Reflection

Naturalization of Philosophical Concepts Underlying Interculturality and Proposal of the Neurocognitive Model *'Elemental Intercultural Imprint'**

[English version]

Naturalización de conceptos filosóficos de base de la interculturalidad y propuesta del modelo neurocognitivo *'Huella Intercultural Elemental'*

Naturalização de conceitos filosóficos fundamentais da interculturalidade e proposta do modelo neurocognitivo *'Pegada Intercultural Elemental'*

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Abstract

Objective: The study proposes an exploration of dyads (philosophy-cognitive neuroscience) that constitute the basis of interculturality, leading to the postulation of the Elemental Intercultural Imprint as a neurocognitive model that impacts the ontological notion of 'interculturality,' viewed under the naturalizing project. **Methodology**: An analytical conceptual methodology was implemented, aiming to demonstrate the modes of naturalization of philosophical concepts descriptively and critically. The following hypothesis is maintained: the progressive naturalization of consciousness, self-control, identity, social mind, alterity, and morality can reveal the neurocognitive mechanisms of interculturality in individuals. To this end, the naturalization of consciousness as attention, identity as self-reference memory, self-control as self-regulation, mind (social) as Theory of Mind, alterity as empathy, and morality as moral cognition are analyzed. **Results**: The conceptual analysis in the reviewed studies found that partial epistemological transposition and methodological symmetry are the most common mechanisms of naturalization of the components of interculturality, and that its neurocognitive architecture allows for the incorporation of other components. **Conclusions**: It is concluded that the proposed neurocognitive basis is indispensable for the empirical study of interculturality.

Keywords: naturalization; philosophy; cognitive neurosciences; interculturality (obtained from the UNESCO thesaurus).

Resumen

Objetivo: en el estudio se propone un recorrido por díadas (filosofía-neurociencias cognitivas) que constituyen la base de la interculturalidad, lo que deriva en la postulación

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de la Huella Intercultural Elemental en calidad de modelo neurocognitivo que repercute en la noción ontológica de 'interculturalidad', vista bajo el proyecto naturalizador. **Metodología**: se implementó una metodología analítica conceptual, cuya aspiración es evidenciar descriptiva y críticamente los modos de naturalización de conceptos filosóficos. Se sostiene la siguiente hipótesis: la progresiva naturalización de la conciencia, el autocontrol, la identidad, la mente social, la alteridad y la moral puede desvelar los mecanismos neurocognitivos de interculturalidad en las personas. Para tal efecto, se analiza la naturalización de la conciencia como atención, de la identidad como memoria de autorreferencia, del autocontrol como autorregulación, de la mente (social) como Teoría de la Mente, de la alteridad como empatía, y de la moral como cognición moral. **Resultados**: a través del análisis conceptual en los estudios revisados, se halló que el traspasamiento epistemológico parcial y la simetría metodológica son los mecanismos más comunes de naturalización de los componentes de la interculturalidad, y que su arquitectura neurocognitiva permite incorporar otros componentes. **Conclusiones**: se concluye que la base neurocognitiva propuesta es indispensable para el estudio empírico de la interculturalidad.

Palabras clave: naturalización; filosofía; neurociencias cognitivas; interculturalidad (obtenidos del tesauro de la UNESCO).

Resumo

Objetivo: o estudo propõe uma exploração das díades (filosofia-neurociências cognitivas) que constituem a base da interculturalidade, resultando na formulação da Pegada Intercultural Elemental como modelo neurocognitivo que influencia a noção ontológica de 'interculturalidade', vista sob o projeto de naturalização. **Metodologia**: foi implementada uma metodologia analítica conceitual, cujo objetivo é evidenciar de forma descritiva e crítica os modos de naturalização de conceitos filosóficos. A seguinte hipótese é sustentada: a progressiva naturalização da consciência, do autocontrole, da identidade, da mente social, da alteridade e da moral pode revelar os mecanismos neurocognitivos da interculturalidade nas pessoas. Para tal efeito, analisa-se a naturalização da consciência como atenção, da identidade como memória de autorreferência, do autocontrole como autorregulação, da mente (social) como Teoria da Mente, da alteridade como empatia e da moral como cognição moral. **Resultados**: através da análise conceitual nos estudos revisados, constatou-se que a transferência epistemológica parcial e a simetria metodológica são os mecanismos mais comuns de naturalização dos componentes da interculturalidade, e que sua arquitetura neurocognitiva permite a incorporação de outros componentes. **Conclusões**: conclui-

se que a base neurocognitiva proposta é indispensável para o estudo empírico da interculturalidade.

Palavras-chave: naturalização; filosofia; neurociências cognitivas; interculturalidade (obtidas do tesauro da UNESCO).

Introduction

> You are very aware that exercising control over your own habits, if not the most important business in life, is at least very close to being so. (Peirce, 1908, p. 3).

The dichotomy of internalist and externalist cognition has persisted throughout history and is still deserving of review today (Gazzaniga, 1993). Both concepts originated in and evolved from different disciplines. On the one hand, cognitive psychology, which emerged in the 1960s, focused on the study of the structures of knowledge, the processes of thought, and the mental activities of the individual; it would later take new directions toward the consolidation of neuropsychology, which is concerned with brain structures and cognitive functioning. Sociology, on the other hand, finds the role of action and the structures of groups and individuals essential for building knowledge in humans, thereby culture is what provides the niche for the development of cognition (Serpell, 1993).

