper, dem Geist und der Umwelt zu verstehen. Einen konzeptionellen Rahmen bietet das Konstruktionsgesetz, das besagt, dass sich Systeme entwickeln, um den Fluss zu maximieren, wobei der menschliche Körper als optimiertes Flusssystem hervorgehoben wird. Betrachtet man die Konfiguration unseres Körpers, insbesondere die des Gehirns, nach den Prinzipien des Konstruktionsgesetzes, wird die Effizienz der Informations- und Energieflüsse deutlich, die für Wahrnehmung, Kognition und Bewusstsein entscheidend sind. Vor allem die topographisch-dynamischen Eigenschaften des Gehirns und seine zeitlich-räumliche Ausrichtung unterstreichen diese Flüsse, was sich auf höhere kognitive Funktionen auswirkt. Wahrnehmung und Sprache als Fließsysteme unterstützen diese Perspektive zusätzlich, da sie zeigen, dass Informationen vom sensorischen Input zu fortgeschrittenen kognitiven Prozessen fließen. Die Integration von antizipatorischen Systemen mit Intentionalität erweitert unser Verständnis der Triade Körper-Geist-Umwelt. Schließlich unterstreicht die Einbeziehung der Phänomenologie, dass die physiologischen

Prozesse, die den Fließsystemen zugrunde liegen, integraler Bestandteil des subjektiven Erlebens sind, was die Relevanz eines ganzheitlichen Ansatzes für Gesundheit, Wohlbefinden und Leistung unterstreicht. Diese umfassende Perspektive, die unterschiedliche Bereiche miteinander verbindet, bietet ein mehrdimensionales Verständnis des menschlichen Zustands.

Schlüsselwörter

Dynamische Systemtheorie, Konstruktionsgesetz, subjektive Erlebnisse, Intentionalität, antizipatorische Systeme, relationale mathematische Modellierung

Abstract

This paper proposes an interdisciplinary approach. It integrates the constructal law, configuration flow systems, and anticipatory systems for understanding the complex interplay between the human body, mind, and the environment. The constructal law, which asserts that systems evolve to maximize flow, serves as a conceptual framework, highlighting the human body as an optimized flow system. Considering our body's configuration, especially the brain's, as in harmony with the constructal law principles, illuminates the efficiency of information and energy flows critical for perception, cognition, and consciousness. In particular, the brain's topographic dynamic properties and temporospatial alignment underscore these flows, with implications for higher cognitive functions. Perception and language, as flow systems, further support this perspective, demonstrating that information flows from sensory input to advanced cognitive processes. The integration of anticipatory systems with intentionality broadens our understanding of the body-mind-environment triad. Lastly, by incorporating phenomenology, it is emphasized that the physiological processes underpinning flow systems are integral to subjective experiences, thereby reinforcing the relevance of a holistic approach to health, well-being, and performance. This comprehensive perspective, connecting disparate fields, offers a multidimensional understanding of the human condition.

keywords

dynamic system theory, constructal law, subjective experiences, intentionality, anticipatory systems, relational mathematical modelling

1. *History of Precursors of DST Applications in Psychotherapy*

In recent years, Dynamic System Theory (DST) has emerged as an essential paradigm in the field of psychotherapy, providing a comprehensive framework for understanding the complexity and nonlinearity of human behavior, development, and change (Gelo & Salvatore, 2016; Mahoney & Marquis, 2002; Schiepek, 2009; Shapiro, 2015; Smith & Thelen, 1994; Thelen & Smith, 2007). Even when the authors do not use it explicitly in their terminology, they implicitly apply the DST in developing communication models and practices (Seligman, 2005; Smith & Thelen, 1994). Looking at a timeline reveals many precursors to the applications of what is known as DST nowadays.

