

RICERCHE

## Somewhere in-between: Inner speech and proto-mental content

Mariela Destéfano<sup>(a)</sup>

Ricevuto: 9 aprile 2023; accettato: 12 dicembre 2023

**Abstract** In this paper, I explain emerging mental content by focusing on the role of inner speech in reading acquisition. I offer a hybrid explanation that relates a Vygotskian conception of inner speech (constructivism) to dual-route psycholinguistic models of reading (cognitivism) and the notion of content-involving mental states based on socio-cultural practices (enactivism). I first clarify some of the presuppositions that allow for my proposed conception of proto-content. Second, I explore the relationship between inner speech and reading acquisition. Lastly, I develop a notion of “proto-content” grounded in the idea of internal aboutness.

**KEYWORDS:** Mental Representations; Reading Acquisition; Linguistic Content; Constructivism; Enactivism; Cognitivism

**Riassunto** *Da qualche parte, là in mezzo: il discorso interiore e il contenuto proto-mentale* – In questo lavoro intendo illustrare l'emergere del contenuto mentale concentrandomi sul ruolo del discorso interiore nella acquisizione della capacità di lettura. Intendo offrire un modello ibrido di spiegazione che metta in relazione una concezione vygotskiana del discorso interiore (costruttivismo) e i modelli di lettura psicolinguistici a due vie (cognitivismo) con la nozione di stati mentali provvisti di contenuto. Chiarirò in primo luogo alcuni presupposti della mia concezione del proto-mentale. In secondo luogo esplorerò la relazione tra discorso interiore e acquisizione della capacità di lettura. In ultima istanza svilupperò una nozione di “proto-contenuto” fondata nell’idea della capacità interna di riferimento.

**PAROLE CHIAVE:** Rappresentazione mentale; Acquisizione della capacità di lettura; Contenuto linguistico; Costruttivismo; Enattivismo; Cognitivismo

<sup>(a)</sup>Departamento de Filosofía, Facultad de Filosofía y Letras, Universidad de Buenos Aires, Puan 480 – C1406CQJ, Buenos Aires (ARG)

E-mail: mariela.destefano@gmail.com



## 1 Introduction

MENTAL CONTENT IS THE PROPERTY that states of mind possess that allows them to represent how things are in the world. Contents are taken to specify the conditions of satisfaction, whether these are understood in terms of truth, accuracy, or veridicality, that are met or fail to be met in any given instance of mental representation. To be in a state of mind with mental representational content is to be in a state of mind about which one can ask the question of whether that state of mind represents or misrepresents how things really are. No one can deny that a naturalized explanation of mental content is needed in the philosophy of mind and cognitive sciences. In fact, from cognitivists such as Fodor<sup>1</sup> to enactivists such as Hutto and Myin,<sup>2</sup> great efforts have been made to naturalize content. However, as far as I know, neither cognitivists nor enactivists have proposed a successful answer to the question of the origins of mental content. These positions are indeed two ends of a spectrum of different views. However, instead of discussing each of them, in this paper, I consider just the two paradigmatic approaches to mental content: the representational explanation (cognitivism) and the non-representational proposal (enactivism).

On one side, cognitivists have been challenged by “the hard problem of content”, which argues that traditional semantic theories of cognition cannot provide a scientifically respectable account of content.<sup>3</sup> This poses an intractable theoretical puzzle for explanatory naturalists who believe that information can be extracted from the world through environmental interactions, where such extracted content meaningfully informs concrete representational vehicles.<sup>4</sup> The use of information theory does not achieve the naturalization of mental content. Therefore, radical forms of enactivism deny that having thoughts with content is fundamental to all cognition.

On the other side, radical enactivists have faced objections regarding “the gap problem”, which suggests that there is an explanatory step between contentless minds and minds involving thought, which enactivists can not explain. Menary explains that «the radicals have a problem bridging the gap between basic cognitive processes and enculturated ones since they believe that meaning or content can only be present in a cognitive system when language and cultural scaffolding are present».<sup>5</sup> Certainly, it might be thought that in distinguishing basic, non-contentful minds and non-basic, contentful minds, enactivists introduce a deep discontinuity that is at odds with naturalism.

My main interest in this paper is to explain the emergence of cognition that involves content while addressing the issues raised against cognitivism and enactivism. Building upon Harnad’s

approach,<sup>6</sup> I will develop the idea that the cognitive architecture includes certain inner states that possess internal correction conditions. These states exhibit “proto-content” based on purely internal resources. Proto-content is not intended to represent complete content since it does not stand for any property of the external world. In particular, proto-content demonstrates what can be termed “internal aboutness”. Both “the hard problem of content” and “the gap problem” vanish if we take this proto-mental content approach.