In this discussion, culture is understood as a purely social concept of an anthropological, externalist nature, mostly motivated by human action and expressed by abilities and habits. This was stated by Edward Tylor, one of the first pioneers to define today's prevalent concept of culture. In his work, this author states that culture is "that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society" (Tylor, 2018, p. 23). As can be seen, the process of acquiring such a skill set goes unnoticed, since both the structure and function of widely diverse and complex concepts (knowledge, morality, customs, etc.) are left aside, as are those that require attention and detail to provide coherence to the possible articulation that generates the complex skill set that Tylor mentions.

As stated previously, the two routes to addressing cognition related to culture and interculturality seem to be firmly rooted in their respective traditional conceptual fields. Thus, an epistemological perspective providing the means to understand the phenomenon of (inter)culture underlies each discipline. This

is why determining the point of articulation between the two epistemologies that supports the current view of culture and provides the basic structures of human cognition becomes necessary. The possibility of an articulatory point allows discussion about the phenomenon of the creation of cultures and their interaction, as well as the emergence of intercultures as an oscillating doorway between oneself and others (Han, 2017). To achieve this, it is crucial to put at the center of the phenomenon the cognitive processes that give place to the roughly speaking prototypical human acts and behaviors of a group and their cultural traits. Otherwise, the study of actions and behaviors would be insufficient to help understand the structure and function of the cognitive processes that give birth to culture. Similarly, to contemplate the sum of cognitive processes as a condensation of culture in individuals without deterring those fulfilling a specific role in the cultural domain would disregard the basic and differential characteristics that culture creates in the human being.

In this regard, two authors who have taken different approaches to explain the role of culture in human cognition must be considered: Michael Tomasello and Antonio Damasio. Tomasello (2007) defends the thesis that shared cultural practices and intentions influence human cognition. This evolutionary psychology perspective establishes the social character of humans, placing group interaction at the center of the basis for cognition. Interaction implies joint attention, shared goals, and collaborative endeavors between members of a group. To facilitate such interaction, Tomasello (2008) argues that language fulfills the dual role of communicating and transmitting concepts and values from one generation to another. In other words, cognition is embedded in social activities mediated by a system of cultural significance (Serpell, 1993). In this way, social cognition represents a socially necessary trait, in contrast to individual cognition, since humans engage in activities where desired goal achieving can only be done in collaboration with others. An example of this is the interpretation of the actions, desires, and intentions of others, as well as their beliefs and knowledge, translated as cognitive constructs that promote or restrict the demeanor and development of a given group (Van Dijk, 2014).

According to Damasio's (2018) central thesis on the role of culture in cognition, cultural values function as somatic markers in interface with emotions, and this, in turn, influences the cognitive processes of individuals. This neuro-cognitive view calls into question the classical view of internalist cognition of higher cognitive processes that function independently of emotions and, consequently, culture (Han, 2013; Han & Ma, 2015). In this fashion, the search for the homeostatic imperative (desired equilibrium) at a cultural level will be satisfied by the meeting of norms, cultural practices, beliefs, and values (moral systems) with the levels of consciousness of people who interpret emotions and

transform them into feelings that govern group selection, its permanence, and its evolution over time (Damasio, 2018).

In short, considering the social nature and neurological substrate of culture to approach it appears to be both pertinent and necessary. One cannot think of culture without the role of emotions, consciousness, and morality, or without human interaction, socialization, and communication. Therefore, the encounter of the two ways of understanding culture is what gives place to the concept of interculturality. To be more specific, interculturality has been defined as a dynamic process in which the human being moves past from their subjectivity (consciousness in Damasio) to intersubjectivity (the collective in Tomasello). Similarly, the most complex concepts of shared intentionality, social beliefs, social representations, shared values, and joint attention and action, among others, are born with the encounter between the individual and the group (Rodríguez, 2018).

Essentially, on the one hand, interculturality brings in some philosophical reflections that account for the flow of different epistemologies without mutual rejection, *mutatis mutandis* (Gosselin, 2010). On the other hand, it brings holistic ontologies which possess such characteristics. Hence, the claim that this manuscript focuses on is the mechanisms of naturalization of the philosophical concepts (Estany, 2022b) that are the basis of interculturality and its encounter with cognitive neuroscience. In this way, while conceptual and theoretical problems such as validity, relativity, objectiveness, and subjectiveness, among others, are involved, the focal point of this study is to reveal the mechanisms of naturalization of philosophical concepts and their possible neurocognitive substrate. The scope and saturation of such encounters will be discussed in the final paragraphs of this article. However, there remains the question: What are the mechanisms of naturalization of consciousness, self-control, identity, alterity, social mind, and morality through the prism of cognitive neuroscience?

Methodology

Following a non-exhaustive and heterogeneous conceptual analytical approach (Zanghellini, 2017), the methodological foundation of the study comprises three specific processes. The first process consists of the conceptual approach and

description of the philosophical constructs anticipated *a priori*. The second process consists of the previous analytical encounter with a hypothetical-deductive approach, where the naturalization of each philosophical concept is reviewed by following the three classical possibilities: methodological symmetry, epistemological replacement (partial or total), and analogy (Estany, 2022a). Based on the preceding, one deduces that processes one and two are coherently interconnected, so they are not presented in isolation. The third process consists of presenting the proposal for the Elemental Intercultural Imprint model (ELINIM), which serves as a complement to the two preceding processes.

