
Cognitive triad model of linguistic performance: theoretical foundations and structural components

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Annotation *This article examines the interrelation of linguistic performance with psychocognitive, neurobiological, and cultural-historical factors from the perspective of cognitive linguistics. The main goal of the study is to propose a cognitive triad model that allows us to interpret human linguistic performance as a single system and to elucidate its theoretical foundations. The study used an interdisciplinary approach, conceptual analysis, comparative analysis, and cognitive modeling methods. The article analyzes linguistic, psycholinguistic, neurolinguistic, and cultural approaches to linguistic performance, and identifies their scientific possibilities and existing limits. As a result, a cognitive triad model based on the integration of psychocognitive processes, neurobiological mechanisms of brain activity, and cultural experience in humans is proposed. This model allows us to explain the processes of human perception, processing, conceptualization, storage, and expression through speech as a holistic, systematic mechanism. The research results reveal the complex nature of linguistic performance and serve as basis for further research in cognitive linguistics, psycholinguistics, neurolinguistics, linguodidactics, artificial intelligence and natural language processing.*

Keywords *Linguistic performance, cognitive linguistics, cognitive model, psychocognitive processes, neurolinguistics, cultural scripts, language and thought, cognitive triad, conceptualization, natural language processing*

Lingvistik faoliyatning kognitiv triada modeli: nazariy asoslari va tarkibiy komponentlari

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Annotatsiya *Ushbu maqolada lisoniy faoliyat va psixokognitiv, neyrobiologik va madaniy-tarixiy omillar o'rtasidagi bog'liqlik kognitiv tilshunoslik nuqtai nazaridan o'rganiladi. Tadqiqotning asosiy maqsadi inson til faoliyatini yagona tizim sifatida talqin qilish*

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va uning nazariy asoslarini aniqlashtirish imkonini beruvchi kognitiv triada modelini taklif qilishdir. Tadqiqotda fanlararo yondashuv, kontseptual tahlil, qiyosiy tahlil va kognitiv modellash usullari qo'llaniladi. Maqolada til faoliyatiga lingvistik, psixolingvistik, neyrolingvistik va madaniy yondashuvlar tahlil qilinadi, ularning ilmiy salohiyati va mavjud cheklovlari aniqlanadi. Til samaradorligi inson tafakkuri, miya faoliyati va madaniy tajribaning o'zaro integratsiyasi sifatida talqin qilinadi. Natijada, psixokognitiv jarayonlar, miya faoliyatining neyrobiologik mexanizmlari va odamlarda madaniy tajribani integratsiyalashga asoslangan kognitiv triada modeli taklif qilinadi. Ushbu model nutqni idrok etish, qayta ishlash, kontseptualizatsiya qilish, saqlash va ifoda etish jarayonlarini yaxlit, tizimli mexanizm sifatida tushuntirishga imkon beradi. Tadqiqot natijalari lisoniy faoliyatning murakkab tabiatini ochib beradi va kognitiv lingvistika, psixolingvistika, neyrolingvistika, lingvodidaktika, shuningdek, sun'iy intellekt va tabiiy tilni qayta ishlash sohalarida keyingi ilmiy tadqiqotlar uchun muhim nazariy va metodologik asos bo'lib xizmat qiladi.

Kalit so'zlar *Lingvistik samaradorlik, kognitiv lingvistika, kognitiv model, psixokognitiv jarayonlar, neyrolingvistika, madaniy skriptlar, til va tafakkur, kognitiv triada, kontseptualizatsiya, tabiiy tilni qayta ishlash*

Когнитивная триадная модель лингвистической деятельности: теоретические основы и структурные компоненты