On this view, the desired explanation of the origins of mental content depends on the interaction of different approaches to the mind. This story about content encompasses fruitful aspects found in (i) constructivism, (ii) cognitivism, and (iii) enactivism. The one-sided perspective on mental content has hindered a successful understanding of its origins. For this reason, I will provide a hybrid explanation of the emergence of mental content that centers on the role of inner speech in reading acquisition. This explanation incorporates a Vygotskian conception of inner speech (constructivism) in connection with dual-route psycholinguistic models of reading (cognitivism) and content-involving cognition based on socio-cultural practices (enactivism).

This paper is divided as follows. In section 2, I will clarify some crucial presuppositions that will enable my conception of proto-content. In section 3, I will explore the relationship between inner speech and reading acquisition, as this capacity is underpinned by the potential for proto-content, which is further discussed in section 4. In the final section, comprising concluding remarks, I emphasize that, by setting aside the standard rivalry between cognitivism and radical enactivism, cognitive science can provide an alternative explanation for the origins of content with stronger credentials.

## 2 Starting assumptions

To begin with, anyone seeking a serious explanation of contentful minds needs to narrow down the phenomenon. Mental content refers to the content of a mental state, such as a thought, belief, desire, fear, intention, or wish. A state with content represents some part or aspect of the world; its content is the way it represents the world as being.<sup>7</sup> Although it might be attributed to both animal and human minds, in this paper, I will focus on the latter. While it is necessary to attribute some form of mental content to nonhuman animals, my attention will be centered on the genealogy of linguistic mental content in human beings. Contrary to what one might think, this attempt does not imply any evolutionary discontinuity between human and nonhuman animals. My proposal is compatible with a pluralistic approach to emerging content. I strongly believe that an adequate explanation of the full range of cognitive

capacities displayed by humans and animals warrants positing various kinds of mental content, from more primitive to full-blown intentional ones. In this paper, I suggest an exclusively ontogenetic explanation of linguistic mental content.

This leads me to my second point. Clearly, a topic such as the origins of mental content requires a diachronic account. The issue at hand is the history of minds with content. The emergence of mental content can be studied by considering the evolutionary history of our species or by focusing on the developmental history of humans within their lifetimes. Although both phylogenetic and ontogenetic perspectives are legitimate forms of diachronic explanations, in this paper, I favor an ontogenetic account of mental content.

In the discussion regarding the psychological continuity between human and nonhuman animals, the origins of content is considered from a phylogenetic perspective.<sup>8</sup> According to Menary<sup>9</sup> and Froese and Di Paolo,<sup>10</sup> radical enactivist views on cognition face particular difficulties with regard to the issue of evolutionary continuity, more specifically, the cognitive gap they posit exists between nonhuman and human animals. However, there is another way to describe a cognitive gap, one restricted to human development. De Jaegher and Froese have referred to this missing link as the “cognitive gap of the life-mind continuity thesis”.<sup>11</sup> This gap separates the activity of basic minds from the abstract cognition achieved by adult human minds (Froese and Di Paolo.<sup>12</sup> In this case, the gap is understood as the distance between a child’s initial cognition and an adult’s contentful mind. My primary interest is to uncover this ontogenetic transition. I will attribute what I call “proto-mental content” to children. This type of content will be considered a distinctive feature of young minds.

In this context, the origins of content will be studied assuming a (i) sociologized, (ii) naturalized, (iii) internalized, and (iv) gradualized view of the mind. Firstly, in this paper, mental content will be conceived as a cognitive achievement that depends on social factors such as public linguistic practices. The hard problem of content has taught us that there are no obvious reasons to characterize semantic aspects of the mind in terms of basic biological functions.<sup>13</sup> The way I see it, informational theories, such as teleosemantics, have failed to explain semantics from a purely biological point of view. Classic teleosemantic theories attempt to naturalize representational content by appealing to biological function, and although this notion enables the organism to keep track of specific worldly items, it doesn’t give rise to truth conditions that are properly associated with mental content. As a result, the explanation of mental content demands tools beyond the biological perspective. As was mentioned, the notion of content involves

the existence of some form of correctness condition. To be in a contentful state of mind is to represent things to be a certain way that they might not be. According to the sociologized view, the process of mastering special kinds of sociocultural practices supports linguistic meanings of the mind.<sup>14</sup> Correctness conditions for linguistic contents appear through a process of linguistic mastery. In this sense, a naturalistic account of these contents, which is not primarily biological, should appeal to scientifically respectable resources such as developmental psychology and psycholinguistics. In this paper, I will restrict the naturalized explanation of content to these scientific disciplines, taking into consideration the performance of young children in the acquisition of reading capacities. This commits me to the methodological stance originally called “relaxed naturalism” by Hutto and Satne.<sup>15</sup>