Results

Parallel between the Philosophical Unit and the Neurocognitive One: Towards a Conception of the Basis of Interculturality

Below there is an analytical conceptual analysis of the natural replacement from consciousness as attention, self-control as self-regulation, identity as self-reference memory, alterity as empathy, the (social) mind as Theory of Mind, and moral as moral cognition.

From Consciousness to Attention

A brief epistemological journey shows that the concept of consciousness has been the subject of extensive debate without a categorical answer. Numerous philosophical perspectives on consciousness involve an introspective and subjective process. This idea was first established by Descartes (2003), who viewed consciousness as a personal and internal testimony. Likewise, Diderot and D'alembert (2017) argue that *conscience* is "the opinion or inner feeling that we have of what we do" (p. 243). In contrast, consciousness is also conceived as a neurobiological substrate-based perceptual process. Plato was one of the first to suggest that consciousness-related phenomena reside in the brain, calling into question the deliberate attitude of introspection (Dal Maschio, 2018). Locke (1999) defines consciousness as "the perception of what passes in a man's own mind" (p. 98). In this manner, the perceptual stance of consciousness affords the opportunity to empirically investigate it via brain structures. Hence, the position of consciousness at the level of perceptual processes (Dehaene, 2014)

and attention (Graziano, 2015) would be situated exclusively in the soft problem of consciousness, excluding the naturalization of consciousness as a subjective interpretation of experience (Chalmers, 2013).

As is evident, a form of epistemological reductionism that confines consciousness to a physiological state of the nervous system has supported its naturalization. This starting point categorically rejects as the basis of consciousness perspectives of metaphysical (Chalmers, 2017) and quantum (Stapp, 2001) natures because they escape a positivistic approach, that is, to constitute a tangible, measurable, and falsifiable phenomenon. Once again, the emphasized method of naturalization is the reduction of the phenomenon to a tangible extent that allows us to define consciousness as "a functional state of the brain characterized by synchronization in the oscillatory activity of certain populations of neurons distributed in different centers and connected to each other by loops" (Ferrús, 2018, p. 14).

With such an evidence-based epistemological stance, it is worth observing the most prominent model in terms of empirical experimentation with consciousness. Following the postulates of Baars (1989), Dehaene et al. (2006) suggest that the code of consciousness is explained by the Global Neuronal Workspace. This theoretical construction stands out for "acceptance of specific brain centers and connectivity pathways for conscious processing" (Ferrús, 2018, p. 74). As neurocognitive support, the authors postulate, from their experiments at the level of visual attention, three systems of the Global Neuronal Workspace, which would begin with a subliminal state, advance to a pre-conscious state, and end in the final conscious state. The rise of this proposal topographically collects the involvement of a greater number of neurons in each stage, being merely sensory at the beginning and completely cognitive in the latter. The connectionist perspective would be given by two orientations: horizontal and vertical. The former lies in the connection of pyramidal neurons to intracortical areas, and the latter lies in the joining pathways of the thalamus with the prefrontal and parietal cortex (Dehaene et al., 2006).

From Identity to Self-reference Memory

Since Aristotle, there have been three fundamental laws that directly impact the ontological nature of entities and the properties that define them: 1) the law of identity; 2) the law of excluded middle; and 3) the law of non-contradiction (Aristotle, 1983). In this section, the focus is on the first law regarding the fact that entities are identical to themselves, expressed in the logical formula $\forall x\ x=x$ (Ruiz, 2018). Parmenides had already argued that "what is is, and what

is not is not", because "one cannot, at the risk of some loss in communication, maintain both that something is and that it is not" (Stannard, 1960, p. 531). This conception of identity has contributed to the origin of the most classical laws of thought (Audi, 1999), but it is not necessarily the notion that gives birth to the psychological identity referred to as the Self, defined as follows:

> [...] A set of meanings applied by actors to the physical and subjective reality, more or less blurred, of their lived worlds, built through another actor. Thus, identity is a perceived sense given by each actor about himself or other actors. (Mucchielli, 1999, p. 60).

Psychological identity may appear in the form of applied meanings and it may have the pretension of naturalization, if cognition gives rise to the identity of substance and relationship (Saussure, 1978), one in which people find habits (and frameworks of validity) as interpretants (Colapietro, 1989) of their experience. In this way, the sense of the Self emerges consciously, individually, and subjectively, allowing the subjects to know themselves in relation to the still-emerging difference with others (Akin, 2018). From this standpoint, it is understood that the concept of identity would rely on the neurocognitive constructs of memory and consciousness since it is necessary to pay attention (Dehaene et al., 2006) to the lived experiences (their essence and relationships: the Eidos) that are transferable to other moments and valid for themselves through habits (Colapietro, 1989).

The above means that one could expect a naturalization of identity through the Global Neuronal Workspace, consciousness, on the one hand, and of the hippocampus, amygdala, certain cortical areas, and other memory-related neurological structures on the other hand.

Functional magnetic resonance studies found that the medial prefrontal regions are involved in self-related processing (Denny et al., 2012). In addition, injuries in this area affect self-reference memory, so the neurons associated with it have been referred to as the self-neurons (Martone, 2022). Particularly, the ventromedial prefrontal region is usually activated during tasks requiring self-reflection, and both the ventromedial and dorsal prefrontal cortex are activated when the subjects reflect on their current situation against their past selves (Stendardi et al., 2021).