Murray Bowen, the developer of Bowen Theory (or Family System [sic] Theory), which views the family as an emotional unit that uses system thinking, was around in the 1950s (Carlson & Dermer, 2017). Gregory Bateson, a British anthropologist, made significant contributions to systems theory and cybernetics in the mid-20th century. Practitioners have applied his expertise and work in some psychotherapy modalities and in the development of neurolinguistic programming (NLP; Krause, 2007; Montuori, 2005; Tosey & Mathison, 2009; Tramonti, 2018). Virginia Satir began her work on family therapy in the late 1950s, often referred to as the "mother of family therapy". She emphasized system thinking in her approach to family therapy, viewing the family as an emotional system. Salvador Minuchin's work on structural family therapy began in the 1960s. Minuchin, renowned for his work in structural family therapy, viewed the family as a system and applied systemic concepts to therapeutic interventions (Colapinto, 2018; Simon, 1995). The work on communication theory and family therapy by Paul Watzlawick, a pioneer in the field of family therapy and communication theory, has been influential in shaping psychotherapeutic interventions. His interactional view of communication systems parallels system thinking and complexity science developed in the 1960s and 1970s (Fitzpatrick, 2004; Griffin, 2005). John H. Weakland, like Watzlawick and Don D. Jackson, worked at the Mental Research Institute in Palo Alto in the 1960s and 1970s, where they developed the interactional perspective and strategic family therapy, which has systemic and complexity science aspects (Ray & Schlanger, 2012). Don D. Jackson has contributed to the development of the interactional perspective and strategic family therapy (Ray, 2000) and Jay Haley was another significant contributor to family therapy, making his impact in the 1970s (Willmarth, 2015; Zeig, 2007).

Based on the fundamentals of Dynamic Systemic Therapy (DST), which are now recognized by the European Association for Psychotherapy and evaluated by the Austrian Psychotherapy Advisory Board in the Federal Ministry, Family System [sic] Therapy and Neuro-Linguistic Psychotherapy (NLPt) are currently considered part of the systemic orientation (Österreichischer Bundesverband für Psychotherapie, 2023).

2. *DST in Psychotherapy Science and Practice*

DST continues to permeate into empirical and theoretical research due to its explanatory concepts for psychotherapy given the complexity of human behavior and emotional states (Gelo & Salvatore, 2016; Shapiro & Scott, 2018). Practitioners understand that many factors influence the human experience, including social interactions, personal history, genetic predispositions and current environmental conditions (Bouchard Jr., 2004; Johnson, 2007). DST allows therapists to conceptualize this complexity by considering all the variables as part of a more extensive, interconnected system (Garcia, 1998). Understanding that changes in one part of the system can lead to changes in other parts helps therapists develop more holistic intervention strategies.

Traditional therapeutic models often assume linear progress; each treatment step leads to a predictable outcome. DST, however, recognizes that human behavior and emotions do not always change linearly (Hayes, Laurenceau, Feldman, Strauss, & Cardaciotto, 2007). Sometimes small changes can lead to significant effects (and vice versa), and progress may not always be gradual. This perspective can help therapists remain patient and adaptive when progress seems slow or unpredictable.

From the perspective of DST, individuals tend to gravitate toward 'attractor states,' which are stable patterns of behavior or emotion. Recognizing these states can help therapists understand their clients' habitual responses and work towards altering these patterns (Rolls, Loh, & Deco, 2008).

DST emphasizes the concept of self-organization, where new behaviors and patterns emerge from the interaction of system components rather than being imposed from outside. This concept can support therapists in fostering clients' capacity for self-change and resilience (de Felice & Giuliani, 2020; Pincus, 2020; Schiepek, Tominschek, & Heinzel, 2014; Shapiro & Scott, 2018).

DST highlights the importance of initial conditions in determining system behavior. In therapy, this could translate into understanding the impact of early life experiences or the initial stages of therapy on the client's subsequent progress (Salvatore, Tschacher, Gelo, & Koch 2015; Shapiro & Scott, 2018).

Points of instability are called bifurcation points in the system, where a small change can lead to a new direction or phase of development. Identifying potential bifurcation points in psychotherapy can help therapists intervene at crucial moments to facilitate positive change (Elkaïm, Goldbeter, & Goldbeter-Merinfeld, 1987; Gharibzadeh, Zendehrouh, Vafadoost, & Bakouie, 2011).

