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Embodied Narrativity: From Etiological Movements to Intentional Actions

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Abstract

This article addresses the relationship between etiological movements and intentional actions that shape the primordial narratives constituting our self-in-process, a self that takes form through bodily narratives that define our "body-in-the-world" (our "lived body") within the configuration of our *Umwelt* ("life-world"). Our study, especially as regards processes that require further refinement, illustrates that bodily narratives are crucial for the formation of the *self's* identity and social visibility, as these enable the exchange of experiences and desires among agents. Drawing on the formulations produced by Edelman and Gallese, we highlight that such narratives are most effectively grounded in and justified by brain states and mental states—specifically beliefs and desires—which drive the meaning-making processes necessary to maintain the organism's homeostasis within its environment.

Keywords

Narrativity, Self, Etiological Movements, Intentional Actions, Mental States, Cortical Activity

When narrative capabilities emerged and affected linguistic and conceptual memory, higher-order consciousness could foster the development of concepts of the past and future related to that self and to others (Edelman & Tononi, 2000: p. 195).

Time becomes human to the extent that it is articulated through a narrative mode, and narrative attains its full meaning when it becomes a condition of temporal existence. (Ricoeur, 1984: p. 52)[1]

[1]Cited by Jonhson & Schulkin (2023: p. 139).

1. Introduction

Creating narratives is arguably one of the most primal and effective strategies humans employ to establish intersubjectivity: we all wish to convey something of who we are to others, what we do, what we intend to do, and what we have observed others doing. To achieve this, we turn to narratives, be they in their most primitive forms, such as bodily actions, like a wink, a nod, a sequence of movements, or a handshake, or through symbolic means, like sign systems used to recount a story (e.g., passing a note or sending a message) without direct physical interaction.

It is through narration that we construct the broadest framework, enabling the exchange of ideas, lived experiences, and projected desires between two agents. While the forms of narrative emergence may vary, be they in terms of distinct semiotic patterns or sensory-motor bodily actions, the prevalence of verbalized narratives continues to be a hallmark of a long-standing symbolic and cultural tradition that rationally underpins our interactions with others. We do not narrate without purpose; even our soliloquies, however intimate, are invariably shaped by the dialogic presence of an "other." This "other" may be the *self* or even a projected "alter-self", that is, a mirror image of the original self. Narrativity thus becomes a means of constructing the *self* and granting it social visibility, as it harnesses the processes governing motor activity and sensory-perceptual patterns to serve the self-organization of life and the agents' continuous pursuit of *selfhood*.

The present article's discussion focuses on bodily narratives, as they constitute a crucial principle of the self-organization of life. Thus, every living being is subject to continuous assemblages involving the environment in which it operates. We highlight that bodily narratives are primordial forms used to structure the ordered set of actions performed by an organism; no organism carries out isolated actions within the environment, however simple they may be. To substantiate the organism's capacity to narrate its experiential activity within the environment, our study draws upon such concepts as the construction of the *self*, primary movements arising from the body's sensory-motor activity, intentional actions built upon the agents' beliefs and desires, and, above all, cortical processes backed by research from various authors cited throughout the text.

2. On the Self-Organization Process of the *Self*

The importance of *self* for narrativity has been highlighted by many authors. Johnson and Schulkin (2023: p. 131), referring to the formulations of Damasio (1999), who distinguished three dimensions of *self*, namely, the *protoself*, the *core self*, and the *autobiographical* or *extended self*, highlight the following:

> In this sense, the self is always a self-in-process, an intertwining of patterns of organism-environment interactions that are tentative and transitory. The origin of all of this self-making turns out to be our bodies—not simply the body as a bag of flesh, but rather the body-in-the-world, the lived body, the body that is the organic medium of our perceiving, feeling, thinking, valuing, and doing.

In Damasio's formulation, organism-environment interactions permeate these three levels of bodily incursions, encompassing distinct aspects that involve the self-in-process. These interactions range from the *protoself*, which includes unconscious bodily and cerebral structures and processes aimed at the homeostatic and allostatic stability of the organism, through the *core self*, which imposes on the conscious core of feeling what is happening in the present moment of the organism's activities within the environment, to the *autobiographical* or *extended self*, which plays a leading role in extending our consciousness to generate narratives through the memory of our previous activities. It is through these attributions that Damasio assigns functionalities to different stages of the *Self*[2]. From this perspective, it is the self that generates the constant and continuous dynamics of the organism in the environment; it is he himself who implements the self-organization of life, as the authors remind us (Johnson & Schulkin, 2023: p. 140):

> The self-in-process is never an act of radically free self-creation. It is rather a cocreation, employing bodily habits, capacities, and values, and negotiated with significant others along culturally laid down paths of narrative development. The self-in-process is never an act of radically free self-creation. It is rather a cocreation, employing bodily habits, capacities, and values, and negotiated with significant others along culturally laid down paths of narrative development.

Thus, in all these moments of our vital activity, in every path we traverse within our environment, we are narrating, saying something to ourselves or to the surrounding world, and recording part of our history. In so doing, we activate the organism's structures and functions. We are not alone in the lived world; we are not a closed, isolated *self*, but rather one that is open and expanded, aiming to reach out and open ourselves to experiences with the Other. In this act of opening up, we seek, within the enactive patterns of direct experience, elements that integrate into the self-organization of life: everything that emerges in our perceptual field serves as challenging material for the production of meaning.

