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CONSTRUCTING MEANING: THE ROLE OF ARISTOTELIAN ETHOS, PATHOS, AND LOGOS THROUGH A NEUROSEMANTIC LENS

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Abstrak

Penelitian ini mengintegrasikan retorika Aristotelian (ethos, pathos, logos) dengan neurosemantik untuk memahami konstruksi makna dalam otak manusia. Dengan pendekatan analisis konseptual, penelitian ini mengeksplorasi mekanisme neural yang mendasari strategi komunikasi berbasis ethos, pathos, dan logos. Hasil menunjukkan bahwa integrasi elemen retoris dengan neurosemantik meningkatkan efektivitas komunikasi dalam berbagai konteks, seperti pendidikan, pemasaran, dan komunikasi politik. Ethos membangun kredibilitas melalui aktivasi ventromedial prefrontal cortex (vmPFC), pathos memicu keterlibatan emosional melalui amigdala dan insula, sedangkan logos memperkuat argumen logis melalui dorsolateral prefrontal cortex (dlPFC). Penelitian ini juga menyoroti aplikasi praktis dalam terapi bahasa dan desain komunikasi berbasis neurosains untuk meningkatkan efektivitas penyampaian pesan.

***Kata kunci**: Ethos, Logos, Pathos, Neurosemantik, Retorika Aristotelian.*

Abstract

This study integrates Aristotelian rhetoric (ethos, pathos, logos) with neurosemantics to examine meaning construction in the human brain. Using a conceptual analysis approach, it explores the neural mechanisms underlying ethos-, pathos-, and logos-based communication strategies. The findings indicate that integrating rhetorical elements with neurosemantics enhances communication effectiveness across various domains, including education,

marketing, and political discourse. Ethos establishes credibility through the activation of the ventromedial prefrontal cortex (vmPFC), pathos fosters emotional engagement via the amygdala and insula, while logos strengthens logical reasoning through the dorsolateral prefrontal cortex (dlPFC). This study also highlights practical applications in language therapy and neuroscience-based communication design to optimize message delivery.

***Keywords**: Ethos, Logos, Pathos, Neurosemantic, Aristotelian Rhetoric.*

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INTRODUCTION

Effective communication strategies rely on a deep understanding of how messages are received and processed by audiences (Livingstone, 2008). Aristotelian rhetoric, which consists of ethos, pathos, and logos (Aristotle, 2007), has long served as a fundamental framework in the study of persuasion and communication strategies. These three elements function as persuasive tools and conceptual frameworks for understanding how messages are conveyed and interpreted by audiences in both political and social communication (Cao, 2023). In communication studies, ethos plays a role in establishing the speaker's credibility, pathos activates audience emotions, and logos provides logical argumentation (Shabrina, 2016). Research indicates that the appropriate application of these three elements enhances the appeal and effectiveness of communication, as seen in advertisements, political speeches, and social media discourse (Fisher, 1969; Talaue, 2022).

However, this approach has primarily been examined within linguistic and social contexts without considering the neural mechanisms underlying its effectiveness. On the other hand, neurosemantics has emerged as a field that explores how the brain processes meaning, offering new insights into language and cognition (Pulvermüller, 2013). Studies in this field suggest that meaning comprehension involves the activation of the prefrontal

cortex, amygdala, and hippocampus, which function in processing both linguistic and emotional information (Pereira et al., 2018). Nonetheless, the integration of Aristotelian rhetorical theory with findings from cognitive neuroscience remains underexplored (Walker, 1990; Shen, 2011). This research seeks to address this gap by connecting Aristotelian principles of persuasion with neuroscientific findings to identify the neurobiological processes that enable ethos-, pathos-, and logos-based communication strategies to effectively shape audience understanding and responses.

This study aims to explore how the brain processes rhetorical elements and how neural activations associated with ethos, pathos, and logos influence communication effectiveness in various contexts, such as education, marketing, and political discourse. An interdisciplinary approach that integrates philosophy, linguistics, and neuroscience is employed to understand the relationship between language, emotion, and cognition in meaning construction. By examining the correlation between rhetorical strategies and neural activation, this research seeks to develop more effective, neuroscience-based communication strategies that are applicable across diverse fields.

Aristotelian rhetoric emphasizes three core elements of persuasion: ethos (the speaker's credibility), pathos (audience emotion), and logos (logical argumentation) (Talaue, 2022). This approach has been widely applied across disciplines, including politics, education, and marketing, as a foundation for constructing persuasive communication (Fisher, 1969; Shabrina, 2016; Zaenuri, 2017). In political communication studies, studies suggest that ethos, pathos, and logos complement one another in constructing strong and persuasive meaning. This is evident in the speeches of Soekarno and Susilo Bambang Yudhoyono, where ethos was predominantly employed to establish credibility and a positive public image (Rohimah, 2022). Additionally, in rhetorical analysis of social media discourse, nonprofit organizations tend to rely more on pathos (emotional appeal) than on ethos and logos,

demonstrating that emotion can be a primary factor in shaping meaning and influencing audience behavior (Auger, 2014).