3. Types of Systems

A system is an approximation by abstraction of an entity. Moreover, Dynamical Systems Theory (DST) provides a mathematical framework for describing the evolution of systems over time (Favela, 2020).

In the literature we can find various types of systems (Miller, 1965). We can use different factors to categorize them, including their structure, behavior, and the nature of their components. We can physically see and touch systems – for example, the solar system, a bicycle, or a computer. Biological systems are systems that are part of living organisms. Examples are the nervous system, the digestive system, or the ecological system. Moreover, social systems involve groups of individuals. Examples include a family, a company, or a country. Mechanical systems involve mechanical parts and obey the laws of mechanics. Examples include a car engine, a windmill, or a clock. Electrical systems, which contain electrical components, obey the laws of electricity. Examples include a circuit board, a power grid, or a computer. Information systems store, retrieve, transmit, and manipulate data or information. Examples include a library, a database, or the internet. Thermodynamic systems are studied in the context of thermodynamics and include systems such as a steam engine, a refrigerator, or heat pump.

Furthermore, dynamic systems exhibit behavior that evolves, often in complex, non-linear ways. Examples include the climate system, population dynamics in ecology, or the economy. Control Systems control output based on input and feedback. Examples include a home thermostat, a car's cruise control system, or an aircraft's autopilot system. Cybernetic systems contain feedback loops and self-regulation. Examples include biological organisms, machines, social systems, and artificial intelligence. Complex adaptive systems have multiple interconnected parts that adapt and evolve. Examples for such are economies, ecosystems, the human brain, and social insect colonies. Finally, open and closed systems can exchange matter and energy with their surroundings (e. g., a boiling pot), while closed systems cannot (e. g., a sealed jar; Newman, 2011).

4. Dynamic System Theory From the Perspective of Constructal Law

We can observe that each type of system "slices" the universe from a particular point of view, enabling the human mind to explore the universe in a particular way. Moreover, as its name implies, a dynamic system exhibits behavior over time. This concept is often used in many fields such as thermodynamics, fluid dynamics, and electrical engineering, as well as in living systems.

In the mid-'90s, through his work in engineering design, ideas abut the evolution of dynamic systems came to Adrian Bejan's attention. He worked on improving the efficiency of heat distributions in coolers. Cooling is a performance. The task is to change the architecture so that the computer's cooling function works efficiently under constraints. One may have noticed that some computers heat up in some places more than in others. Bejan's task was to improve upon this uneven heat distribution. He observed that, despite uneven heat distributions, the energy was optimally distributed. The solution was not to aim at a perfect system but to optimally distribute imperfections to provide easier heat dissipation via the components. Furthermore, this does not only apply to human-made systems, but that observation is accurate for natural systems as well. Its architecture is continuously redesigned to fulfill the requirement of the 'constructal law' – "make sure that the currents have easy access."

The constructal law is a theory concerning the generation of designs (configurations, patterns, geometry) in nature. According to this theory, natural design and the constructal law unite all animate and inanimate systems (Bejan, 2016). The constructal law was stated by Adrian Bejan in 1996 (p. xxxii) as follows: "For a finite-size system to persist in time (to live), it must evolve in such a way that it provides easier access to the imposed currents that flow through it". The constructal law is gaining increased acceptance within the scientific community (Bejan & Lorente, 2010).

The constructal law is a principle that explains the evolution of designs in nature, covering both animate and inanimate systems. Bejan (Bejan & Lorente, 2010a, 2011) (2011) explains that the constructal law is a self-standing law in physics that accounts for the necessity of designs to occur and the temporal direction of the phenomenon. The constructal law has two beneficial sides: the prediction of natural phenomena and the strategic engineering of novel architectures based on the constructal law. Bejan further explains that the constructal law accounts for the design phenomenon and all the individually described phenomena with final design statements of "optimality" (Bejan, 2015). Rocha discusses the applications of the constructal law, including the optimization of fins and assemblies of fin activities (Rocha, 2011). Overall, the constructal law can explain the evolution of design in nature and has practical applications in engineering.