It is important to emphasize that, throughout this reflection, the production of meaning is highlighted as a process of self-organization of the human organism in the configuration of its "lifeworld"—its *Umwelt*. No specific human organism can sustain itself without producing meaning, without drawing upon environmental affordances to be self-constituted. Human activity, in particular, entails a wide range of implications capable of integrating the entire organic apparatus, as proposed by Johnson (2007: p. 155):

> (...) in order to have human meaning, you need a human brain, operating in a living human body, continually interacting with a human environment that

[2]Both Damasio (1999) and Johnson and Schulkin (2023: pp. 132-137) present a detailed account and a broad scope regarding this typology of the self. However, delving into the characteristics and functionalities of this trilogy is not the aim of the present text.

> is at once physical, social, and cultural. Take away any one of these three dimensions, and you lose the possibility of meaning: no brain, no meaning; no body, no meaning; no environment, no meaning. Although the brain alone cannot give us meaning, it is surely the supreme bodily organ in the construction of meaning.

In this light, we are constantly aware of the need to generate meaning through the intermittent pursuit of homeostasis for an organism perpetually thrown out of balance by the vicissitudes of life. The organism's mobility within the environment is essential; hence, embodied narratives can hold significant value, as they integrate the three requirements highlighted by Johnson. We seek to ground these narratives in their origins within our cortical activity, which determines mental states of belief and desire, while also placing them within the body's sensorimotor principles, the essential conditions for the organism's movement through the environment. Embodied narratives serve as a crucial trigger for our activity in the world, and this activity is reflected in a form of meaning-making that does not extend to non-human organisms.

3. The Semiotization of Narratives

The intersubjective nature of human activity has generated many verbalized narrative patterns as a means of capturing the attention of others and drawing them into a shared realm of concerns, achievements, and conflicts. No form of knowledge exists without relying on narrative patterns: the Evangelists narrated "the Good News," just as a scientific theory narrates discoveries and hypotheses in detail. Historical narratives address the scientific, customary, mythical, or mystical foundations of civilizations, communities, and social groups. These narratives endure over time through continuous updating, sustained by the vigor of new narratives that both consolidate and revise them. In his analysis of the narratives that made Nazi practices feasible, Jean-Pierre Faye asserts that narratives precede and anticipate historical events. We simulate events based on the narratives we generate, whether fictional or otherwise.

Beyond their omnipresence in the symbolic realm of our existence, narratives materialize across all types of discursive or textual genres. There is no dimension of human culture that does not lend itself to the development of narratives, which, in turn, entail their own strategies for comprehension. Logic, hermeneutics, literary criticism, semiotics, discourse analysis, and clinical practice are strategies devised to facilitate the analytical processes of understanding and interpreting through narratives. While these strategies are widely practiced and revitalized by academic specialists, in the present study, we will focus on a more primal type of narrative, one less dependent on conceptual frameworks or symbolic constructs and more grounded in the lived experiences of agents within the forms of life. It is a narrative that emerges and is built primarily through bodily movements, through the act of setting the body in motion to construct one's *Umwelt*.

4. The Scenic Configuration of Bodily Narratives

There are moments when we silence our symbolic systems to let the body speak, connecting with the environment through its sensors, as highlighted by Johnson and Schulkin (2023: p. 134):

> We have a felt awareness that we see with our eyes, smell with our nose, touch with our skin (covering multiple body parts), hear with our ears, and taste with our mouth, tongue, and nose. Sensory portal maps thus appear to supply us with a sense of the perspectives from which we perceptually engage aspects of our environment.

Thus, considering narrativity from the perspective of the body[3] entails looking at certain processes that define the basic conditions of its mobility within the environment through the activation of its sensors. Central to a narrative in this sense is the presence of the organism, which emerges with its motor functions through movements and actions carried out by an agent. There is no narrativity without action, nor action without a body; the two factors converge within the bounds of time and space, essential parameters that serve to define the scope of narratives in terms of the movements and actions that sustain our being and our presence in the world, as noted by Johnson and Schulkin (2023: p. 139):

> Narrative structure is not an artificial framework externally imposed on an individual life. As Ricoeur (1984) has pointed out, human action manifests an intrinsically narrative pattern that is rooted in the conceptual structure of action. Actions are not merely events connected via causal chains. The conceptual structure of action involves agents, character, acts performed, the historical context of the act, motives for acting, ends and goals pursued, and values to be realized.

As the authors point out, narrativity (narrative structure) is not an artificial modeling of actions within the environment; it is not a mere sequence of actions connected solely by causal networks; rather, it dynamically structures the set of our actions in the lifeworld. Our narrative patterns, as Ricoeur highlights above, have an intrinsic structural dimension within the activities of agents in the environment and thus fulfill a wide range of functions in the construction of the *Umwelt*, as demonstrated by Johnson and Schulkin. The execution of any agent's actions is extensive and complex: no matter how simple an action may be, it still entails many details of which we are not always fully conscious during its performance, as Baars (1997: p. 138) notes:

> Most details of routine actions like reading or writing must be automatic: we could never control their numerous details, given the limited capacity of the

[3]Here, we are drawing upon the concept of the body adopted by Husserl and Merleau-Ponty through their appropriation of the German terms "Leib"—the dynamism of the organism within the environment; a body that experiences the world—and "Körper"—its physical-anatomical conditions, which can be described objectively.

> conscious system. Usually only the novel features of an action are conscious and under voluntary control. But automatic aspects of an act can sometimes become unwanted. This becomes clear when we try to control "bad habits" that have been practiced for years: almost everyone seems to have at least one, whether it is overeating, smoking, nervous gestures.