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Аннотация *В данной статье рассматривается взаимосвязь языковой деятельности с психокогнитивными, нейробиологическими и культурно-историческими факторами с точки зрения когнитивной лингвистики. Главная цель исследования – предложить модель когнитивной триады, позволяющую интерпретировать языковую деятельность человека как единую систему и прояснить её теоретические основы. В исследовании использован междисциплинарный подход, концептуальный анализ, сравнительный анализ и методы когнитивного моделирования. В статье анализируются лингвистические, психолингвистические, нейролингвистические и культурные подходы к языковой деятельности, определяются их научные возможности и существующие ограничения. Языковая эффективность интерпретируется как взаимная интеграция человеческого мышления, мозговой активности и культурного опыта. В результате предлагается модель когнитивной триады, основанная на интеграции психокогнитивных процессов, нейробиологических механизмов мозговой активности и*

культурного опыта у человека. Эта модель позволяет объяснить процессы восприятия, обработки, концептуализации, хранения и выражения речи как целостный, системный механизм. Результаты исследования раскрывают сложную природу языковой деятельности и служат важной теоретической и методологической основой для дальнейших научных исследований в областях когнитивной лингвистики, психолингвистики, нейролингвистики, лингводидактики, а также искусственного интеллекта и обработки естественного языка.

**Ключевые
слова**

Лингвистическая эффективность, когнитивная лингвистика, когнитивная модель, психокогнитивные процессы, нейролингвистика, культурные сценарии, язык и мышление, когнитивная триада, концептуализация, обработка естественного языка

Introduction

Linguistic performance is one of the most complex manifestations of human thinking, communication and social experience, and is one of the main objects of research in linguistics, psychology, neurobiology and cognitive sciences (Saussure, 1959). Through language, a person not only transmits information, but also receives, processes, conceptualizes and creates meaning based on his individual and cultural experience (Черниговская, 2006). Therefore, the study of linguistic performance not only as a language system or speech process, but also as an integration of complex psychocognitive, biological and cultural processes occurring in the human mind is one of the relevant directions of modern cognitive linguistics (Sapir & Whorf, 1956; Wierzbicka, 1997).

In recent years, the directions of psycholinguistics, neurolinguistics and cultural linguistics have developed significantly in research devoted to the study of linguistic performance. Noam Chomsky has extensively covered the biological foundations of language, Jean Piaget and Lev Vygotsky have extensively covered the cognitive and social mechanisms of thinking and language development, and Tatyana Chernigovskaya has extensively covered the neurobiological

foundations of language. At the same time, the relationship between language and culture is scientifically substantiated in the studies of Edward Sapir, Benjamin Lee Whorf and Anna Wierzbicka. However, most of these approaches analyze individual aspects of linguistic performance and do not allow it to be interpreted as a single integrative system.

The analysis of the literature shows that a theoretical approach that combines the psychocognitive, neurobiological and cultural-historical components of linguistic performance within a single conceptual model has not yet been sufficiently developed. It is this gap that constitutes the scientific problem of this study.

The purpose of this article is to develop a cognitive triad model that interprets the psychocognitive, neurobiological and cultural-historical components of linguistic performance as a single interrelated system and to substantiate its theoretical and practical significance. The study provides a comparative and conceptual analysis of the theories of cognitive linguistics, psycholinguistics, neurolinguistics and cultural linguistics based on an interdisciplinary approach.

The proposed cognitive triad model explains linguistic performance based on the integration of three interrelated components –

psychocognitive processes, neurobiological mechanisms, and cultural-historical factors. This model allows us to interpret the internal mechanisms of linguistic performance as a holistic system and can serve as a theoretical basis for research in the fields of linguistics, education, psycholinguistics, and artificial intelligence.

Existing research primarily explains linguistic abilities using specific theoretical approaches. However, the dynamic interactions between psychocognitive, neurobiological, and cultural-historical components have not yet received adequate conceptual understanding.

The article consists of the following sections: first, the scientific literature on the topic is analyzed, then the research methodology is described. The next section discusses the cognitive triad model of linguistic performance and analyzes its theoretical and practical significance. Finally, the research results are summarized, conclusions are drawn, and future research directions are outlined.