According to Martone (2022), lesions influencing the groups of neurons responsible for the past self and its projection into the future result in substantial changes to the self-concept of identity. Differences between healthy people and those with lesions in the ventromedial prefrontal cortex are widely significant in terms of their own descriptions using adjectives located in past and future contexts, with the linguistic reservoir to refer to those contexts being reduced

in people with injuries (Stendardi et al., 2021). Addis and Schacter (2011) demonstrated that, by stimulating the hippocampus, people find it harder to talk about themselves and project themselves into future plans, which would have an impact on their episodic memory. As expected, the concept of identity (as self-reference) is required for the ethnocentric stages that will then become ethno-relative (Chen & Starosta, 2000), and its naturalization is possible through methodological symmetry and the transfer of philosophy and psychology to cognitive neurosciences.

From Self-control (the Self as Center of Power) to Self-regulation

Thinking of consciousness as a perceptual and attentional process entails seeing the powers that a person can activate toward their power and control. The concept of self-control originates from Peirce's theory of signs (1908), which leads to human agency. The author proposes that agents possess the power to exert real, albeit limited, control over the course of their behavior, manifested in three levels of creative powers: the power of sensation, the force of action, and the strength of habit formation. In Peirce's words, "The self is a center of power and control" (Cited in Colapietro, 1989, p. 42). Ergo, Peirce repeatedly discusses the close relationship between self-control and human characteristics, i.e., the branches of their social relationships and the goal to which every subject aspires (Boero, 2009). These social relationships indicate the need for self-control to create interculturality; without the ability to resist instinct and impulse in favor of self-regulated actions, the principle of cooperation and survival could not take place (Tomasello, 2007).

Following that, the semiotic perspective of Peirce (1974) assumes a triadic relationship between a sign or representative (firstness), an object (secondness), and an interpreter (thirdness). The existence of the sign is essential for a relationship between the object and the interpreter to exist. The sign is something that represents another thing, its object, as distinguished from the dynamic object. Specifically, the dynamic object is composed of the real object and the mediated object; the object, as it is, is represented by the sign, and the interpretant is its resultant effect. Conspicuously, the semiosis system is itself a regulation and self-control system that rests on the interaction of firstness, secondness, and thirdness (Colapietro, 1989). This system provides entities (subjects in this case) with dynamic roles that activate and inhibit functions as their triadic relationship changes.

To illustrate, while the object determines a sign, the sign determines the interpreter; the latter can modify signs in the future, while, as a product of this first semiosis, the first interpreter passes to the place of the sign in a new and

repeated semiotic triad, generating "continuity", an infinite flow of signs that occurs inexorably in a context. In Savan's (1988) words,

> [...] one must ask, what is the context within which the sign functions, for its community of interpretants? And what, within the context, makes the difference between true and false, correct or incorrect, acceptable and unacceptable, in the functioning of the object of such signs. (p. 16).

Here, the regulatory character of the context is also depicted, it leads to the assumption of validity criteria, which depending on the context, will limit the power of the Self.

As a transition to cognitive neurosciences, a partial reduction, in which the interpreter (the effect that generates a sign) can be different in nature, namely, 1) emotional: understood as a practically automatic and instinctive primary process; 2) energetic, which implies passing to the deadline of a particular action; and 3) normative, in which interpreters obey a more general, common and conditional order. It is from these final interpreters that the subject consolidates habits (Vilà, 2015), that is, the disposition to act in a certain way in certain circumstances, and to attribute a certain meaning to a certain sign in a particular and familiar context, which is translated as a social and collective act, i.e., intercultural. In Peirce's words, "to learn is to acquire a habit" (Cited by Colapietro, 1989, p. 88) and the habit is formed by the effect of the previous signs, such as catalysts that reinforce or change habits using what the subject considers valid or true (Boero, 2009).

Colapietro (1989), paraphrasing Peirce (1877), asserts that the human mind is an extraordinarily complex and hierarchically ordered network of habits, the majority of which are not the result of the activity of the mind but rather the result of the innate constitution of our bodies or the actual course of our experience. Here, the Self, or the capacity for control and power of the human mind, is released and uses its creative powers as an autonomous agent. Following Peirce, the type of mind that can evolve into a Self, an autonomous agent, must possess three powers: to feel, to act, and to learn. In the first place, this includes not only being able to experience emotions but also having the capacity to become conscious and control one's emotions; in the second place, the power of action that allows the subject to modify something; and in the third place, the power to acquire habits, which is only possible when the subject has passed through the two preceding powers.

In distinguishing the cognitive mind from the rational mind, Colapietro (1989, p. 113) summarizes Peirce's position, indicating that all agents with the capacity for acts of interpretation possess a cognitive mind, even if such acts are instinctive. Nevertheless, it is a mind that, in addition to being cognitive,

has control over some of its acts of inference, meaning that it can regulate the formation of several of its behaviors. Peirce's insistence that reasoning needs self-control and self-criticism stems from the previous idea. It can be deduced that the most important aspect of mental phenomena would be the autonomous agent's control over its own behavior. According to Colapietro (1989), "the phenomena of the mind are *either* themselves the principal objects of criticism and control" (p. 106), which can be interpreted as factors in the process of self-directed action. The author identifies the following as foundational elements of the Peircean perspective. 1) Semiosis, in which consciousness functions as a sign. 2) The habit, which predisposes the agent to act in a particular manner under specific conditions. 3) Self-control autonomy, which allows the subject to regulate their behavior based on social and ideal norms. Lastly, the capacity for self-control and self-criticism enables autonomous agents to evaluate and critique each action considering their future behavior.