The complexity of our actions within the environment implies a multifaceted view of their nature: we register our presence in the environment through movements, with conscious and unconscious actions, habitual and automatic actions, as well as creative and intentional actions designed to overcome unforeseen circumstances. Every action presupposes an agent endowed with a body that, beyond its anatomical configuration, integrates decisively into the environment. From this environment, through experience, it draws the necessary ingredients to become a living body, one that feels, recognizes values, and self-organizes, acting upon the environment and generating meaning. What causes a body to move is the agent that conveys primary movements to it, movements confined to specific parts of its anatomy: hands opening and closing, fingers bending and straightening, the head moving laterally and vertically, and so on. Simultaneously, the agent uses these primary bodily movements to perform actions extending to the body itself, such as scratching one's head or rubbing one's hands, and actions reaching beyond it, like washing a dish or turning on a computer. A body's capacity to move within the environment is linked to sensors stimulated by efferent neuronal firing.

All organisms, when exposed to an environment, are subject to both performing motor actions within that environment and receiving information from its interactions with it. In one direction, the brain stimulates the organism's motor activity via efferent neurons, triggering motor neurons to act upon the muscular structure of various body parts—hands, arms, legs, etc. In the other direction, afferent signals from sensory neurons convey information to the brain regarding the organism's sensory and proprioceptive activity, such as pain, temperature, cutaneous events, and so forth. Bodily narratives depend decisively, though not exclusively, on efferent signals that activate muscular systems to stimulate various bodily movements; afferent signals can represent ways of adjusting our motor actions.

All this sensory stimulation drives distinct cognitive functions that manifest outwardly as actions upon the environment in search of information. The totality of our enactive activities constitutes, above all, a behavioral pattern that enables the organism's self-organization, as expressed by Metzinger & Gallese (2003: p. 550):

> From a first-person perspective, the dynamic social environment appears as populated by volitional agents capable of entertaining, similarly to the observer, an intentional relation to the world. We experience other agents as directed at certain target states or objects. We are "intentionality-detectors": As human beings, we cannot only mentally build an "objective," third-person account of the behaviors constituting the events of our social world.

A body deprived of the movement potential of its sensors would also be deprived of its elementary cognitive functions. The haptic system, for instance, in conjunction with the visual system, allows the organism to directly explore the environment through which it moves: through our actions, we discern what is smooth or rough, what is distant or near, and so forth. Much of the body's journey through the environment can be characterized by the interplay of various sensors, given the immense diversity of the environments that a body traverses. A body without movement is, at its core, a body deprived of etiological functions; it is a body with arms that do not lift, knees that do not bend, and hands that do not articulate (opening and closing), as well as a head incapable of partial rotation. How, then, can we infer from this set of factors that a moving body encompasses the range of actions capable of defining a bodily narrative?

5. Hypotheses Regarding the Structuring of Bodily Narratives

A bodily narrative is an ordered sequence of actions that has a final action as its goal. Thus, any set of planned and sequentially ordered actions presupposes bodily narratives, since such actions necessarily entail movements performed by the body. In this regard, bodily narratives—body movements involved in any of an organism's actions within its environment—are primitive, natural patterns that activate the organism's motor and sensory principles in the execution of actions, be they conscious or not.

The complex nature of a narrative is linked to a primary complexity that extends to the concept of action—its central core—which is often viewed from diverse perspectives: the space-time of its execution, its reach toward environmental targets, the bodily nature of its structure, and even the challenges standing in the way of its realization. Gallese (2000: p. 23), analyzing the relationship between the control of agency and the representation of actions, states:

> To that purpose, I will present a new account of action, arguing against what is still commonly held as its proper definition, namely the final outcome of a cascade-like process that starts from the analysis of sensory data, incorporates the result of decision processes, and ends up with responses (actions) to externally - or internally-generated stimuli. I will argue against this account of action by presenting and discussing recent findings from the investigation of neural mechanisms that are at the basis of sensorimotor integration. It will become clear that the so-called 'motor functions' of the nervous system not only provide the means to control and execute action but also to *represent* it.

Gallese emphasizes the need for a neurophysiological foundation to characterize actions, drawing on motor functions of the nervous system that are sufficient not only for the control and execution of actions but also for their representation. Guided by this theoretical orientation, the author criticizes the separation between perception and action, arguing that, from a neurophysiological standpoint, all

perception entails the simulation of actions. Likewise, he proposes redefining the concept of representation by linking it to a form of control the brain exerts over actions and the dynamics of organism-environment interactions (which result in actions). Thus, the aim is not to view representation as a conceptualization, or an abstraction of objects, but rather to focus on its actual role in the organism's activities during interactions with the environment. Indeed, he notes: "Actually, following this view, action control and action representation become two sides of the same coin" (Gallese, 2000: p. 23).

Gallese presents an extensive argument for conceptualizing actions from this perspective, a scope that extends beyond the immediate aims of the present essay, as it does not address narrativity. Although this conceptualization of action does not conflict with the goals of our own reflection, we now return to a more specific discussion regarding narrativity. After all, what is a bodily narrative?

> Formally, we can define a bodily narrative as an organic set of etiological movements [EM_i, EM_j, EM_k]—which may be sequential, associated with a set of intermediate-level intentional actions [IA_1, IA_2, IA_n] that are sequentially ordered for a given task and culminate in a final intentional action [IA_F].