Literature analysis

Linguistic performance is a complex scientific concept formed at the intersection of linguistics, psychology, neurobiology and cognitive sciences, and its theoretical foundations have been interpreted differently by different scientific schools. Research shows that existing approaches to the interpretation of linguistic performance have developed mainly within the framework of linguistic, psychocognitive, neurobiological and cultural directions. Although these theories have shed light on certain aspects of linguistic performance, the issue of interpreting them as a single integrative system still remains relevant.

Psychocognitive foundations of linguistic performance

The theoretical foundations of language activity were developed through the contributions of several linguistic, cognitive, and psycholinguistic theories. Ferdinand de Saussure laid the foundations of modern linguistics by distinguishing between langue

(language as a social system) and parole (its individual realization in speech), thereby establishing a conceptual distinction between language and linguistic performance (Saussure, 1959). This distinction served as the basis for subsequent research into the mechanisms underlying speech production and language use.

Building on structural linguistics, Noam Chomsky shifted attention to the biological foundations of language, proposing the theory of universal grammar. According to Chomsky (1965), humans possess innate cognitive mechanisms that allow them to acquire language independently of their cultural or linguistic environment. His theory demonstrated that language activity is supported by biologically determined mental structures and is not acquired solely under environmental influences.

While Chomsky emphasized the innate nature of language, Jean Piaget explained language activity as a consequence of cognitive development. He argued that language develops gradually, passing through successive stages of intellectual maturation, beginning with sensorimotor experience and culminating in abstract thought. Each stage of development expands the individual's capacity for conceptualization, symbolic representation, and increasingly complex linguistic expression (Piaget and Inhelder, 1969).

Lev Vygotsky complemented this view, emphasizing the crucial role of social interaction in cognitive and linguistic development. According to him, language initially functions as a social means of communication before becoming internalized as inner speech, which subsequently regulates thinking and problem solving (Vygotsky, 1978). Consequently, language activity reflects not only cognitive maturation but also the influence of social and cultural interaction.

Research on first language acquisition further demonstrates that language development occurs through a continuous interaction between cognitive readiness and

communicative experience. Clark (2003) argues that children actively construct linguistic knowledge through interactions with their environment, gradually transforming perceptions and communicative needs into meaningful speech. Thus, language acquisition depends not only on the influence of the linguistic environment but also on the child's cognitive abilities and communicative intentions.

These cognitive and linguistic perspectives are further supported by the neuropsychological research of Tatyana Chernigovskaya, who interprets language acquisition as the result of a continuous interaction between genetic predisposition, brain plasticity, cognitive development, and environmental influences (Chernigovskaya, 2006, 2013). According to her, successful linguistic functioning results from the coordinated action of cognitive, biological, and experiential mechanisms, rather than any single factor.

Overall, the theories reviewed explain linguistic functioning from structural, biological, cognitive, developmental, and psycholinguistic perspectives. However, they primarily focus on individual aspects of language, paying limited attention to their mutual integration. This theoretical limitation underpins the cognitive triad model proposed in this study, which interprets linguistic functioning as the result of the continuous interaction of psychocognitive, neurobiological, and cultural-historical components.

Neurobiological Basis of Language Activity

The neurobiological component of language activity explains how brain structures and neural mechanisms support the perception, processing, comprehension, and production of speech. Modern neurolinguistic research shows that language activity arises from the coordinated activity of multiple cortical and subcortical areas, rather than isolated language centers.

Recent studies in the field of neurolinguistics and cognitive neurobiology have provided a deeper understanding of the biological mechanisms of language activity. Paul Broca was the first to demonstrate the connection between the left frontal lobe and speech production. His discoveries laid the biological basis for expressive speech and laid the foundation for modern neurolinguistics (Broca, 1861). Wernicke expanded on Broca's findings by demonstrating that language comprehension depends primarily on the posterior temporal cortex. Together, Broca and Wernicke's discoveries established the functional specialization of language processing in the human brain. The brain centers identified by Broca and Wernicke are recognized as the main neural centers of speech production and speech comprehension (Wernicke, C. (1874). Recent neuroimaging studies further indicate that language processing relies on distributed neural networks connecting frontal and temporal regions via dorsal and ventral pathways, rather than isolated cortical. In his studies, Friederici extensively covered the functional interconnection of these centers and their role in language processing (Friederici, 2012).