Meanwhile, neurosemantics is a field that examines how meaning is constructed and processed in the brain through the interaction of language, cognition, and emotion (Binder & Desai, 2011). Studies in this domain reveal that meaning comprehension is not limited to linguistic levels but also involves complex neural activity, including the prefrontal cortex, amygdala, and hippocampus, which work together in processing received information (Pereira et al., 2018). This understanding provides new perspectives for explaining communication effectiveness from a neuroscientific standpoint.

If ethos relies on the speaker's credibility, research in neurosemantics suggests that this credibility is linked to activity in the ventromedial prefrontal cortex (vmPFC), which plays a role in social evaluation and trust (Li et al., 2013). Pathos, which pertains to audience emotions, is associated with the activation of the amygdala and insula in response to emotional stimuli. Research by Jezzini et al. (2015) indicates that these brain regions play a central role in processing emotional expression and perception, supporting the idea that emotional engagement in rhetoric has a neurobiological basis. Meanwhile, logos, which is grounded in rationality and logical argumentation, involves the dorsolateral prefrontal cortex (dlPFC), which is responsible for analytical processing and evidence-based decision-making (Friedrich & Friederici, 2013). By understanding the relationship between Aristotelian rhetorical principles and neurosemantic mechanisms, this study seeks to uncover how communication strategies can be designed more effectively based on the cognitive and emotional processes occurring in the brain.

Although these studies provide valuable insights into how each rhetorical element is processed in the brain, gaps remain in the literature regarding how these three elements interact to form effective communication. Most research has focused on each element in isolation without considering the integrative dynamics

between ethos, pathos, and logos within a comprehensive communication model. Furthermore, few studies have explored how these concepts can be translated into neuroscience-based communication strategies that are practically applicable in fields such as education and language therapy (Kieu, 2023). This research aims to address these gaps by presenting an interdisciplinary approach that bridges Aristotelian rhetoric and neurosemantics to understand how rhetorical elements can be optimized in communication based on neural processing.

This study makes a theoretical contribution by integrating Aristotelian rhetoric and neurosemantics to understand persuasion mechanisms. While ethos, pathos, and logos have long been fundamental concepts in communication studies, this research offers a novel approach by examining how each of these elements is processed in the brain through neural mapping. By linking Aristotelian rhetoric with neuroscience, this study enriches the literature in communication and cognitive sciences while providing a foundation for a new model that explains the interaction between language, emotion, and logic in meaning construction (Jacobs, 2015; Gibbons, 2018). Thus, this research not only advances theoretical perspectives in communication and neuroscience but also opens avenues for practical applications that enhance communication effectiveness across professional and academic contexts.

DISCUSSION

1. The Neurosemantic Basis of Meaning Construction

Neurosemantics is an interdisciplinary field that examines the relationship between neural mechanisms, language and meaning (Pulvermüller, 2013). Fundamentally, neurosemantics seeks to answer how meaning is constructed, represented, and processed in the human brain. In contrast to traditional linguistic approaches that view meaning as a symbolic construction in language, neurosemantics argues that meaning is rooted in neural activations distributed across different areas of the brain and influenced by sensorimotor experiences and social context (Hagoort, 2019). In this

context, meaning is not only processed as a static representation in linguistic structures but also involves interactions between perception, memory, emotion and reasoning.

Meaning in neurosemantics is constructed through a vast neural network, including the prefrontal cortex for meaning-based decision making, the temporal cortex for semantic representation, as well as the limbic system for the involvement of emotions in meaning processing (Binder & Desai, 2011). Neurolinguistic studies show that semantic processing is not limited to one specific area, but involves dispersed activation, especially in the ventral stream in language processing pathways (Hickok & Poeppel, 2007). Understanding meaning involves the integration of information from multiple sensory modalities, including physical and conceptual experiences (Barsalou, 2008).

In line with the principle of embodied cognition, neurosemantics argues that meaning is dynamic and connected to bodily and environmental experiences. For example, the concept of "heat" is not only abstractly encoded in language but also has a connection with the body's sensorimotor experience of heat. This suggests that meaning-making does not only occur at the linguistic level, but also in the relationship between brain representations and real-world experiences (Gallese & Lakoff, 2005). However, this approach has limitations as it does not fully explain how phenomenological awareness of meaning is formed. According to Merleau-Ponty (1945), phenomenology emphasizes that subjective experience derives not only from neural activity but also from awareness of meaning itself.