However, in contrast to Hutto and Satne’s enactivism, I will adopt an internalist view of the mind. Philosophers of mind and cognitive science have associated the term “internalisms” with different theses. A common way to describe internalism is to say that an individual’s mental content is fixed or determined by the intrinsic, physical properties of that individual, where this relation of determination has typically been understood in terms of the notion of supervenience.<sup>16</sup> Following Gertler:

Since the work of Bürge, Davidson, Kripke, and Putnam in the 1970s, philosophers of language and mind have engaged in extensive debate over the following question: Do mental content properties – such as thinking that quenches thirst – supervene on properties intrinsic to the thinker? An affirmative answer endorses internalism (or “individualism”); a negative answer expresses externalism.<sup>17</sup>

Nevertheless, the notion of “internalism” assumed in this paper departs from this metaphysical thesis on the determination of mental content. In fact, I will endorse a methodological conception of “internalism”, in which generalizations that serve to explain cognitive phenomena do not inherently rely on external factors. Internalist inquiry means that cognitive science is framed as a science of states theoretically conceived independently of factors external to the organism. This kind of internalism resembles Chomsky’s, which is not related to any conscious manipulation of inner states. As Collins states, «when Chomsky speaks of “internalism”, he doesn’t have in mind an “inner theater” or essential conscious access to content». <sup>18</sup> On the contrary, the idea that the mind is built up by internal mental states is deeply related to the canonical form of psychological explanation, where cognitive capacities are decomposed into smaller interconnected subpersonal subcapacities that

jointly carry out a larger function as a whole.<sup>19</sup>

Having acknowledged that cognitive capacities are the target of psychological explanations, I then focus on those capacities that serve as precursors to the early manifestation of mental content. What I call a “gradualized picture of the mind” aligns with the goal of finding the intermediate stages of development [that would be] needed for the acquisition of mature cognitive skills. Indeed, it is unlikely that adult capacities emerge out of nowhere without any intermediate phases.<sup>20</sup> I have a reason for embracing this gradualism; it aligns with Morgan’s canon, which is imposed on psychological explanations. As is known, Morgan stated that:

In no case should we interpret an action as the result of the exercise of a higher psychological faculty if it can be interpreted as the outcome of the exercise of one that stands lower on the psychological scale.<sup>21</sup>

Morgan’s canon is often thought to impose requirements that are incompatible with attributing thoughts to prelinguistic infants and early hominids. However, it is still difficult to envision a return to the methodological precepts of behaviorism in infant development research.<sup>22</sup> Therefore, Morgan’s canon cannot compel us to adopt a purely behaviorist stance in psychological explanations. In this regard, the development of content deserves an intermediary explanation that avoids both behavioral biases and full-blown content.

### 3 Inner Speech in action

The acquisition of early literacy is one of the most significant developmental milestones in human life. The goal of reading is to understand entire texts, not just to identify individual words. Children do not automatically learn how to comprehend information; they need patient instruction. Reading is a cognitive capacity strongly rooted in the socio-cultural practices shared by people in communities. Consequently, meaningful texts enable children to make connections between their classrooms and the outside world. Research on the psychogenesis of literacy indicates that there are three main stages in learning to read.<sup>23</sup> Initially, children regard written language as an object, much like they do with other objects in the surrounding world. This is the pictorial stage before formal reading instruction, where children are capable of memorizing, recognizing, and spelling words as if they were common objects. Awareness of phonemes occurs during the second stage, the phonological stage, in which children decode words into letters and connect letters to sounds, developing the grapheme-to-phoneme transition. In this phase, children focus on isolated letters or relevant groups, rehearsing the linkage of graph-

emes to speech sounds to form words. Finally, the third stage corresponds to the orthographic stage, where children have a large lexicon of visual units, and reading time is determined more by word frequency than word length. In what follows, I will carefully examine the second stage of reading acquisition, during which children discover the coordination between sounds that can be spoken or heard and symbols that can be written or read.