Chernigovskaya interprets language as a product of the evolutionary development of the human brain and substantiates the interrelationship of genetic factors, brain plasticity, and cognitive development in the process of language acquisition. In her opinion, language acquisition occurs as a result of the combined influence of biological capabilities and the external environment (Черниговская, 2006; Черниговская, 2013). Thus, neurobiological evidence shows that language abilities are the result of a continuous interaction between inherited neural mechanisms, brain plasticity, and cognitive development.

Brain region	Function	Contribution to linguistic performance
<i>Broca's area</i>	Speech production	Language planning and articulation
<i>Wernicke's area</i>	Language comprehension	Semantic processing
<i>Arcuate fasciculus</i>	Neural connectivity	Information transfer between language centers
<i>Prefrontal cortex</i>	Executive control	Planning and working memory
<i>Limbic system</i>	Emotion	Emotional aspects of communication

Table 1. *Neurobiological mechanisms supporting linguistic performance*

Although neurolinguistic research successfully elucidates the biological mechanisms underlying language processing, it has largely focused on neural processes. Their interaction with psychocognitive development and cultural experience remains insufficiently integrated. This limitation highlights the need for an interdisciplinary model of the cognitive triad.

Cultural-cognitive basis of linguistic performance

Representatives of cultural linguistics assess language not only as a communicative tool, but also as a system reflecting the historical and cultural experience of society. According to the theory of linguistic relativity put forward by Sapir and Whorf, language directly affects the way a person perceives and conceptualizes the world (Sapir & Whorf, 1956). Each language reflects the worldview and cultural values of its speakers. This theory demonstrates that language skills are influenced not only by individual cognitive abilities, but also by culture-specific ways of perceiving and interpreting reality.

This idea was later developed by Wierzbicka in the theory of cultural scripts. He interprets cultural scripts as cognitive mechanisms that explain communicative norms and speech behaviors characteristic of a particular society (Wierzbicka, 1997). According to Verzhbitskaya (1997), cultural scripts are culturally accepted cognitive models that regulate communicative behavior within a speech community. They explain not only what speakers say but also how meanings are

interpreted, evaluated, and socially accepted. This approach is of great scientific importance in demonstrating the inextricable link between culture and language.

Although cultural-linguistic theories successfully explain the influence of cultural values and communicative norms on language use, they primarily focus on the cultural dimension of linguistic performance. Their interaction with psychocognitive development and neurobiological mechanisms remains understudied. Therefore, this study proposes a cognitive triad model that integrates these complementary perspectives into a unified theoretical framework.

Cognitive Triad Component	Main Theoretical Foundations	Representative Scholars	Contribution to Linguistic Performance
<i>Psychocognitive</i>	Cognitive development, language acquisition, conceptual processing	Piaget, Vygotsky, Clark, Chomsky	Formation of perception, cognition, memory and speech planning
<i>Neurobiological</i>	Brain organization of language, neural mechanisms	Broca, Wernicke, Chernigovskaya, Friederici	Neural processing of language and speech production
<i>Cultural-Historical</i>	Linguistic relativity, cultural scripts, sociocultural interaction	Sapir, Whorf, Wierzbicka	Cultural conceptualization and communicative behavior

Table 2. *Theoretical Foundations of the Cognitive Triad Model*

The analysis of the above scientific approaches shows that the linguistic, psychocognitive, neurobiological and cultural aspects of linguistic performance have been widely studied within the framework of various scientific schools. However, existing theories interpret these components mainly as independent systems. As a result, a scientific gap remains in explaining the inextricable link between linguistic performance and human thinking, brain activity and cultural experience on the basis of a single conceptual model.