In this framework, understanding meaning does not only occur through language, but also through the activation of semantic memory, which involves the connection between concepts that have been stored in the hippocampus and medial temporal cortex (Binder & Desai, 2011). Therefore, when a person understands a word or concept, the brain not only accesses the meaning in isolation, but also connects it to previous experiences, emotional states, and social context (Hauk et al., 2004). However, if meaning is fully understood

simply as neural activation, then questions arise about intentionality—how meaning can lead to action or broader understanding (Searle, 1983). In the context of communication, meaning is not only internal, but also oriented towards the communicative intention of the speaker as well as the interpretation of the listener.

This neurosemantic approach can be the basis for understanding how meaning is constructed in human communication. However, neuroscientific studies show that meaning-making is not only a passive process but also active and predictive. The predictive processing model in neurocognition argues that the brain does not simply receive passive information from the environment, but actively builds hypotheses about meaning based on expectations and previous experiences (Clark, 2013). This suggests that the interpretation of meaning is dynamic and contextual, depending on how the brain structures information based on experience and the social environment. From a pragmatic perspective, this approach is close to the concept of neuropragmatism, which seeks to link biological processes in the brain with the socio-linguistic context in meaning formation (Mey, 2001).

In the context of communication, neurosemantics offers new insights into how humans understand and respond to meaning. As shown in neuroimaging studies, meaning in communication often involves interactions between brain systems that process language, emotion and social context (Huth et al., 2016). Therefore, understanding neurosemantic mechanisms can help in a variety of applications, such as natural language processing, language-based therapy and more effective communication strategies.

2. The Role of Ethos, Pathos, and Logos in Cognitive and Neural Processing

Aristotle, in his *Rhetoric*, outlined three fundamental dimensions of persuasion, ethos, pathos and logos as key tools in

building effective arguments. However, in the development of modern science, these concepts are not just treated as rhetorical principles, but also have profound implications in neuroscience and philosophy of mind. Cognitive neuroscience has provided evidence that the processes of credibility (ethos), emotion (pathos), and logic (logos) are not only represented in language but also have direct correlations with neural activity in various brain regions (Frith & Frith, 2012).

From a neurosemantic point of view, communication is not only a linguistic activity but also a process of meaning representation in the nervous system, where ethos, pathos, and logos work interactively to form understanding within the individual. However, this approach has limitations as not only neural mechanisms determine meaning and the interpretation of information, but also intentionality and reflective consciousness (Searle, 1983). Thus, to understand how the brain forms, processes, and interprets communication, we need to integrate empirical approaches in neuroscience and conceptual approaches in the philosophy of mind.

Ethos: Credibility, Social Evaluation, and the Representation of Trust

Ethos relates to the trustworthiness and credibility of the speaker which forms the basis for the acceptance of a message. Neurocognitively, the evaluation of a person's credibility occurs in the ventromedial prefrontal cortex (vmPFC) and orbitofrontal cortex (OFC), two brain regions that play an important role in social-based decision-making (Kawasaki et al., 2016).

The ventromedial prefrontal cortex (vmPFC) plays a crucial role in assessing credibility and processing social rewards, allowing individuals to evaluate a speaker's trustworthiness based on past experiences (Frith & Frith, 2012). Its activation increases when assessing intentions and moral character, suggesting that the brain not only responds to information but also constructs a mental model

of the speaker's integrity (Todorov et al., 2008). Similarly, the orbitofrontal cortex (OFC) contributes to decision-making by integrating emotional experiences, enabling individuals to evaluate the social consequences of statements or actions (Bechara et al., 2000). Damage to the OFC impairs credibility assessment due to a weakened ability to link linguistic information with social norms (Bechara et al., 1994). This highlights that ethos integration in the brain is both cognitive and emotional, as credibility is often judged based on conditioned emotional responses from past social experiences.

Ethos can be related to Dennett's (1987) concept of "intentional stance", that is, how humans automatically interpret the intentions of others based on mental models formed through social experiences. In this context, the brain not only judges the truth of a statement, but also who said it, suggesting that meaning in communication is highly dependent on social and normative factors.

Pathos: Emotion, Empathy, and Affective Resonance in Persuasion

Pathos refers to the emotional affect in communication, which plays a role in enhancing the affective resonance between the speaker and the audience. From a neuroscience point of view, emotional processing in persuasion mainly involves the amygdala, insula, and temporoparietal junction (TPJ) (Adolphs, 2002).