We will consider this type of system to interpret the variance of the human body and its mental correlates, particularly from the perspective of the constructal law proposed by Adrian Bejan in 1996.

5. *Flow Systems With Configurations and Human Body*

A particular category of systems called "Flow Systems with Configurations", refers to systems in which the flow of some quantity (such as energy, matter, or information) is essential and where the configuration or arrangement of the system's components affects that flow (Lin, 2001). The human body is a testament to the principles of flow systems with configurations and the constructal law proposed by Bejan (2007; Bejan & Lorente, 2008). This law states that for a system of finite size to persist over time, it must evolve to provide easier access to the currents that flow through it. The human body, with its intricate networks that facilitate flows of various kinds, adheres remarkably well to this principle (Bejan, 2005).

A profound example is the body's circulatory system. Starting with a central, robust heart, the system branches into progressively smaller vessels, mirroring a tree-like structure. This configuration enables efficient blood flow to every cell and organ, ensuring the delivery of essential nutrients and the removal of waste products (Razavi, Shirani, Salimpour, & Kassab, 2014). Similarly, the body's respiratory system embodies the constructal law. The bronchi in our lungs branch out to provide an efficient means of airflow. This branching structure ensures optimal gas exchange, facilitating the distribution of oxygen throughout the entire lung area and, consequently, the bloodstream (Reis, Miguel, & Aydin, 2004; Reis & Miguel, 2006).

We can think of the nervous system as conforming to the constructal law. Central control mechanisms in the brain and spinal cord send signals through an intricate network of peripheral nerves. This network configuration allows efficient communication between the brain and various parts of the body, coordinating everything from conscious movements to automatic physiological responses (Reis & Miguel, 2006).

The human body's locomotion and metabolic pathways also reflect the principles of the constructal law. The biophysical characteristics of running and walking have evolved to minimize energy expenditure and promote efficient movement. Similarly, the metabolic pathways within our cells ensure efficient energy production and material exchange following a network flow configuration (Bejan, 2010, 2013).

The visual system, too, is not exempt from the constructal law. The structure and positioning of the eyes provide a wide field of vision and depth perception, facilitating interaction with our surroundings. This configuration is vital for survival, allowing us to respond effectively to potential environmental threats and opportunities (Bejan, 2019; Lucia, Grisolia, & Astori, 2017).

The human body offers a compelling illustration of the constructal law in action through its circulatory, respiratory, nervous, locomotor, metabolic, and visual systems. This law provides a unique lens through which to understand the design and function of biological systems, opening new avenues for exploration in human health, performance, and well-being (Bejan, 2013).

The human body's alignment with the constructal law extends beyond its physical configuration to encompass subjective experience and intentionality. As biological entities, we do not exist in isolation. Our lived experiences, intentions, and perceptions also follow the principles of flow and configuration, affecting and being affected by the physical systems in our bodies (Caragea & Zaharia, 2018).

6. Brain and the Mind in the Perspective of the Constructal Law

The constructal law posits that for a system to survive, it must evolve in ways that provide easier access to the flows of its currents (Reis & Miguel, 2006). In the context of the brain and perception, this principle could explain how the brain has evolved to optimize information flow (Lucia, Grisolia, & Astori, 2017), from sensory input to higher-order processing.

The human brain, a complex organ, is the central processing unit for sensory data, responsible for integrating, interpreting, and responding to environmental stimuli. Its capacity to systematize sensory processes and information flow is indispensable for higher-order cognitive functions, including consciousness, attention, and decision making. We propose that the constructal law, a universal principle of flow systems, provides a comprehensive framework for understanding these processes, particularly highlighting the phenomenon of temporal alignment and topographic dynamic properties in the brain (Northoff, Scalabrini, & Fogel, 2023).

Temporal alignment in the brain involves the synchronization of faster frequencies, corresponding to shorter time scales, with slower frequencies corresponding to longer time scales. Intrinsic spontaneous activity establishes these longer time scales, while external stimulus-induced activity contributes to the shorter ones. Remarkably, these temporal dynamics recur spatially in the same voxels and regions across days, indicating the stability of the brain's spontaneous activity. This stability is confined within individuals and consistently observed across subjects, suggesting a shared neurobiological architecture (Klar, Çatal, Langner, Huang, & Northoff, 2023).