Therefore, this study proposes a cognitive triad model that integrates the psychocognitive, neurobiological and cultural-historical components of linguistic performance. This model allows us to explain the internal mechanisms of linguistic performance as a holistic system.

Methodology

This study was conducted on the basis of a theoretical and interdisciplinary approach. The methodological basis of the study was formed by theoretical views developed in the fields of cognitive linguistics, psycholinguistics, neurolinguistics and cultural linguistics. During the study, the principle of interdisciplinary integration was used to identify the interrelationships between the psychocognitive, neurobiological and cultural-historical components of linguistic

performance and to interpret them as a single conceptual system.

Several scientific methods were used in the study. The main theories and scientific views on linguistic performance were systematized using descriptive analysis. The views of representatives of various scientific schools, including structuralism, generative grammar, cognitive linguistics, psycholinguistics and cultural linguistics, were compared through comparative analysis. Based on conceptual analysis, the structural components of linguistic performance and their functional characteristics were identified.

Also, the cognitive modeling method was used as the main methodological tool of the study. This method made it possible to integrate the psychocognitive, neurobiological and cultural-historical components of linguistic performance into a single theoretical model. This model was developed by synthesizing the common and different aspects of existing theoretical approaches.

In the process of research, the main criteria for selecting scientific literature were their theoretical significance, modernity and the level of coverage of various aspects of linguistic performance. The analysis involved fundamental scientific sources recognized in the fields of cognitive linguistics, psycholinguistics, neurolinguistics, cultural linguistics and philosophy of language.

As a result, the existing theoretical views were generalized from an interdisciplinary perspective, and a cognitive triad model was developed that explains linguistic performance based on the mutual integration of psychocognitive processes, neurobiological mechanisms and cultural-historical factors.

Results

A theoretical analysis of the reviewed literature revealed that language activity cannot be adequately explained by isolated linguistic, psychocognitive, neurobiological, or cultural approaches. While each of these perspectives provides valuable insights into individual aspects of language activity, none independently explains the complex mechanisms underlying language activity. This finding underscored the need to develop an integrative theoretical framework.

Based on an interdisciplinary analysis, a cognitive triad of language activity was developed. The proposed model integrates three interrelated components – psychocognitive, neurobiological, and cultural-historical – into a single conceptual framework. Unlike previous theoretical approaches, the model explains language activity as the result of continuous interactions between these components, rather than as the product of any single mechanism.

The psychocognitive component represents the internal cognitive processes involved in language activity, including perception, attention, memory, conceptualization, and speech planning. These processes enable individuals to receive external information, transform it into meaningful cognitive representations, and prepare it for linguistic expression.

The neurobiological component provides the biological basis for language activity. It encompasses the coordinated activity of brain structures responsible for language perception, comprehension, speech production, and neural integration. This component explains how cognitive processes are supported by the

functional organization of the human brain and neural networks.

The cultural-historical component reflects the influence of cultural knowledge, communicative traditions, social experience, and shared values on language activity. It explains how native speakers interpret, organize, and express meanings in culturally determined communicative contexts.

The proposed cognitive triad model demonstrates that these three components function as an integrated system. Language activity arises from their continuous interaction, where psychocognitive processes provide cognitive organization, neurobiological mechanisms ensure physiological implementation, and cultural and historical factors determine communicative interpretation and social significance.

The developed model expands existing theoretical approaches by providing a comprehensive framework for explaining language abilities. It also lays a theoretical foundation for further research in cognitive linguistics, psycholinguistics, neurolinguistics, cultural linguistics, language education, and artificial intelligence.