The amygdala plays a crucial role in threat detection and automatic affective responses, making messages that evoke strong emotions more likely to be remembered and accepted (Bechara et al., 2000). Heightened amygdala activation occurs when individuals encounter emotionally charged narratives that induce fear or empathy, explaining why negative emotions are often more persuasive than neutral ones. Meanwhile, the insula mediates the connection between internal emotions and external expression, indicating that emotional responses in persuasion are not merely automatic reactions but also results of affective reflection (Craig,

2009). In communication, individuals who craft emotional narratives aligned with the audience's experiences are more effective in fostering emotional engagement. Speaking in phenomenological terms, emotions are not only the result of neural activation, but also part of a world-oriented embodied consciousness (Merleau-Ponty, 1945). Therefore, emotional persuasion works not only through neural triggers, but also through individuals' subjective interpretations based on their experiences and culture.

Logos: Logical Processing, Argument Structure, and Bounded Rationality

Logos refers to the strength of logical arguments in persuasion, which is mainly mediated by the dorsolateral prefrontal cortex (dlPFC), hippocampus, and superior parietal lobule (SPL) (Friedrich & Friederici, 2013). The dlPFC regulates cognitive control and evidence-based reasoning, enabling logical assessment (Goel, 2007). It helps overcome biases (Prado & Noveck, 2007) and supports inhibitory control for precise evaluation (Tsujii et al., 2009). The hippocampus facilitates episodic memory, allowing individuals to connect new information with past experiences (Battaglia et al., 2011). Meanwhile, the superior parietal lobule (SPL) plays a role in hierarchical processing and abstraction, supporting the comprehension of complex argument structures (Dehaene et al., 1999). Logos can be attributed to bounded rationality (Simon, 1955), which emphasizes that although humans use logic in decision-making, they are still influenced by cognitive biases and information limitations.

3. The Integration of Philosophy, Rhetoric, and Neuroscience

An Interdisciplinary Approach to Understanding the Construction of Meaning

Understanding how humans shape and interpret meaning cannot be fully explained by a single discipline. Philosophy, rhetoric, and neuroscience each offer unique perspectives that,

when combined, provide a richer framework for understanding the construction of meaning in communication (Hagoort, 2019). Searle (1983) argues that meaning cannot be understood only as a symbolic representation in language, but also as a phenomenon of intentionality, where the mind is always directed towards something outside itself.

On the other hand, Aristotle (2007) elaborates that effective persuasion consists of ethos, pathos, and logos, each of which has a role in establishing credibility, emotional engagement, and logic-based argumentation. Pulvermüller (2013) adds that meaning in communication is not only constructed through language, but also through neural activation in the brain, suggesting that communication is not just a linguistic process, but also a biological phenomenon associated with complex neural networks. Therefore, the integration of philosophy, rhetoric, and neuroscience allows us to understand the multidimensional process of meaning formation, covering biological, social, and conceptual aspects.

Philosophy of Mind's Contribution to Cognitive Phenomena in Ethos, Pathos, and Logos

In the philosophy of mind, the processing of ethos, pathos, and logos can be understood as part of mental representation, enabling individuals to connect information with their experiences and communicative intentions. Dennett (1987) posits that humans adopt the intentional stance, interpreting others' actions based on assumed intentions. In neuroscience, credibility evaluation is processed in the ventromedial prefrontal cortex (vmPFC), which governs moral decision-making (Frith & Frith, 2012). Phenomenologically, Merleau-Ponty (1945) emphasizes that emotions are not merely neural activations but embodied experiences, involving interactions between the body and the environment. This relates to pathos, where the activation of the amygdala and insula illustrates how emotions enhance audience engagement in communication (Adolphs, 2002). Regarding logos, Fodor (1975) argues that symbolic representation in human thought is rooted in a modular mental

system, with the dorsolateral prefrontal cortex (dlPFC) and hippocampus playing key roles in evidence-based information processing (Goel, 2007). Searle (1983) asserts that intentionality allows individuals to comprehend meaning in communication based on goals and context rather than mere neural stimuli. Thus, the processing of ethos, pathos, and logos is not solely a linguistic phenomenon but also reflects how the brain represents, processes, and integrates meaning in social communication.

Neuropragmatism as a Bridge between Philosophy and Neuroscience in Rhetoric

Neuropragmatism emerges as an approach that bridges biological, social, and linguistic understandings in meaning construction (Mey, 2001). This perspective suggests that meaning is not solely an individual process but also a dynamic interaction in which the brain predicts and adjusts meaning based on context and experience. Regarding ethos, Kawasaki et al. (2016) argue that credibility is shaped not only by a speaker's character but also by audience responses, which dynamically process credibility through social experiences. In pathos, Saxe and Kanwisher (2003) emphasize that emotions in communication extend beyond amygdala activation, involving social interactions that enhance audience engagement. The temporoparietal junction (TPJ) plays a crucial role in empathy processing, allowing listeners to experience a speaker's emotions as if they were their own.