Any bodily movement within the environment requires the extensive involvement of brain regions that are reciprocally intertwined in its execution, as stated by Edelman & Tononi (2000: p. 44):

> These reciprocal pathways are among the main means that allow for the integration of distributed brain functions. They provide a major structural basis for reentry, a process of signaling back and forth along reciprocal connections, that, as we describe later, offers the key to resolving the problem of integrating the vários fuctionally segregate properties of brain areas despite the lack of a central coordinative área.

A bodily narrative, however elementary, is implicated in this reciprocity between brain areas. The visual cortex plays a direct role in spatially guiding the body's mobility, thus determining the direction and reach toward a target, such as when an agent seated at a table intends to open a window in a room. This visual mapping integrates with various motor areas that facilitate mobility, combining movements with intentional actions. The prefrontal motor cortex performs the executive function of planning and commanding our actions; it maps out our path through the environment to reach a target in an optimized manner. The primary motor cortex encodes what was planned and organized by the prefrontal motor cortex into sequences of motor procedures. The final stage of triggering the movements involved in the cited example falls to the primary motor cortex, which issues motor commands to the body muscles involved in such actions, primarily the legs, arms, and hands. It is this state of continuous reciprocity between cortical areas that Edelman and Tononi characterize above as a process of re-entry among diverse regions of the brain.

The proposed definition is very generic and requires the specification of numerous operational facts to better approximate the actual performance of an agent when executing a given narrative geared toward a specific event. We could begin by highlighting the importance of the prefrontal motor cortex as a decisive stage in an agent's activities within the environment, as noted by Edelman (2006: p. 55):

> The largest contribution to this increase [in brain size during human evolution] was made by the growth of the prefrontal cortex, the part of the brain that is essential for judgment and planning. The Evolution of reentrant connectivity provided vertebrate, mammalian, and finallly human brains with the most important organizing principle for the acquisition of knowledge.

When addressing the evolution of the brain, Edelman highlights, regarding the prefrontal motor cortex, the functions of planning (selecting the sensors to execute a given task) and judgment (assessing such conditions as the organism's accessibility to the environment) for any action an agent might perform. Located in the anterior portion of the frontal lobe, this region serves as a parameter for modeling experiences and interactions with the environment; it plays a prominent role in guiding both our cognitive processes and our unique actions. Thus, the prefrontal motor cortex is decisive in the implementation of both etiological movements (EMs) and intentional actions (IAs), as it is geared toward optimizing the planning of our percepto-sensory activity within the environment and the execution of our actions.

Mobility is intrinsic to any living organism; even when appearing inert, its respiratory system and heartbeat remain active to sustain it. While any activity of an organism presupposes such movements, we are particularly interested in the movements of an agent that engages with the environment and seeks energy to maintain equilibrium and wellbeing. An organism's movements are complex, integrating patterns that are conscious and unconscious, habitual and unique, intentional and unintentional. We are considering narratives that draw upon both etiological movements and intentional actions, as the latter are always geared toward an end, toward a goal to be achieved by the agents of a Complex Adaptive System within the dynamics of sustaining and expanding life. What, then, is an etiological movement that combines with intentional actions to form a bodily narrative?

An etiological movement is not merely a physiological event involving a body mobilizing in response to signals from the primary motor area, which sends commands to muscles in specific regions. Thus, the opening and closing of the hand, the bending of the leg, or the raising of the arm constitute etiological movements that arise from the anatomical structure of these organs; however, within their primary functionality, they already carry the pre-intentional content of an action that forms part of a bodily narrative. An etiological movement is not an intentional action, but rather an anatomical precondition for such actions to exist.

In any narrative, we can identify the presence of EMs—movements resulting

from the anatomical activation of a body part and devoid of intentionality, yet serving as the foundation for intentional actions. EMs are part of the array of our bodily activations; there is no agency exerted upon the environment without an EM as the starting point, since the body must move through sensory activation. Consequently, EMs give rise to an agent's IAs[4]. Thus, the importance of movement in an organism's action processes stems from the fact that movements are the origin of all the bodily narratives an agent constructs within the environment. The correlation between movement and action is therefore defined by intentional processes that ensure the attainment of a target envisioned and desired by the agent.

Although it is easier to isolate EMs, since they are linked to a body part and are the origin and support of our actions, it is important to emphasize that a narrative, however simple, can trigger several EMs—the multimodal nature of actions—as well as several IAs, and will always have the structure of a narrative, since it incorporates a set of EMs and IAs in the achievement of a specific goal. For example, drinking a glass of water as an intentional action implies at least three EMs: the act of opening and closing the hand to support the structure of the glass, followed by the act of raising the arm to bring the glass to the mouth and, finally, the act of opening the mouth to receive the liquid, which qualifies as a consecutive intentional action that constitutes the target of the narrative: drinking water. A simple and commonplace bodily narrative can give rise to many EMs as well as many IAs.

Within the scope of a bodily narrative, formed by a cast of EMs and IAs, it is necessary to highlight the external causal link that exists between the ordered set of movements and actions. EMs always have an organic and immediate causality, generated by efferent neuronal firings, but not necessarily ordered in a single way. Thus, to sit in a chair, the movement of bending the legs is prioritized, but there may be circumstances in which the agent needs to grip the arm of the chair to be able to sit, turning the body into the right position to reach the seat. To handle objects, the EM with the hands is primary, but it can be accompanied by many other EMs. The most complex ordering is due to the IAs, which generally make up our bodily narratives. Gallagher & Zahavi (2008: pp. 154-155) propose different attributions when AIs converge in a narrative. The authors even ask, on several occasions, what an action is.