The temporal structure of a task, depicted by its inter-trial intervals, influences the brain's temporal alignment. The transition from the resting state to task-related modulation is contingent on this temporal structure. This understanding broadens the scope for interpreting the brain-environment interaction while allowing for other potential influences on task-related changes. Crucially, the task's temporal structure can modulate the brain's intrinsic scale-free dynamics, such as temporo-spatial alignment and nestedness (Northoff & Zilio, 2022).

Intrinsic neuronal time scales, gauged by the signal's autocorrelation during the resting state, adhere to a topographic partitioning into higher-order trans-modal association and lower-order unimodal sensorimotor regions. Moreover, the scale-free dynamics of the resting state, evaluated in the same core-periphery topography, undergo modulation by the task's temporal structure, even during conscious wakefulness. This modulation, particularly by the inter-trial intervals of the task, exemplifies temporo-spatial alignment and nestedness (Klar et al., 2023).

The shorter time scales or faster frequencies of the brain, nested into and dependent on longer time scales or slower frequencies, underscore the concept of temporo-spatial nestedness. Intrinsic and ongoing spontaneous activity predominantly drives this nestedness. It implies a necessary degree of scale-free dynamics of the brain's ongoing spontaneous activity, particularly during the resting state (Klar et al., 2023).

The brain's capability to organize sensory processes and information flow is a sophisticated mechanism involving temporal alignment, topographic and dynamic properties, and temporo-spatial nestedness. These processes are vital for higher cognitive functions such as consciousness, attention, and decision making. Further exploration is needed to fully understand the full spectrum of the brain's organization of sensory processing and its implications for cognitive functioning. This exploration, grounded in the principles of constructal law, offers a promising avenue for advancing our understanding of the complexities of the human brain.

Unimodal areas are typically involved in processing specific types of sensory information. For instance, the occipital lobe dedicates specific regions to visual processing. Multimodal areas, on the other hand, integrate information from multiple sensory modalities and are often associated with higher-order cognitive functions such as abstract thinking.

Within this framework, it is conceivable that the evolution of the brain's development has followed the constructal law. This law optimizes the information flow from the sensory organs (input) through unimodal areas (initial processing) and then to multimodal areas (integration and higher order processing). This optimized flow of information might facilitate perception and contribute to our ability to think abstractly and engage in complex cognitive functions.

The brain encompasses an intricate network of interlinked neurons. These neurons engage in complex communication using electrical and chemical signals creating a continuous information exchange. The brain organizes this flow of information in a hierarchical manner, from simple sensory inputs to complex cognitive processes (Deco & Kringelbach, 2017). This organization allows for the efficient processing and integration of information, enabling us to perceive our environment, process our thoughts, and interact with the world.

The brain regulates the energy flow of the body by controlling various physiological processes. For instance, it regulates our metabolic rate, heart rate, and body temperature, ensuring energy is efficiently used and distributed throughout the body. This regulation of energy flow is essential for survival and overall functioning (Abizaid & Horvath, 2008; Matafome & Seiça, 2017; Roh & Kim, 2016).

From the perspective of the constructal law, the brain's organization and its regulation of information and energy flow can be perceived from as an optimization process. Like other natural flow systems, the brain has evolved to minimize resistance and maximize flow efficiency. For instance, developing specialized brain regions and networks for different tasks allows for efficient processing and integration of information. Similarly, the brain's regulation of energy flow in the body ensures energy is used and distributed most efficiently (Bejan, 2015b; Bejan & Lorente, 2010).

Mental processes, including consciousness, attention, and decision making, can also be seen in the context of the constructal law (Caragea & Zaharia, 2018). These processes involve the flow of information within the brain, and how the brain organizes and regulates this flow is critical for these processes to occur efficiently. For instance, as discussed earlier, synchronizing neural activity across different timescales allows for integrating immediate sensory input with existing knowledge and context, which is crucial for conscious perception and decision-making.