For logos, Hagoort (2019) posits that logical and evidence-based meaning-making does not occur in isolation but is embedded within a socio-linguistic context. The brain relies on semantic memory and cognitive prediction to assess whether an argument is logically valid or acceptable. Thus, neuropragmatism connects biological mechanisms with social contexts, demonstrating that meaning in communication results from the interaction between the brain, language, and social environment. The integration of philosophy, rhetoric, and neuroscience provides a multidimensional understanding of meaning construction in

communication. While the philosophy of mind explores conceptual aspects of intentionality and consciousness, rhetoric highlights linguistic persuasion strategies, and neuroscience offers empirical insights into the neural mechanisms underlying these processes. Approaches like neuropragmatism reinforce the view that meaning is not merely individual but also socially and contextually grounded, reflecting the dynamic interplay between mind, language, and brain.

4. Practical Implications and Applications

The integration between Aristotelian rhetoric (ethos, pathos, logos) and neurosemantics not only has theoretical implications but also contributes in various practical fields such as education, marketing, psychotherapy, and social communication. An understanding of how neural mechanisms and rhetorical strategies play a role in constructing meaning enables more effective applications across sectors (Hagoort, 2019).

Ethos, pathos and logos play an important role in improving learning effectiveness in educational contexts. Harmon et al. (2015) found that teacher credibility (ethos) has a significant impact on student trust, which is associated with ventromedial prefrontal cortex (vmPFC) activation in assessing authority. In addition, Gibbons' (2018) research showed that emotional engagement (pathos) can improve memory through amygdala activation, which explains why the use of stories and analogies in learning improves student understanding. On the other hand, Turner (2002) found that logical argumentation (logos) activates the dorsolateral prefrontal cortex (dlPFC), which allows students to develop better critical and analytical thinking skills.

Rhetoric-based approaches also have been shown to increase the effectiveness of marketing and advertising. Wang (2016) noted that ethos in the form of celebrity endorsers or authoritative figures can increase consumer trust in brands, while Auger (2014) found that emotion-based advertising (pathos) is more effective in creating

emotional attachment with audiences through activation of the insula and amygdala. Meanwhile, Liu et al. (2019) showed that the use of logos-based data and facts can strengthen message credibility and improve rationality-based decision-making.

In psychotherapy, an understanding of ethos, pathos and logos can enrich the therapeutic approach. Caro (1996) emphasized that therapist credibility (ethos) plays a role in establishing a strong therapeutic relationship with patients, which aligns with Kawasaki et al.'s (2016) findings of vmPFC activation in assessing social trust. In addition, the emotional approach in pathos-based therapy, as described by Bahrami et al. (2020), can increase the effectiveness of therapy through insula activation, allowing patients to be more open to their emotional processes. Whereas in cognitive therapy, the use of evidence-based logical argumentation (logos) can help patients develop a more rational and adaptive mindset.

Social and political communication is greatly influenced by the way rhetoric is used in delivering messages to the public. Assegaff (2023) identified that ethos in political leadership is crucial in building legitimacy and public trust, while the use of pathos in political speeches can increase voters' emotional engagement through the activation of the insula and TPJ. In addition, Turner's (2002) research shows that data- and fact-based argumentation (logos) is crucial in public policy communication as it influences voters' rational evaluation and their decision-making. To provide a clearer picture of the relationship between ethos, pathos and logos with the research findings and their applications in various fields, the following table summarizes the integration of the findings and their practical applications:

Tabel 1. *Neuroscientific Basis and Practical Applications of Ethos, Pathos, and Logos*

Elements of Rhetoric	Research Findings	Neural Mechanism	Practical Applications
Ethos (Credibility)	Harmon et al. (2015): The credibility of a speaker enhances audience trust and activates the brain's reward system.	Activation of the vmPFC in evaluating credibility and social trust.	Education: Teachers build credibility to enhance students' trust. Marketing: Use of celebrities or authoritative figures in advertisements. Politics: Leaders' credibility in establishing public legitimacy.
Pathos (Emotion)	Gibbons (2018): Pathos enhances memory and persuasion through the activation of the emotional processing pathway in the brain.	Activation of the amygdala, insula, and TPJ in emotional processing and empathy.	Education: Using emotional storytelling to increase student engagement. Marketing: Emotion-based campaigns to create a strong connection with consumers. Psychotherapy: Emotional therapy approaches to build therapeutic relationships.
Logos (Logic and Argumentation)	Turner (2002): Logical argumentation activates neural mechanisms that improve rational	Activation of the dlPFC and hippocampus in evidence-based argument processing.	Education: Training students in critical thinking and evidence-based argument analysis. Marketing: Using data and statistics in fact-based marketing