According to Carver and Scheier (2011), human behavior is a continuous flow of actions aimed at achieving objectives, accompanied by constant feedback on the behavior itself. This requires self-evaluation and the ability to correct errors to make the necessary adjustments and remain on the path toward the desired goal, which typically entails resisting impulses or responding to external disturbances. In this view, self-control is associated with the ability to manage the cognitive, emotional, and behavioral resources necessary to achieve an objective; this includes adapting to change and accommodating and modifying behavior in response to environmental demands (Robledo & Ramirez, 2023).

In general, self-control enables the subject to inhibit a predominant or automatic response, thereby enabling alternative, rational responses. The subject would be at the mercy of his impulses and instincts if he lacked this capacity for self-control (Baumeister & Monroe, 2014). From this epistemological perspective, the key term for comprehending self-control is 'goals', which can be translated as the projection of behavior to a moment in the future with a specific purpose (Carver & Scheiler, 2011). This premise appears consistent with Peirce's conception of self-control as the capacity of an individual to moderate their emotions and behaviors through reason and, as a result, to direct their actions from ideals rather than biological impulses.

To identify the neurocognitive substrate that supports and naturalizes self-control, it is necessary to distinguish between two regulatory processes. From one angle, every living organism possesses physiological self-regulatory mechanisms of an autonomic nature that drive the continuous pursuit of systemic equilibrium (homeostasis). From another angle, this discussion focuses on the processes of intentional self-regulation, as such processes normalize a distinct

autoregulatory capacity in the human cognitive processing capacity (McGeer & Pettit, 2002).

Cognitive neuroscience's approach to the human capacity for self-control has been progressive. One of the first contributors to this discussion was Luria (1981), who posited three interconnected functional nodes: the first functional unit is associated with the alert-motivation mechanism, composed of the limbic and reticular systems; the second unit is responsible for the reception, processing, and storage of information, integrated by the post-Rolandic cortical areas; of association and the third unit is responsible for programming, control, and execution.

Luria conferred the prefrontal cortex, in conjunction with other subcortical regions, the primary responsibility for regulating, monitoring, and managing the subject's responses. In an analogy proposed by Goldberg (2015), the prefrontal cortex can be seen as the CEO of the nervous system, in charge of superior cognitive functions, like executive functions, implied in the control of thought, action, and emotion (Müller et al., 2009). In essence, the prefrontal cortex would be responsible for higher-order cognitive processing, and its function would be to foster the development of pre-cultural and pre-moral states in humans, thereby promoting the emergence of cultures (Damasio, 2014).

From the Mind (and the Social Mind) to Theory of Mind

One of the most traditional ideas of philosophy is that humans and, to varying degrees, other primates possess mental abilities that are traditionally interpreted as products of structural and functional brain processes which are less tangible, to some extent (Bruner, 2018). Descartes' rigorous description of the qualities of the mind is the outcome of his work on thought (Rodríguez, 2018). The mind is an object of study in phenomenology, psychology, and philosophy of mind, among other fields. However, the mind is often seen as the antithesis of eliminative materialism due to the dualistic nature inherited from Descartes, which forces us to picture it as a metaphysical construction. Because of this epistemological reductionism, the naturalization of the mind is usually equivalent to the product of the functioning of the central nervous system (Bruner, 2018). Therefore, the mind consists of at least states of consciousness, identities, and self-control (the self as center of power), which can be empirically observed as attention, self-reference memory, and self-regulation.

However, the individual mind would succumb to solipsism, which would prevent him from recognizing interculturality. In this regard, Peirce postulates semiotic interaction, which includes contact with other minds, as discussed

previously. In this regard, there are two valid premises: "the community precedes the individual" and "the self knows itself in relation to others" (Cited by Colapietro, 1989, p. 73). The first premise demonstrates that human beings are born with the essential baggage to be influenced by the signs of a world that is already physically and symbolically constructed, a world full of signs. Therefore, one would be able to interpret the signals, but this could only be accomplished through interaction with other minds in the community. As Peirce stated,

> [...] man is not whole as long as he is single, that he is essentially a possible member of society. Especially, one man's experience is nothing, if it stands alone [...] It is not 'my' experience that has to be thought of; and this 'us' has indefinite possibilities. (Cited by Colapietro, 1989, p. 122).

This relationship with others is what enables humans to construct meaning and truth, allowing them to share a common consciousness, which is only possible through communication and interaction. Such communication and interaction are made possible by theorization of the own mind and the mind of others, which inevitably results in the connection between the individuality and collectivity of humans (Astington & Baird, 2005). Accordingly, the most fundamental aspect of human nature is its continuous communication with others and the world; what Peirce referred to as semiotic intersubjectivity is currently known as the Theory of Mind in the cognitive sciences. With the discovery of Mirror Neurons, the fundamental theoretical and conceptual tenets of the Theory of Mind became observable and verifiable, almost by serendipity. Di Pellegrino et al. (1992) observed the activation of the ventral premotor cortex in macaques as they were observing actions. The activation of these regions in the macaques without the actual performance of the actions was interpreted as the construction of the minds beyond the individual mind.