The brain's organization and the processes of the mind can be seen as a manifestation of the constructal law. The brain has evolved to optimize the flow of information and energy, facilitating our perception, cognition, and interaction with the world. Adopting this perspective can provide valuable insights into both, the brain's functions and disorders, potentially leading to new therapeutic approaches.

7. Perception, Language, and the Constructal Law

Perception plays a critical role in our interaction with the environment. Through perception, we become aware of our surroundings and respond accordingly. For instance, consider the visual system. Through their position and structure, the eyes follow the constructal law by providing a wide field of vision and depth perception. This optimal configuration allows us to perceive threats or opportunities in our environment, facilitating adaptive responses (Bejan, 2019).

Furthermore, studies suggest that our perceptual experiences can impact our physiological state. For instance, gazing upon expansive landscapes can reduce the body's perceived stress (Li & Sullivan, 2016). This finding highlights how our perceptual experiences may affect our body's stress response system, underscoring the interconnectedness of our subjective and physical experiences.

The Constructal Law posits that flow systems evolve to minimize resistance and maximize flow (Bejan, 2013), we can further our understanding of the brain's organization and function. Regarding perception and language processing, the brain's organization and temporal alignment may be seen as a reflection of the constructal law.

Perception and language processing require an intricate flow of information through numerous brain regions. The flow of information starts by receiving external stimuli, which are then transmitted to primary sensory areas in the brain. Subsequently, many other brain regions receive this information for further processing, integration, and interpretation. This complex process culminates in a conscious perception and understanding of the world, that includes both the comprehension and generation of language.

As discussed previously, temporal alignment plays a critical role in this process. The brain's ability to synchronize faster, short-term neural activity (associated with direct sensory input and processing) with slower, long-term neural activity (associated with ongoing spontaneous activity and slower cognitive processes) is essential for smooth and efficient information flow. This synchronization integrates direct sensory input with existing knowledge and context, which is especially crucial for language comprehension and production (Klar et al., 2023).

Drawing parallels with the constructal law, this information flow may be likened to other natural flow systems, such as river networks or tree branches. Similar to how these systems evolve over time to minimize resistance and maximize flow, so does the brain’s structure and function evolve to optimize the flow of information. This evolution includes the development of specialized brain regions and networks for different aspects of perception and language processing and the synchronization of neural activity across different timescales to ensure smooth and efficient information flow.

8. Phenomenology and the Constructal Law

Unimodal brain areas typically process specific types of sensory information. For instance, the occipital lobe dedicates specific regions to visual processing. Multimodal areas, on the other hand, integrate information from multiple sensory modalities and are often associated with higher-order cognitive functions such as abstract thinking (Northoff et al., 2023).

Phenomenology, a branch of philosophy, concerns itself with the structures of experience and consciousness. It examines the phenomena that appear in acts of consciousness (Heotis, 2020). This phenomenon is closely tied to the brain’s organization of energy and information flows, as it results from these internal processes (Demertzi et al., 2019).

From a phenomenological perspective, consciousness is not a passive receptacle of stimuli but an active and dynamic process that assigns meaning and value to our sensory experiences (Ameroff, Kaszniak, & Scott, 1996; Baars, 1988). Underlying these experiences is the flow of energy and information through the brain’s intricate networks. Neurons constantly exchange energy in the form of electrical and chemical signals. Through this exchange thoughts, perceptions, and other cognitive functions emerge from the processed and transmitted information. In response to our environment, the brain continually reorganizes these flows, allowing us to adapt and learn.

These flows, from a phenomenological standpoint, can be seen as the basis for consciousness‘s intentional directedness. In other words, the brain organizes energy and information flows to facilitate our ability to focus on specific objects or thoughts, imbuing them with meaning. This meaning-making process is integral to our subjective experiences and ability to navigate the world.

Moreover, the constructal law’s principles can be applied here. It posits that systems (in this case, the brain) evolve to provide easier and more efficient access to flows (energy and information). This principle can be seen in the hierarchical organization of the brain, with its specialized regions and networks designed for efficient energy and information processing.