Elements of Rhetoric	Research Findings	Neural Mechanism	Practical Applications
	decision-making.		strategies. Politics: Using data in public policy communication.
Integration of Ethos, Pathos, and Logos	Auger (2014): The combination of the three rhetorical elements enhances communication effectiveness and message appeal.	Activation of the limbic system and prefrontal cortex in persuasive communication processing.	Social Communication: Enhancing public engagement through balanced communication strategies. Political Rhetoric: Combining the three elements to increase persuasion in political campaigns. Education: A learning approach that balances authority, emotion, and evidence-based argumentation.

The implications of this study are that the integration between Aristotelian rhetoric and neurosemantics provides theoretical insights and extensive practical applications in various fields. In education, rhetorical strategies can enhance the effectiveness of teaching and learning. In marketing, an understanding of ethos, pathos and logos can help build brands and enhance consumer persuasion. In psychotherapy, ethos and pathos-based strategies can strengthen therapeutic relationships, while in social and political communication, a combination of these three elements can increase the effectiveness of public messages. By understanding the interplay between neural mechanisms, rhetorical strategies and

practical applications, this research makes a significant contribution to building a more evidence-based and effective model of communication across multiple contexts (Hagoort, 2019).

5. Refining the Understanding of Meaning Construction

Critical Analysis of the Meaning Construction Process

The understanding of meaning construction has been a central topic in the fields of philosophy of mind, cognitive neuroscience, and linguistics. One of the key debates in this domain concerns whether meaning is solely a product of biological mechanisms in the brain or whether it also necessitates social construction and subjective reflection. Searle (1983) argues that meaning in communication originates from intentionality, which refers to the mind's capacity to refer to external objects or concepts. However, from a cognitive neuroscience perspective, scholars like Hagoort (2019) emphasize that meaning is not merely a mental representation, but rather the result of an interaction between neural structures, individual experiences, and the brain's predictive expectations.

From the standpoint of phenomenological philosophy, Merleau-Ponty (1945) highlights that meaning-making does not occur in a vacuum but always involves embodied consciousness, in which individuals comprehend the world through their sensorimotor experiences. This challenges neuroscientific approaches, which often reduce meaning to purely cognitive processing. This perspective is further supported by research in predictive coding, which suggests that the brain does not passively interpret information but actively predicts and adjusts meaning based on prior experiences (Clark, 2013). Consequently, meaning construction is not merely information processing but also entails subjective interpretation, sensory experience, and social interaction.

Neuroscientific approaches to meaning construction frequently focus on the activation of specific brain areas, such as the ventromedial prefrontal cortex (vmPFC), dorsolateral prefrontal

cortex (dlPFC), hippocampus, and insula. However, these approaches often overlook the conceptual and normative dimensions of meaning, which are central to philosophy of language and hermeneutics. Therefore, an integration between empirical approaches in neuroscience and conceptual approaches in philosophy is necessary to develop a more comprehensive model of meaning construction (Hutto & Myin, 2013).

Connecting Neuroscientific Findings with the Philosophy of Intentionality and Meaning Construction

One of the primary challenges in linking neuroscientific findings with philosophical perspectives on meaning is that both fields operate under different foundational assumptions regarding how meaning is constructed. In philosophy of mind, meaning is often associated with mental representation and intentionality. Brentano (1874) asserts that intentionality is the defining feature of consciousness, meaning that all mental experiences are inherently directed toward something external. This perspective is further elaborated by Fodor (1975), who formulated the language of thought hypothesis, proposing that meaning arises from symbolic manipulation within the cognitive system.

However, from a cognitive neuroscience standpoint, meaning is not viewed as a static symbolic entity, but rather as the dynamic result of neural activation patterns. Hagoort (2019) argues that language processing in the brain is not merely the outcome of mental representations but involves the coordination of multiple brain regions that function to comprehend meaning across different contexts. For instance, neuroimaging studies indicate that the hippocampus plays a crucial role in linking past experiences with present understanding, while the dlPFC is involved in logical evaluation and meaning-based decision-making (Pulvermüller, 2013).

Additionally, neuroscience-based predictive processing approaches (Clark, 2013) suggest that meaning in communication is not solely generated through bottom-up stimulus processing but is

also shaped by the brain's predictions and expectations derived from prior experiences. This indicates that meaning is flexible and context-dependent, relying on how the brain reconstructs incoming information to fit existing mental models. Such a perspective challenges traditional models in the philosophy of language, which assume that meaning is fixed and can be reduced to linguistic or symbolic structures alone.