Discussion and Analysis

Interpretation of the Cognitive Triad Model of Linguistic Performance

The results of this study support the view that linguistic performance cannot be adequately explained by a single theoretical perspective. Existing linguistic, psychocognitive, neurobiological, and cultural approaches have made significant contributions to understanding linguistic performance; however, they have largely examined these aspects independently. The cognitive triad model proposed in this study addresses this theoretical gap by integrating psychocognitive, neurobiological, and cultural-historical components into a unified conceptual framework.

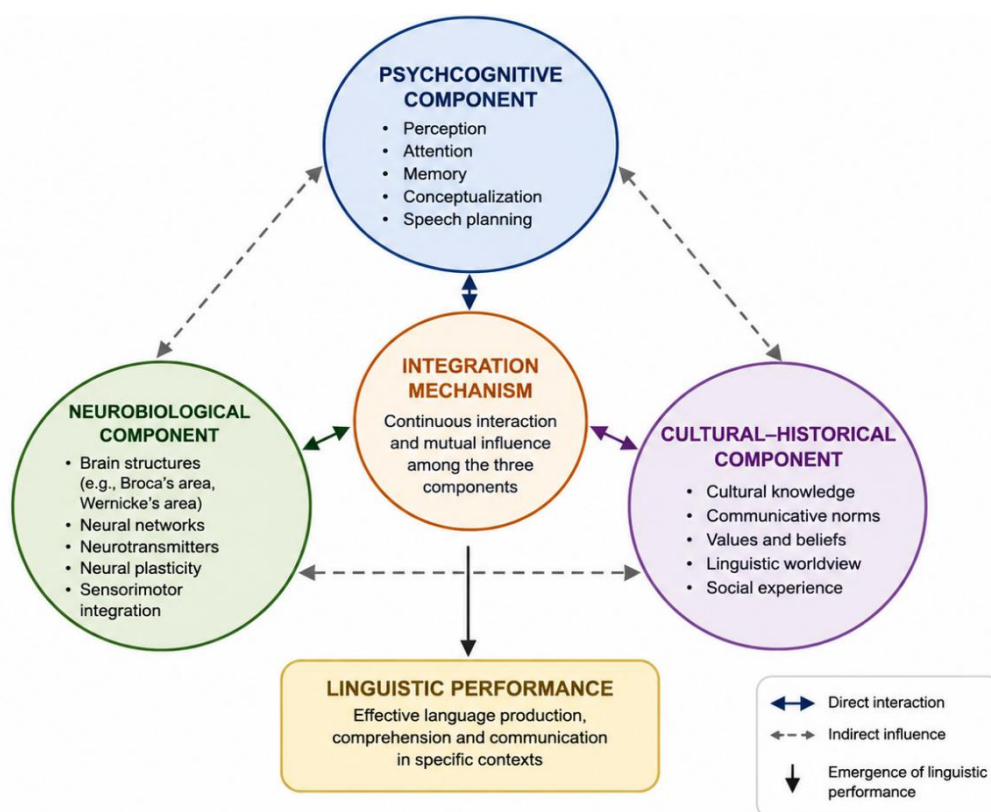
Unlike previous approaches, the proposed model does not replace existing theories but rather synthesizes them into an

interdisciplinary system. Structural linguistics explains the organization of language, psychocognitive theories clarify the development of cognitive mechanisms, neurolinguistics reveals the biological basis of language processing, and cultural linguistics explains the influence of social experience and cultural values on communication. The cognitive triad model demonstrates that these perspectives complement each other, rather than contradict each other, and should be interpreted as interacting components of linguistic performance.

An important theoretical contribution of the model lies in the distinction between the conceptual framework and the phenomenon it explains. Linguistic performance is the observable outcome of human communicative activity, while the cognitive triad model provides a theoretical explanation of the mechanisms underlying this activity.

Accordingly, linguistic performance arises from the continuous interaction of psychocognitive processes, neurobiological mechanisms, and cultural-historical experience, rather than from the independent functioning of any single component.