> (3) You hear a knock at the door and you are expecting a friend to visit, so you get up, walk to the door and open it.
>
> For example, I can describe (3) as an intentional action of answering the door and letting my friend in. In performing this action, of course, I have to get up out of my chair, walk across the room, and twist the doorknob. All such movements subtend and support the intentional action of letting my friend in; in that sense, they are organized by the intentional action; and as such

[4]Wittgenstein (1979), in a single sentence, characterizes the distinction between EM and IA in our terms as follows: "(...) what is left over if I subtract the fact that my arm goes up from the fact that I raise my arm?" (PI, § 621).

> they are all intentional movements. If you stop me before I reach the door and ask me if I knew that I was walking across the room and if I intended to do so, I would surely say yes—I have to do so to get to the door.

From the perspective adopted here, we are dealing with a bodily narrative consisting of EMs—straightening the body, moving about on foot, and operating the door handle with the hand (utilizing haptic and visual systems driven by the prefrontal motor cortex)—which are causally ordered. This set of EMs is characterized by intentional actions at various levels, culminating in an IA_F that defines the narrative: *gaining entry to the room*. Each EM in this narrative is marked by a distinct intention: (a) the EM of straightening the body is associated with the intention of *becoming mobile*; (b) the EM of using bipedal locomotion is associated with the intention of *reaching the door*; and (c) the EM of operating the handle is associated with the intention of *opening the door*.

Gallagher and Zahavi (2008: p. 156) offer more specific commentary on these intermediate intentions, particularly to characterize, from their perspective, what constitutes an action:

> For a movement to be an action it has to be goal-directed and intentional. A movement that is a reflex, or passive, or subintentional, or preintentional is not an action, although it might be interpreted as an action from the outside, that is, by some other person.

Without describing them in further detail, the authors characterized intermediate intentions as *subintentional* or *preintentional*. Following the narrative of freeing up the room for a friend, we revisited the authors' description, illustrating, for each circumstance, a specific type of EM and its corresponding preintention, while highlighting how this set converges on the narrative's ultimate goal: freeing up the room. Here, we adopt the term "preintentional" to characterize, within the set of intentions associated with Mes, such as *moving about*, *reaching the door*, or *opening the* door, those intentions that culminate in an IA_f, such as clearing the way into the room.

Thus, what characterizes many of our actions, especially final actions (IA_f), is the intention to reach a specific goal; the organism does not act without purpose, nor does it wander through the environment at random. Each action is a way of executing and updating the organism's activities within the environment; actions are, therefore, diverse patterns of life's self-organization. Consequently, it is likely that all activities within the environment have a desired outcome as their narrative goal. Since movements lie at the origin of our intentional actions, we can coordinate a lateral head movement (EM_l) with an eye movement (EM_l) to *get a better view of something* beside us. I raise my arm (EM) to *get a book off the shelf* (IA); I open and close my hand (EMs) to grasp a glass (IA); I bend my knees 90 degrees (EM) to *sit down* (IA). The correlation between an etiological movement and an intentional action may well represent a minimalist, more primitive pattern of bodily narrative, especially when it occurs strictly *in corpore*. Thus, *scratching one's head* is a more primitive and less complex intentional action than combing one's

hair; the latter necessarily involves an instrument requiring proper handling by the agent, as described below.

Bodily narrative: *scratching one's head* {*in corpore*]

$$\left\{ EM_i \text{ [raise the arm]} + IA_i \text{ [reach the head]} + IA_f \text{ [rub the fingertips on the scalp]} \right\}$$

Bodily narrative: *comb one's hair* [*ad corpus*]

$$\left\{ \begin{array}{l} EM_i \text{ [extend the arm]} + EM_j \text{ [open the hand]} + IA_1 \text{ [get the comb]} + \\ EM_k \text{ [close the hand]} + EM_l \text{ [raise the arm]} + IA_2 \text{ [run a comb through the hair]} \; IA_f \text{ [fix the hair]} \end{array} \right\}$$

Bodily narratives possess varying degrees of complexity, depending on the number of actions and movements unfolding from an initial fixed point to a final one. We never fully exhaust the description of a narrative regarding the number of details involved between these two extremes; in describing it, we highlight only what is most salient for its comprehension. There is no *a priori* limit to the actions or movements that make up this interval, although we must assume that the organism prioritizes a rational economy in the execution of EMs and IAs to achieve a goal. *Ex corpore* narratives are likely those that typically involve a more extensive ordered set of EMs and IAs, such as *crossing a street*, which may minimally entail:

Bodily narrative: *crossing a street* [*ex corpore*]

$$\left\{ \begin{array}{l} EM_i \text{ [move to the sidewalk]} + [EM_j \text{ [turn the head toward the flow of cars]} + EM_k \text{ [go down to the street]} + EM_l \text{ [move through the street]} + \\ EM_m \text{[step up onto the other sidewalk]} + IA_f \text{ [cross the street]} \end{array} \right\}$$

This is a simplified way of describing such a bodily narrative, prioritizing the sequence of MEs and highlighting the AI_f [crossing the street]. However, revisiting the Gallagher & Zahavi quote above, we can say that each EM in this narrative entails preintentions, that is, a specific action for each movement, such as: (a) [EM_j [turning the head toward the flow of cars] → IA_j [assessing whether the road is clear]; (b) EM_k [stepping onto the street] → IA_k [crossing the street].