Since then, interest in the Mirror Neuron Mechanisms has expanded to include research on humans, who, due to their Theory of Mind, possess the ability to envision and simulate actions for various purposes, such as predicting and explaining the behavior of others (Rivière & Núñez, 2001). Research in Theory of Mind has come to suggest the Theory of Mind Network, comprised of the medial prefrontal cortex, including the dorsomedial and ventromedial portions, the right temporoparietal junction (and to a lesser extent the left), the precuneus, the temporal pole, and the superior temporal sulcus, as demonstrated by research on humans using a variety of tasks and techniques to examine activation areas (Carmona, 2014; Gazzaniga, 2014).

Now, there is a demand to divide the Theory of Mind Network into primary (medial prefrontal cortex, temporoparietal junction) and secondary (precuneus,

temporal pole, and superior right temporal sulcus) processes. The cognitive processes associated with the junction of the temporoparietal lobes are the monitoring of reality's change and the shifting of attention from one's own mental states to those of others. The medial prefrontal cortex, for its part, is associated with abstraction and reflection processes, as well as the construction of distinct temporal-spatial realities. Regarding the secondary areas, the precuneus is responsible for constructing images of past events that also permit projections into the future; the temporal pole appears to play a role in the integration of multimodal information with emotional-visceral responses and the perception of complex stimuli in complex social acts; and finally, the superior temporal sulcus is associated with the perception of biological movements (Carmona, 2014). As can be seen, the individual mind interacts with other minds by focusing on their self-awareness and self-regulation of action in relation to other minds.

From Alterity to Empathy

Until now, it has been demonstrated that people possess an identity, recognize themselves as beings, and are able to comprehend that their mind is distinct from the minds and identities of others; this argument shows an active emphasis on Peirce's concept of intersubjectivity, which constantly revolves around the need for otherness for self-disclosure, the powerful Self, that is to say, of the interaction of the minds. Peirce highlights the need for otherness, asserting that "when a person finds himself in the society of others, he is just as sure of their existence as of his own, though he may entertain a metaphysical theory that they are all hypostatically the same ego" (Cited by Colapietro, 1989, p. 79). Here, the concept of otherness may refer to the love for truth and humanity in a sort of continuity, a premise that is supplemented by Colapietro (1989), who states that "'Continuity' here implies that the distance between two minds, rather than being the most absolute breach in nature, is the most fordable strap in this domain" (p. 78); such a continuum is possible due to the continuous semiotic and intersubjective flows.

Levinas also manifests that alterity is the starting point for bridging the gap between the Self and others. The central axis of his proposal is the inequality of the relationship's starting point, the position of the vulnerability of the person who interpellates 'me': their *visage* (Levinas, 1982). The instant a subject looks at the *face* of others, it becomes possible to approach them while respecting their freedom and without erasing their uniqueness or alterity (Fernández, 2015). Hence, alterity, as intersubjectivity guaranteed for semiotic and humanistic continuity through interaction, is bolstered by the concept of self-construction, which begins with the presence of others, where the absence of selfishness and

illusory solipsism makes way for interaction and authentic recognition with and from others, thereby fostering the emergence of empathy.

Empathy, the concept naturalized as the evolution of alterity, can be observed at the level of neuronal group activity in the cerebral cortex. The correct operation of empathy also requires the Theory of Mind and the other concepts discussed thus far. Two specific brain regions, the anterior insula, and the anterior cingulate cortex, have been associated with the processing of empathy in humans (Carmona, 2014). These two regions have been identified as those responsible for self-managing emotional states and bodily states and sensations, as demonstrated by studies using neuroimaging techniques, which provided evidence of the constant activation of these regions when people were exposed to painful and non-painful images (Singer & Klimecki, 2014).

From Morality to Moral Cognition

Moral philosophers have always been interested in morality. In fact, two distinct schools of thought are worth mentioning. The first is represented by those who believe that emotions hinder rational thought and moral judgment; as manifested by the Stoics, Plato, Descartes, Spinoza, Kant, and Nietzsche, among others (Wallach, 2010). The second current is represented by those who believe that "emotions play an essential role in life and ethics" (Restrepo et al., 2022, p. 78), Aristotle, Pascal, Hume, and Smith among them (Wallach, 2010). Veritably, "Rousseau, Hutcheson, and Schopenhauer were interested in showing that certain emotions, such as pity, love, and care, lead to moral behavior" (Wallach, 2010, p. 422). In addition, the essential distinction falls upon classical dichotomies such as reason-emotion, theoretical-practical factual world-value issues, objective-subjective, and absolute-relative.

In proximity with the cognitive neurosciences, Churchland (2011) currently supports the thesis of eliminative materialism, in which morality is reduced to the activation and inhibition of neurotransmitters such as oxytocin, serotonin, and vasopressin arginine (and their receptors) involved in a complex social structure where they converge on "care or attention to others; recognition of the psychological states of others; problem-solving in a social context; and learning of social practices" (Estany, 2022a, p. 301). This eliminative position proposes defining morality as "a natural phenomenon: limited by the forces of natural selection, rooted in neurobiology, shaped by local ecology, and modified by cultural developments" (Churchland, 2011, p. 191). Although the position reduces to neurobiology, the author promotes bridging it with social sciences, where culture mobilizes the internalist moral process. Thus, Churchland applies

the naturalization process of morality from a totalitarian instance where the thorough application of empirical norms of natural sciences is imperative.