The model also emphasizes that the relationship between these three components is dynamic, not hierarchical. Psychocognitive mechanisms organize perception, attention, memory, conceptualization, and speech planning; neurobiological mechanisms provide the neural basis necessary for these processes; and cultural-historical factors determine how linguistic knowledge is interpreted and applied in specific communicative contexts. Consequently, changes occurring in one component inevitably influence the functioning of the other two, confirming the systemic nature of linguistic performance.



Note. Linguistic performance emerges through the dynamic and reciprocal interaction of psychocognitive, neurobiological and cultural-historical components.

Figure 1. *Cognitive Triad Model of Linguistic Performance: Structural Components and Their Interaction*

Figure 1 illustrates this theoretical interplay and demonstrates that linguistic performance should be understood as the product of the continuous integration of these three complementary dimensions, rather than as the result of isolated cognitive, biological, or cultural processes.

Theoretical and Practical Significance of the Cognitive Triad Model

The proposed cognitive triad model contributes to cognitive linguistics by providing an interdisciplinary explanation of linguistic performance that integrates previously independent theoretical traditions into a unified conceptual framework. Rather than competing with existing theories, the model establishes conceptual links between them, thereby offering a more comprehensive explanation of language production, comprehension, and communicative behavior.

From a theoretical perspective, the model expands current understanding of linguistic performance by demonstrating that cognitive activity, brain function, and cultural experience operate as interdependent mechanisms. This integrated perspective can contribute to further theoretical developments in cognitive linguistics, psycholinguistics, neurolinguistics, and cultural linguistics.

From a practical perspective, the proposed model has several important applications. In language education, it can facilitate the development of teaching strategies that simultaneously consider students' cognitive development, neuropsychological characteristics, and sociocultural background. In psycholinguistics and clinical linguistics, the model can contribute to a more comprehensive understanding of speech disorders by considering both neural mechanisms and cognitive processing in conjunction with communicative experience. In computational linguistics and artificial intelligence, the model provides a theoretical basis for improving natural language processing systems by

integrating cognitive, neural, and cultural aspects of language.

While the proposed model is theoretical in nature, it lays a conceptual foundation for future empirical research. Future research could validate the model across different languages, cultures, and communicative contexts, and explore its relationship to higher-order cognitive structures such as frames, scripts, images, and gestalts.

Thus, the linguistic performance model has become not only of theoretical value, but also an important practical tool for solving real-life problems. Therefore, the cognitive triad model proposed here is helpful not only for further explaining the theoretical essence of linguistic performance, but also for extending its practical application to the fields of education, psycholinguistics, neurolinguistics and artificial intelligence.

Conclusion

This study proposes a cognitive triad of linguistic activity that integrates psychocognitive, neurobiological, and cultural-historical aspects into a unified conceptual framework. Unlike existing theoretical approaches, which primarily explain linguistic activity from different disciplinary perspectives, the proposed model demonstrates that linguistic activity arises from the dynamic interaction of these three complementary components.

The results emphasize that linguistic activity should be understood not simply as the production or comprehension of language, but as a multidimensional phenomenon resulting from the continuous interaction of cognitive processes, neural mechanisms, and sociocultural experience. In this regard, the proposed model contributes to cognitive linguistics by providing an interdisciplinary explanation of the internal mechanisms underlying linguistic activity.

The theoretical significance of the study lies in the integration of concepts from cognitive linguistics, psycholinguistics, neurolinguistics, and cultural linguistics into a

unified explanatory framework. The model also has practical implications for language education, speech therapy, intercultural communication, natural language processing, and artificial intelligence, where understanding the interaction of cognitive, biological, and cultural factors is increasingly important.

Although the proposed model is theoretical in nature, it lays the foundation for

future empirical research. Further research could validate the model with speakers of different languages and cultures and explore its relationship with higher-order cognitive structures such as frames, scripts, images, and gestalts. Such research will contribute to a deeper understanding of the cognitive architecture of language processing and support the further development of interdisciplinary research in linguistics.

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