As previously noted, bodily narratives, even when not verbalized, possess an intersubjective dimension. However, we frequently encounter sets of actions where we articulate only one of the stages, typically the final intentional action. To do this, we employ key expressions, such as "I'm going to…" (IA_f), or "I need to…" (IA_f) to serve a metaperformative function; these, in the commissive mode, project or perform a set of an agent's bodily actions that remain unspoken. Examples include: "*I'm going to lie down*" (performing a set of actions, some perhaps unique to the agent, which culminate in the IA_f: lying down); "*I'm going to make coffee*" (idem); and "*I need to catch a taxi*"[5]

[5]There is nothing exceptional about framing such forms as metaperformative. After all, they appear in many other contexts—for instance: "Have you heard the latest..." or "Here's a new one..." (for jokes or

Bodily narratives present an immediate perception, although they may still be subject to more detailed scrutiny regarding aspects other than etiological movements and intentional actions. Thus, in the approach to narratives, it is common to simultaneously evoke two fundamental concepts that portray forms of life in a society, imagination and memory, whether or not they involve the implementation of fictional patterns. Gallese (2011: p. 197), commenting on the work of Siri Hustvedt, states:

> However, a common feature of memory and imagination is their emotional contour, a contour that resurfaces even when memory and imagination are reordered within a narrative structure.

These categories play a significant role in the mental and bodily activity of agents, especially since imagining often prompts us to recall events that actually occurred, but, when articulated through groups of fictional narratives, it can also lead us to think about things that could never have happened. In this context, we focus our reflection on bodily expression and a specific brain function: the simulation of actions (narratives) generated by classes of mirror neurons, as highlighted by Gallese (2011: p. 197):

> It has been proposed that our brain-body systems are equipped with a prerational, nonintrospective process—embodied simulation—generating a physical, and not simply "mental," experience of the mind, motor intentions, emotions, sensations, and lived experiences of other people, even when narrated.
>
> The mirror mechanism maps the sensory description of others' actions, emotions, and sensations onto the perceiver's own motor, visceromotor, and somatosensory representations of those actions, emotions, and sensations.

The two excerpts above characterize the current stage of discussion regarding an alternative perspective through which to understand our actions and, by extension, our narratives. As we shall see later, our actions can result from mapping the actions of others as we watch them perform. In general, and as suggested by Gallese's two formulations, the same cortical apparatus used by the person performing a set of actions simulates that same perspective in the observer, thanks to the functional nature of mirror neurons. However, the role of mirror neurons requires further clarification regarding actions that originate from an agent regardless of any observation by others.

Another challenge facing the study of bodily narratives is the need to step back and evaluate the correlation between brain states and mental states, which determine these narratives in the first instance and are intertwined with the issue of mirror neurons. For example, it is difficult to conceive of an intentional action that does not stem from a mental state, such as possibility, necessity, challenge,

rumors); "Once upon a time..." or "There was a time when..." (for fictional narratives); "In those days..." (for Gospel narratives); or "With no further business to discuss..." (for formal protocols).

intolerance, or anger, and all these states likely influence the content of a narrative. Yet such mental states arise from complex brain activity within cortical networks involving numerous brain regions as well as various clusters and classes of neurons. Conversely, if bodily narratives are grounded in mental states, we must ask which brain states underpin them. This correlation leads us to examine the mind-brain relationship as a foundation for understanding bodily narratives. We begin by considering a question raised by Edelman (2001: p. 37):

> Can we build a picture of the structure and dynamics of the extraordinary object that can account for the origin of the mind? This is in fact the main goal of modern neuroscience, and, when reached, it will have larger consequences for humankind.

Although the mind occupies a significant place in Edelman's reflections, especially when addressing its relationship with consciousness, memory, and intentionality, it is in the book *Bright Air*, *Brilliant Fire*: *On the Matter of Mind* (Edelman, 1992) that the question of the mind takes on special prominence in his theory, as he proposes treating the mind as an object of the natural world. The passage above illustrates his constant concern with establishing brain states as a condition for mental states; this is particularly evident when, addressing his aim to describe a biological theory of mind and treat it as an object of the natural world, the author states: "To do so, I shall go into the organization of the actual matter underlying our minds—neurons, their connections, and their patterns (Edelman, 1992: p. 1)". Thus, in many instances, such as when addressing consciousness or memory, links to the mind play a major role in the author's reflections. However, it is by aligning his theory with neural Darwinism that he most directly makes the connection between mental states and the brain, as highlighted in the following quote (Edelman, 2001: p. 45):

> Almost two decades ago, I began to think about how the mind could arise in evolution and development. It seemed to me then, as it does now, that the mind must have risen as a result of two processes of selection: natural selection and somatic selection. The first is hardly doubted except perhaps by some philosophers and theologians. Thinking about the second led to the proposal of a theory concerned with the evolution, development, structure, and function of the brain.

In his theory (TNGS), Edelman highlights a special emphasis on two forms of selection: one implicated in brain development—*selective development*—committed to the anatomical formation of the brain, resulting from somatic selections along the developmental continuum of an organism, that is, *connectivity at the synapse level*; the other—*experiential selection*—a synaptic selection process that occurs within neuronal groups. The author's formulation implies conceiving a theory of mind that can emerge directly from the development of a theory of the brain, a dimension proposed and implicit in his approach.