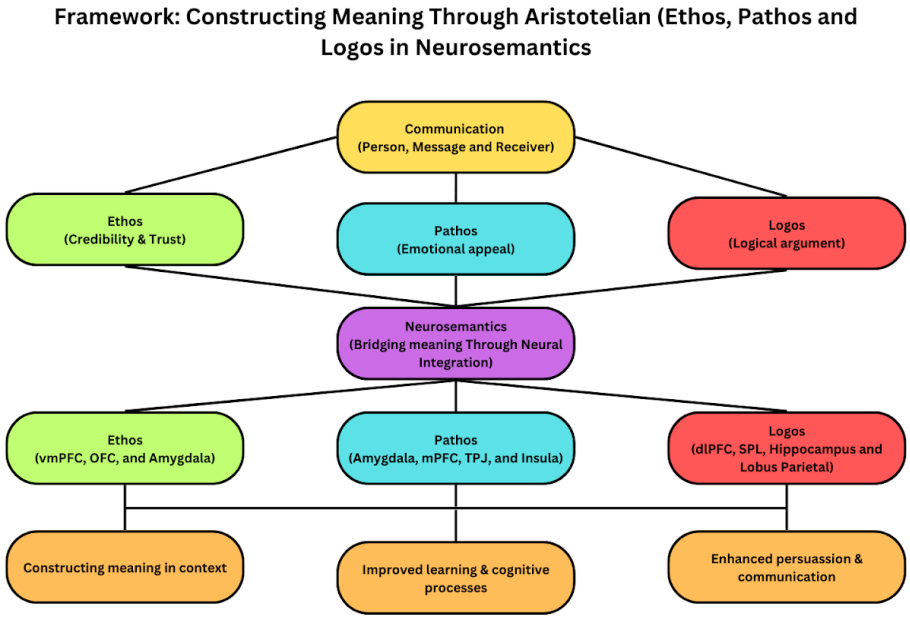

Fig. 1. Meaning construction in neurosemantics

In understanding the role of ethos, pathos, and logos in meaning construction from the perspective of neuroscience and philosophy of mind, a conceptual model that integrates these elements holistically is required. Therefore, the diagram of "meaning construction in neurosemantics" was developed as a result of synthesizing various theories in this study (see Figure 1). The model is rooted in the Aristotelian concept of persuasion, where ethos relates to credibility and trustworthiness, which in neuroscience is associated with the activity of the ventromedial prefrontal cortex (vmPFC) and amygdala, which play a role in value

evaluation and emotional responses to trust (Bechara et al., 1996; Krueger et al., 2008).

Pathos, as the emotional aspect of communication, involves the amygdala, medial prefrontal cortex (mPFC), and temporoparietal junction (TPJ), which play a role in empathy and understanding others' perspectives (Immordino-Yang & Damasio, 2007; Van Overwalle, 2009). Meanwhile, logos as the foundation of logical argumentation is associated with the dorsolateral prefrontal cortex (dlPFC), superior parietal lobule (SPL), and hippocampus, which support evidence processing as well as logic-based decision making (Goel & Dolan, 2003; Monti et al., 2009). In this model, neurosemantics serves as an integrative bridge connecting the three elements in meaning processing, emphasizing that meaning construction is not just the result of linguistic processing alone, but also involves the broader nervous system (Pulvermüller, 2013). As such, this framework is not derived from one particular source, but rather is a synthesis of various findings in the fields of neuroscience, philosophy of mind, and neurorhetoric that have been described in this research.

Challenges and Opportunities in Interdisciplinary Approaches: Overcoming Methodological Boundaries between Philosophy and Neuroscience

The integration of philosophy and neuroscience in understanding meaning-making poses significant methodological challenges. One of the main challenges is the epistemological difference between these two disciplines. Philosophy tends to use deductive and conceptual methods, while neuroscience relies on empirical and experimental methods. This creates difficulties in relating empirical findings in brain studies to abstract concepts of intentionality and consciousness in philosophy (Bennett & Hacker, 2003).

Some of the key challenges in this interdisciplinary approach include:

1. Neuroscience reductionism: Some approaches in neuroscience tend to reduce meaning-making to mere neural activation, without considering the social and normative aspects of meaning-making (Hutto & Myin, 2013). Critiques from phenomenological philosophy emphasize that human understanding of the world depends not only on neural processing, but also embodied experience in social interaction (Merleau-Ponty, 1945).
2. Difficulties in translating neuroscience findings into philosophical theories of language: Although research in neuroscience has shown how the brain processes language and meaning, there are still difficulties in translating these findings into broader linguistic and semantic theories (Hagoort, 2019).
3. Limitations of experimental methods in testing the concept of intentionality: Many concepts in philosophy of mind, such as intentionality and reflective consciousness, are difficult to test directly using experimental methods in neuroscience (Searle, 1983).