Early assimilation of current accounts on morality appears to cast aside the traditional dichotomies that separate morality from reason (the philosophical thesis) as empirical evidence converges in the acceptance of the implication of emotions (Damasio et al., 1991; Moll et al., 2008) and social intuitions (Haidt & Bjorklund, 2008), and even of dual models of reason and emotion (Greene et al., 2008). At the level of naturalization, there is an abandonment of aprioristic epistemology and an acceptance of neurocognitive methodologies from several theoretical constructs that comprise moral cognition, namely moral judgment (Young & Saxe, 2008) and moral reasoning (Knobe, 2005; Paxton & Greene, 2010). Let us mention Kant's (2005) contribution to *a priori* and *a posteriori* knowledge since the concepts of moral judgment and moral reasoning in cognitive neurosciences are apparently derived from there, despite the lack of pretension of a categorical imperative (Greene, 2022).

In *The Critique of Pure Reason*, Kant specifically breaks down the terms concept, judgment, and reason. The concept (the objects granted to humans as phenomena) is framed by sensitivity and judgment within comprehension (the thought or thought phenomena). As faculties of the human mind, synthetic and analytic judgments are constituted by concepts. Kant (2005) identifies reason (in its logical sense) as the "faculty of the unity of the understanding rules under principles" (p. 220). The preceding assertion suggests that there is a continuum between moral judgment and moral reasoning, both of which are based on concepts of persons. Moral reasoning is "the conscious mental activity through which one evaluates a moral judgment for its (in)consistency with other moral commitments, where these commitments are linked to one or more moral principles and (in some cases) particular moral judgments" (Paxton & Greene, 2010, p. 516).

At first glance, it is apparent that moral cognition (judgment and reasoning) is conceptually close to Theory of Mind (Monasterio, 2020; Knobe, 2005; Knobe & Gendler, 2013; Churchland, 2011); in consequence, a group of authors advocate for a specific field in which the two converge, namely Social Cognition (Astington & Baird, 2005). It has been observed through the application of functional magnetic resonance imaging technologies, that the transversal cognitive constructs for humans in Social Cognition are intentionality and beliefs (Young & Saxe, 2008). The structures and functions of the cerebral cortex implicated in the so-called Moral Reasoning Network are well understood. The Right Temporo-Parietal Junction, Precuneus, and Medial Prefrontal Cortex process moral information at different ages and in distinct contexts, as demonstrated by empirical research (Young et al., 2007; Young & Saxe, 2008). Without question, the neurocognitive

plane of morality is born at the intersection of the morphology of the cerebral cortex, which serves various functions in different regions and networks, resulting in the conscious consideration of moral phenomena. This intersection would provide broad depth in interculturality, allowing moral beliefs, shared value judgments, as well as attention and collaborative action in the intercultural human to emerge and be consolidated.

The sustaining of naturalization of the philosophical concepts in question as basic and necessary constructs for interculturality, results in the proposition of a neurocognitive model as the basis for the human being's interculturality. Consequently, the interconnection of essentially internalist cognitive processes and externalist ones is being accepted as the basis of interculturality. Two particularities arise from there: 1) that the ontological basis of interculturality possesses individual traits, such as subjectivity, and collective traits, such as intersubjectivity; 2) that attention, self-regulation, self-reference memory, Theory of Mind, empathy, and moral cognition are naturalized through the methodological symmetry of cognitive neurosciences (Table 1), which leads them to be contemplated under Cartesian dualism but not under internal-external dualism.

Table 1. *Conglomerate of the bases of interculturality.*

Philosophical Unit	Type of Naturalization	Neurocognitive Unit	
		Cognitive Unit	Neurobiological Regions
1. Consciousness	A: Partial replacement. B: Methodological symmetry.	Attention	Global Neuronal Workspace depending on perceptual modality
2. Self-control	A: Partial replacement. B: Methodological symmetry.	Self-regulation (programming, regulation, and verification)	Prefrontal cortex

3. Identity	A: Partial replacement. B: Methodological symmetry. C: Analogy	Self-reference memory	Ventromedial prefrontal cortex and hippocampus
4.The mind (and the social mind)	A: Partial replacement. B: Methodological symmetry.	Theory of Mind	Medial prefrontal cortex (dorsolateral and ventromedial), right temporoparietal junction (and to a lesser extent the left), Precuneus, temporal pole and superior temporal sulcus
5. Alterity	A: Total replacement. B: Methodological symmetry.	Empathy	Anterior insula and anterior cingulate cortex
6. Morality	A: Total replacement. B: Methodological symmetry.	Moral Cognition	Right temporo-parietal junction, Precuneus, medial prefrontal cortex

Brief Presentation of the Model

As for the structure of the model, the genesis of interculturality seems to be attention, which then adheres to self-regulation, which also joins self-reference memory, until it reaches moral cognition. This set structure, except for the genesis, indicates that each subset is a necessary and sufficient neurocognitive construction for interculturality. Such a formulation can be summarized in the following operation: Interculturality (X) is constituted, at the neurocognitive level,

by the integration of the whole of attention, which at the same time is a subset of B, which are subsets of C, which at the very same time are subsets of D, etc. Where A is attention, B is self-regulation, C is the memory of self-reference, D is the Theory of the Mind, E is empathy, and f is moral cognition; be the expression:

$$X = A \subseteq B,$$
$$A \wedge B \subseteq C$$
$$A \wedge B \wedge C \subseteq D$$
$$A \wedge B \wedge C \wedge D \subseteq E$$
$$A \wedge B \wedge C \wedge D \wedge E \subseteq f$$