Other authors have been concerned with this foundation of the mind from a

complex physical system such as the brain, which includes anatomical and functional aspects—neurons, synapses, cortical networks, among others. Bear & Cooper (2001: p. 142) present the following question:

> The scientific problem, as we see it, is to construct from material components such as neurons and systems of neurons the simplest entity that performs the most primitive conscious act.
>
> ....
>
> In considering this question, we must overcome the fear of, or aversion to, assumptions about the internal workings of the mind that cannot be directly verified by experience.

This issue continues to be a burgeoning challenge for attempts to conceptualize the mind based on the physical processes that implement our brain system. These are two functional aspects of our organism that appear differently yet are essential to all our conscious acts, from the simplest to the most complex. The elements constituting the brain are verifiable physical entities, whereas our mental activity cannot be verified to the same extent. For the authors, this gap between the observable and the unobservable should not deter us from making assumptions about our mental activity. In summary, Bear & Cooper (2001: p. 143) reaffirm the foundations of a theory of mind in these terms:

> A satisfactory theory of mind not only allows but, in our opinion, requires the introduction of mental entities constructed from the material available. We will be satisfied, only when we see before us constructs that can have mental experience, when we see how they work and how they come about from more primitive entities such as neurons.

The ideas formulated by Edelman and the requirements outlined by Bear & Cooper map out a path toward a theory of mind grounded in the functional conditions of an organism and fueled by the components that structure our brain activity. Fundamentally, we have efferent (motor) neurons, which transmit information from the brain to organic sensors, and afferent (sensory) neurons, which convey information about sensor activity back to the brain. This description is generic and merely sketches a broad outline without specifying particular brain regions or the musculature involved in haptic activities, for instance.

When considering mental states, shaped primarily by beliefs and desires, we are well aware of the need to return to what underpins our mental activity: namely, its grounding in brain activity. Edelman (1992: p. 7) had already posited details regarding this integration when he stated:

> So it is natural to make the assumption that a particular kind of biological organization gives rise to mental process. (...) Therefore we will also want to know something about how the brain structures underlying the mind rose in evolutionary history. (...) The findings of neuroscientists indicate that mental processes arise from the workings of enormously intricate brain systems at many different levels of organization.

Thus, the correlation between brain states and mental states, regardless of the terminology used, appears to be essential to the activity of human organisms. Indeed, in the present day, it is difficult to conceive of an organism's activity functioning independently of the brain. However, the notion that this correlation is causal in nature still requires further study, as the author himself acknowledges: "to pursue the subject scientifically we must turn to how the brain is organized" (Edelman, 1992: p. 7). Finally, while there is an extensive body of literature regarding the mind's causality over physical states, the academic community is still cautious about taking a stance on the causality between brain and mind. We posit the existence of a correlation, yet we are far from fully characterizing it.

Despite the complexity of this process, there appears to be no turning back regarding these requirements: current knowledge of brain structures and functions seems to herald a new perspective for the study of the mind and the structure of knowledge in general. Meeting these requirements may require procedures that currently elude us due to their technical specificity and vast scope, hence the authors' cautious phrasing. The challenges posed by this complexity extend to the most mundane questions: how can we represent neuronal correlations to explain our ability to move our bodies—to stand up from a chair or reach out to grab a book from a shelf? How are neuronal clusters effectively organized or identified, and how do they guide themselves to perform specific functions that constitute the brain states underlying the mental states that drive our actions in the world? Many of these phenomena have been addressed by various authors, as we shall demonstrate later. In broad terms, we can examine the issues raised here based on the following hypothesis:

BS [x] $\wedge$ [MS: belief y] $\wedge$ [MS: desire z] $\rightarrow$ [bodily narrative w].

Under this general hypothesis, we posit a brain state, BS(x), followed by two mental states, [MS: belief y] and [MS: desire z], which are determinative in the configuration of any bodily narrative. Analyzing the simplest bodily narrative identified above, we could rewrite it as follows:

Bodily narrative: *Scratching one's head* {*in corpore*]

$$\left\{ EM_i \text{ [raise the arm]} + IA_i \text{ [reach the head]} + IA_f \text{ [rub the fingertips on the scalp]} \right\}$$

Rewriting the narrative based on the hypothesis: *scratching one's head* (in corpore)

$$\left\{ \begin{array}{l} \text{BE [x: neuronal configuration of the primary motor cortex, via efferent motor neurons that activate arm muscles]} \leftrightarrow EM_i \text{ [raise the arm]} \ \wedge \\ \text{[ME: BELIEF: able to reach the head]} > IA_i \text{ [reach the scalp]} \wedge \text{[ME: DESIRE: rub the fingertips on the scalp]} > IA_f \text{ [relieve the discomfort of itching]} \end{array} \right\}$$

This is a rather generic description, even though it is defined by real elements relevant to the development of this narrative. However, despite its generic nature, it highlights efferent signals sent from the brain to the arm muscles to drive flexion

and extension toward the head, yet it omits the afferent information regarding fine-tuning, derived from the arm's sensory interaction with the environment and sent back to the brain for subsequent adjustments. The model also fails to highlight the efferent effects associated with finger friction, among many other details involving the brain regions implicated in this activity.