However, despite the challenges, interdisciplinary approaches also open up new opportunities. One of these is the development of neuropragmatism, which links predictive models in neuroscience with action theory in philosophy of language (Mey, 2001). In addition, collaboration between neuroscience and hermeneutics can provide new insights into how meaning develops in social and cultural contexts. By overcoming these methodological limitations, the study of meaning construction can evolve towards a more integrative and comprehensive model.

A critical analysis of meaning formation shows that meaning is not just the result of neural activation in the brain, but is also the result of the interaction between mental representations, subjective experience, and social context. By connecting findings in neuroscience with philosophical theories of intentionality and meaning-making, we can gain a deeper understanding of how individuals shape and make sense of the world. However, to

achieve an interdisciplinary approach, there needs to be further efforts in overcoming the methodological differences between philosophy and neuroscience, so that research on meaning is not only limited to biological aspects, but also reflects the complexity of human experience as a whole.

CONCLUSION AND RECOMMENDATIONS

This study has examined the integration of Aristotelian rhetorical principles within a neurosemantic framework to understand the cognitive and neural processes underlying meaning construction. The findings indicate that each rhetorical element corresponds to specific neural mechanisms: ethos is linked to credibility processing through the ventromedial prefrontal cortex (vmPFC), orbitofrontal cortex (OFC), and amygdala; pathos involves emotional engagement via the amygdala, medial prefrontal cortex (mPFC), insula, and temporoparietal junction (TPJ); and logos relies on logical reasoning mediated by the dorsolateral prefrontal cortex (dlPFC), superior parietal cortex (SPL), hippocampus, and parietal lobe.

In answering the research question, the study demonstrates that rhetorical persuasion is not merely a linguistic or social phenomenon but also a neurocognitive process. Ethos, pathos, and logos influence meaning construction by activating neural circuits associated with trust, emotional response, and logical reasoning, respectively. These findings highlight the interdisciplinary nature of communication, where meaning is shaped not only by external discourse but also by internal cognitive mechanisms. From a broader perspective, this research asserts that meaning is not a static entity but a dynamic process involving linguistic, emotional, and logical elements that are processed in the brain. This challenges traditional views that separate rhetoric from cognition and underscores the necessity of integrating both perspectives to gain a holistic understanding of communication.

By integrating philosophy, rhetoric, and neuroscience, this study proposes a comprehensive model for analyzing persuasive

communication. Philosophy contributes to the conceptual foundation of meaning and interpretation, rhetoric provides the strategic framework for persuasion, and neuroscience uncovers the biological mechanisms that underlie these processes. This interdisciplinary approach enables a deeper analysis of how meaning is not only constructed but also perceived, interpreted, and acted upon in various contexts, including education, marketing, psychotherapy, and political discourse. The study highlights the need for future research that goes beyond neuroimaging and incorporates phenomenological and cognitive-linguistic perspectives to explore the subjective dimensions of meaning-making.

The findings of this research suggest several practical implications. In education, a neurosemantic approach can inform curriculum design to enhance comprehension and critical thinking through rhetoric-based instruction. In marketing, understanding the neural correlates of persuasion can lead to more effective advertising strategies that ethically engage consumers. In therapy, insights from neurosemantic research can improve language interventions for individuals with communication disorders by tailoring messages that align with cognitive and emotional processing patterns. While the study affirms the relevance of integrating neuroscience and rhetoric, it also acknowledges the challenges inherent in this endeavor. Key obstacles include the mind-brain problem, differing research methodologies, and epistemological tensions between empirical and conceptual analysis. Addressing these issues requires sustained interdisciplinary dialogue, the development of integrative theoretical models, and ethical considerations in applying neuroscientific insights to social and communicative practices.

This study contributes to the growing discourse on the intersection of rhetoric, neuroscience, and philosophy of mind by providing a nuanced understanding of how meaning is formed and processed. The main argument posited is that persuasion is not merely a linguistic construct but a deeply embedded cognitive

function with neurobiological underpinnings. This perspective challenges the reductionist view that confines meaning-making to either linguistic structures or neural correlates, advocating instead for a synthesis of both. By recognizing the reciprocal relationship between rhetorical strategies and neural processes, this research opens pathways for further exploration into how human cognition shapes and is shaped by communicative acts. Ultimately, understanding meaning through a neurosemantic lens provides a richer, more holistic framework for studying human interaction in an increasingly complex communicative landscape.

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