From this perspective, the brain’s organization of the flow of energy and information is not merely a physiological process but a fundamental aspect of our organism and its interaction with conscious experience. Our ability to perceive, think, and interact with the world stems from this, ultimately shaping our subjective reality and behavior. Grasping the connection between brain function and phenomenology can offer a profound understanding of consciousness and human behavior and experience.

Intentionality is another crucial aspect of our subjective experience associated with the body's configuration flow systems. Our intentions can direct our attention, shape our actions, and influence our physiological state. For instance, the intention to relax can guide our focus toward calming stimuli, reducing heart rate and stress hormones (Sahlin et al., 2014; Sarang & Telles, 2006). In this way, our intentions can directly influence the flow within our body's systems.

Moreover, the concept of intentionality fits well within the framework of Anticipatory Systems (Leydesdorff & Dubois, 2008; Wendemuth et al., 2018). Our intentions often involve anticipating future states or events, guiding our actions toward desired outcomes. This forward-looking aspect of intentionality aligns with anticipatory systems, which incorporate predictions about future states into their current behavior.

Continous rearrangements of the system components explained by the Constructal Law could be as well a basis for the relational biology models proposed by Rosen in his Anticipatory Systems work (Rosen, 1977, 1991, 2012). The evolutive addition to the thermodynamics added by the Constructal Law with impact our current understanding of the organism's architecture and along the closed-to-efficient causation models proposed in mathematical biology (Louie, 2009, 2022; Rosen, 1991) gives a basis for a novel theoretical framework by means of the mathematics of Category Theory to view human experience and interaction.

The human organism's design and function exemplify the principles of the constructal law and anticipatory principles. Nevertheless, the relevance extends beyond our body's physical configuration to also include our mental and emotional life. Perception and intentionality, critical aspects of our subjective experience, interact with and influence the body's flow systems. The mathematics of category theory offers the possibility of joining computable algorithms, such as those exemplified by differential equations, with non-computable algorithms, such as those proposed in mathematical biology through (M,R)-systems proposed by Rosen. Together they can explain the neurolinguistic processes and transformations observed in different helping professions. Understanding these interactions can provide valuable insights into the interplay between our physical and mental states, opening new avenues for research and intervention in health, well-being, and performance.

9. Conclusions

The valuable idea emerging is the integrated understanding of the human body and mind through the lens of configuration flow systems, explained by the constructal law of anticipatory systems. This comprehensive perspective allows us to see the body as a physical entity and a system deeply intertwined with subjective experiences, language, intentions, and perceptions.

Recognizing that our subjective experiences and intentions can directly be related to the flow within our body's systems and shape our interactions with the environment provides a profound insight. This emphasizes the importance of adopting a holistic approach human health, well-being, and performance and paves the way for potential new interventions in these areas.

Whether they be biological, physical, social, or cognitive, different systems can be perceived as different realities, each with its unique rules, structures, and dynamics - some we do not understand yet. Understanding these systems requires distinct scientific approaches and methodologies. As a universal principle of design and evolution in nature, the constructal law provides a unified lens to view and study various systems. The constructal law postulates that flow systems evolve to minimize resistance and maximize flow, a principle that applies across diverse systems, thereby bridging different "realities". The constructal law offers insights into the evolutionary dynamics of systems, enabling us to understand how they adapt, evolve, and self-organize for greater efficiency. This comprehension can foster a deeper understanding of natural phenomena and human-designed systems. Different systems may represent different levels of reality, each with unique complexity and guiding principles. These distinct levels are interconnected, thus allowing for transitions between them. Beyond physical systems, we must explore how different levels of reality can elucidate the multifaceted nature of human life and experience. This endeavor involves examining the intertwining of our physiological systems with our perceptions, language, intentions, and consciousness, as informed by the constructal law and anticipatory system theory.

This synthesis of ideas from different fields and perspectives presents a rich, multi-dimensional view of the human condition, underscoring the complex interplay between our physical and mental states and our environment. Such comprehension is valuable for various fields, spanning from health sciences and psychology to systems theory and even philosophy.

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