In more technical terms, drawing partly on the proposal by Gallese & Lakoff (2005), this characterization of the brain state could be described in terms of neuronal clusters (using the authors' terminology[6]) that are active during simulation processes (or otherwise) and associated with the functions of the F5c-PF cluster. This cluster contains neurons that transmit information for upper-limb movements: F5c is an area of the premotor cortex involved in the organization and execution of manual movements, while PF is an area located in the parietal lobe involved in sensory perception and the visuomotor integration that coordinates movement.[7]

6. Conclusion

However simple an organism's actions in the environment may seem to our intuition, descriptively, they prove to be entwined in many complex technical details stemming from the agent's brain activity. This characterization by Gallese & Lakoff, defining actions and simulations involving the cerebral apparatus (specifically, the brain processes involved in grasping and similar actions), highlights the complexity of our actions when understood and described in terms of brain activity. No less complex, though perhaps more intuitive, are the dimensions of our mental activities. As presented by the authors fostering this reflection, the major challenge emerging from these discussions is to unite these two often-divorced facets in a reciprocal process that secures our existence in the lifeworld.

For instance, the cortical simulation concept has become the subject of extensive discussion following approaches grounded in the discovery of mirror neurons (Gallese, Fadiga, Fogassi, & Rizzolatti, 1996). The repercussions of this discovery are profound and challenge the traditional view held by various "mindreading" approaches, such as the versions described by Shanton and Goldman (2010). Despite the proliferation of articles on simulation via mirror neurons, objections have been raised regarding the functional characterization attributed to them—*Mirror neurons are premotor neurons that fire both when an action is executed and when it is observed being performed by someone else* (Gallese et al., 1996: p.

[6]By a "cluster" we do not merely mean a bunch of individual neurons in the same place. A *functional cluster* is a cortical network that functions as a unit with respect to relevant neural computations. (Gallese & Lakoff, 2005: p. 6).

[7]Gallese and Lakoff also highlight two other clusters involved in upper-limb motor actions. One—*the F4-VIP cluster*—transforms the position of objects within the agent's space based on whether they are approaching or receding; the other—*the F5ab-AIP cluster*—involves a combination of canonical neurons that transforms and projects the physical properties of objects, determining their suitability for manipulation. The authors' formulation points to further, more detailed implications regarding the clusters in question.

595), as the authors highlight in their groundbreaking paper.

Cook & Bird (2013) raise objections to the canonical view implied by two foundations of neuronal simulation theory regarding human observers, based on two questions: Do mirror neurons "mirror"? and Do mirror neurons encode goals? Regarding the mirroring of actions between an agent and an observer, they point out that only 20% - 30% actually show a direct correspondence. The second question appears to be the more complex one, as it echoes objections raised by other authors, such as Gallagher (2007). According to Gallagher, the simulation of an action lacks an operator characterizing the observer's action—acting (or pretending) as if one were the other—which is not represented by neuronal firing, since neurons do not pretend; they merely fire. Gallagher adds other components, particularly those related to the observer's empirical activity. For him, there is no symmetry between neuronal activity and the cognitive-level functions that implement the observer's conscious experiences. Kosonogov (2021) is more incisive in criticizing the idea that an observer can detect the target or intention behind another person's actions. The author questions how mirror neurons could know the target of an action before it is even performed; he argues that recognizing the agent's intent must result from inferential processes originating in other brain regions, rather than from neuronal firing, which presumably follows the recognition of the target. However, Kosogonov acknowledges that mirror neurons may be useful for the future production of previously observed actions, facilitating their execution by the observer.

Driven by advances in recent brain research, cortical simulation has become a central issue regarding social cognition, intersubjectivity, and social sharing among agents in a community. Criticisms arising from the initial formulation are part of the necessary adjustments and revisions to the theory, which can clarify its scope in light of the numerous studies seeking to address questions concerning simulation.

We can now revisit the definition of "bodily narrative", adjusting it to incorporate these new aspects of its nature, while merely alluding to the technical characterizations developed within these theoretical frameworks:

> Formally, a bodily narrative is defined by two stages: (a) functional groups of neurons that trigger and regulate the organism's activities and constitute brain states (BSs) correlated with metapredicates—BELIEF, DESIRE—which form mental states (MSs) that project; (b) an organic set of etiological movements [EM_i, EM_j, EM_k], which can be ordered and associated with a set of intermediate-level intentional actions [IA_1, IA_2, IA_n], ordered according to a specific task, culminating in a final intentional action IA_f.

In our view, this proposition regarding the nature and functionality of bodily actions comprehensively encompasses any type of organismic activity, ranging from the simplest to the most complex. To move within its environment, any organism relies on cerebral parameters; no movement occurs independently of the brain. Likewise, we can extend this principle to an agent's mental activities, draw-

ing on authors who propose a structure of the mind based on the elements and processes that structure the brain—or, as Edelman (1992: p. 9) emphasizes, "putting the mind back into nature." Any activity of an organism, however elementary, entails movement within the environment driven by beliefs (its contingent history) and desires (an inherent lack or an intentional project). Organisms move by generating meaning and aiming for homeostasis; without such movement, there is no life.

Author Contributions

This paper stems from collective discussions, integrating professionals from various fields (psychoanalysis, literature, history, physics, linguistics) of the Grupo Complexo Cognitio, but was prepared in consecutive stages with the direct participation of: (a) Nacimento: responsible for surveying theoretical texts and evaluating the appropriation of theoretical concepts; (b) Cavalheiro: responsible for evaluating the biological dimensions and the methodology of the approach; (c) Mari: responsible for compiling the proposed partial ideas and for drafting the final text. A final review of the text's writing and content was conducted by all three authors in two stages: upon submission to the official translator and following translation.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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