Said otherwise,

$$X = \subseteq (((((A)\ B)\ C)\ D)\ E)\ f)$$

Figure 1. *Model of the logical structure of interculturality.*

However, given the social and intersubjective properties of the model, since (inter)culture is not entirely an internal cognitive process and not a completely external one (Han, 2017), it is pertinent to assume the primary metaphoric concept of Lakoff and Johnson (1999), which facilitates finding support on concrete experience to represent the dynamic structure of a model. This simplifies picturing that sets can be defined by neurocognitive structures that are their own but are not hermetic. Genuinely, by assuming that interculturality is the product of the interaction of its sets, a fingertip composed of papillary ridges and interpapillary lines could be projected. This type of fingertip is characteristic of all human beings that have fingers, verified in what is called the fingerprint (an imprint). An imprint, although with the same characteristics (attention, empathy, etc.) varies between people and contexts.

This metaphor of the imprint provides the model with the property of dynamism, so that interculturality depends on the person, who, despite having the same universal characteristics under neurotypical conditions, will diversify the implication, consciously or not, of the neurocognitive constructs that happen to him ($X = \subseteq (((((A \wedge\vee B) \wedge\vee C) \wedge\vee D) \wedge\vee E) \wedge\vee f)$), mediated all these by his experiences in the cultural niche of which he is an active part, which will be visible in his intercultural action. Additionally, being an elementary model, other ridges and interpapillary lines (neurocognitive structures) can appear as part of the intercultural imprint of people (Figure 2). For now, the model proposed is

the *Elemental Intercultural Imprint* as the dynamic neurocognitive set responsible for the emergence of interculturality in human beings.

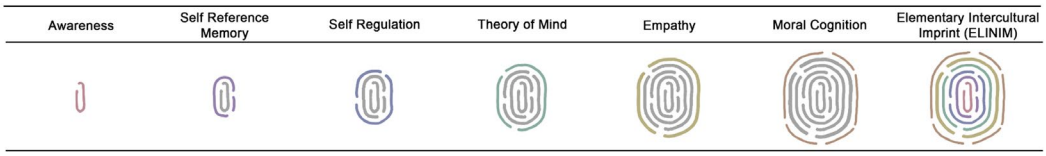

Figure 2. *Elemental Intercultural Imprint (ELINIM).*

Conclusions and Projections

As a result of the analysis of the cognitive and neurocognitive dyads as well as the proposal for the model of Elemental Intercultural Imprint, this study affirmatively corroborates the study hypothesis, namely, that the progressive naturalization of consciousness, self-control, identity, social mind, alterity, and morality can reveal the neurocognitive mechanisms of interculturality in people. In this regard, it was found that methodological symmetry with cognitive neurosciences, that is, the adoption of neuroimaging techniques and their respective naturalist correlates, represents a constant form of naturalization of philosophy. For their part, the epistemological replacement and analogy are presented in the naturalization of some concepts but not in all, which also highlights the imperative need for philosophy, without which there would be no possibility of naturalization at all.

Consequently, it can be concluded that interculturality, as an object of study, should be addressed not only through tangible intercultural acts (communicative, corporal, etc.) but also through the basic neurocognitive mechanisms. Therefore, it would be useful to observe the neurocognitive human traits that other authors suggest studying, such as the social and cognitive circularity of interculturality: the loop system (Han & Ma, 2015). For the time being, it is established that the elemental neurocognitive basis of interculturality lies in attention, self-reference memory, self-regulation, Theory of the Mind, alterity, and empathy, which, dynamically and contextually, constitute the Elemental Intercultural Imprint in humans.

All things considered, it seems relevant to mention that human beings can pay attention (in different degrees) to some phenomena that might elucidate their own existential correlate in the here and now, seen in the past and projected in the future, full of volition, which they must self-regulate according to their goals. All of which meets the theorization of their own mind and that of others, against which they must be empathic and co-build the moral foundations that shape the

norms, codes, and values that, later, will define them as culture. It is important to notice the transition from the subjective to the intersubjective because it is precisely that concept that rejects the dichotomy of internalist and externalist cognition by being contemplated as Peircean continuity.

As expected, the study of interculturality under the prism of the Elemental Intercultural Imprint brings great challenges. On the one hand, the degree of involvement of each neurocognitive component remains under discussion because this will depend on the context and the sensory modality used. In addition, the mechanism of methodological symmetry as a naturalizing strategy of preference over the other mechanisms of naturalization remains to be discussed. Another great challenge is overcoming the hegemonic places from which interculturality is often approached, studies circumscribed to WEIRD populations (Western, Educated, Industrialized, Rich, Democratic) that underestimate the impact of cultural variation on human cognition and bias our understanding of it (Barrett, Stich & Laurence, 2012; Núñez et al., 2019), and perspectives permeated by the dominant voice of certain regions that invisibilize academic contributions constructed from non-WEIRD regions (Barrett, 2020). On the other hand, the characteristics of non-prototypical neurodevelopment, such as ADHD and the Autistic Spectrum Disorder, can guide against the necessary and sufficient neurocognitive properties in the Elemental Intercultural Imprint, so that the debate of modularity, connectionism, and, why not, embodiment may be further explored. Finally, as Han (2017) would consider, the holistic or atomized study of the Elemental Intercultural Imprint seems to have important keys for intercultural communication, peace, and good quality of life.

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