Thanks to formal education, day by day, they become capable of segmenting sentences and words into many parts to establish connections between oral segments and written ones. Dehaene observes that the first years of formal reading instruction are crucial for children’s efficient development, given the role of phonological awareness in this process. He emphasizes the need to explicitly teach children that speech is composed of phonemes, and when phonemes are combined, they create words. This phonological stage is marked by distinctive regularization errors. Beginning readers can sound out a few letters but typically struggle when a word is even slightly irregular. Moreover, they experience complexity effects: «a first-grader may be able to read simple syllables with a consonant followed by a vowel (CV), but typically faces increasing difficulty as the number of consonants grows (CVC, CCVC, and so on). Complex words such as “strict” (CCCVC) cannot be deciphered by a novice».<sup>24</sup> These findings indicate that reading acquisition progresses from simple to complex rules.

Most of the current models of reading postulate that reading relies on the coordination between two reading routes: the sub-lexical route and the lexical one.<sup>25</sup> The lexical route is generally used by fluent readers who are capable of linking orthographic representations with word meanings. However, the use of the sub-lexical route seems to be central in the phonological stage when phonological awareness is being enhanced. Researchers have discovered that both young children and adults read new written inputs using the grapheme-to-phoneme conversion, which supplements the letter-to-sound decoding employed by the sub-lexical route. This decoding procedure involves dividing written words into graphemes (letters or groups of letters), mapping sounds or phonemes to those graphemes, and blending the sounds together to produce pronunciation.<sup>26</sup> In short, the sub-lexical route converts letters into speech sounds, and the lexical route provides access to a mental dictionary of word meaning.<sup>27</sup> In fact, people with phonological dyslexia exhibit difficulties in decoding new written words because reading new words that are not in their lexicon requires grapheme-to-phoneme decoding, which appears to be impaired.<sup>28</sup>

Given that phonological upgrade is one of the central achievements in early literacy, what is the mechanism that enhances the grapheme-to-

phoneme conversion in the sub-lexical route? Undoubtedly, this stage of acquisition reveals changes arising from regularity and complexity effects leading to their resolution. This poses a challenging research question for psycholinguistics concerning the factors that drive the transition from the phonological to the orthographic stage.<sup>29</sup> One promising line of research focuses on the role of inner speech in reading acquisition. There is a consensus for treating inner speech as a form of internal, self-directed inaudible speech. It is traditionally described as verbal thinking, internal monologue, mental self-talk, inner voice, subvocal rehearsal, or covert language behavior.<sup>30</sup> In this context, inner speech can be primarily defined as the subjective experience of language in the absence of overt and audible articulation. This internal form of speech is typically distinguished from two external forms of speech: social speech (oral or written speech directed to others) and private speech (audibly or subvocally articulated speech directed to oneself, sometimes referred to as egocentric speech).<sup>31</sup> Vygotsky was one of the first developmental psychologists to examine the experience of speaking silently in one's head. He proposed that this development occurs through the gradual internalization of linguistic interactions shaped by social exchanges. Words that were previously used to regulate the behavior of others are "turned back on the self" to regulate the child's behavior. During the preschool and early school years, this self-directed speech is mainly overt and audible, representing a developmental stage known as private speech. With further development, these overt dialogues with oneself become internalized, making them entirely covert and inaudible, marking the development of inner speech.<sup>32</sup>

Studies on inner speech have shown that phonological representation is highly specific in this internalized social speech. For instance, Corcoran<sup>33</sup> demonstrated that readers automatically access phonetics in inner speech during silent reading. Similarly, Özdemir and colleagues<sup>34</sup> reported that the "uniqueness point", which is the place in the sequence of the word's phonemes where it deviates from every other word in the language, influenced phoneme monitoring in inner speech, suggesting that inner speech is specified to the same level as overt speech. Lastly, Slevc and Ferreira<sup>35</sup> documented a phonemic similarity effect in inner speech. All of these studies confirm that the phonological properties of words are manipulated during episodes of inner speech.

Psychologists like Vicente and Martinez-Manrique have identified various cognitive functions of inner speech.<sup>36</sup> Broadly speaking, these functions encompass thought broadcasting, behavior control, working memory, and verbal self-regulation, including reasoning, planning, memory, and attribution of mental states).<sup>37</sup> Although inner

speech in adulthood has predominantly been studied as a cognitive tool supporting other cognitive capacities, I prefer to focus on one of its functions in childhood. Liva and colleagues (1994) argue that «inner speech can be considered a mediator between a text and a child, much like a mother reading a story to her child serves as a mediator between the book and the child».<sup>38</sup>

When children learn to read, internal speech allows them to draw on previously acquired language, facilitating the connection between oral and written words. Based on this hypothesis, two experiments were conducted, training struggling readers in 3rd grade to use inner speech to enhance their reading abilities. As a result, the children significantly improved their reading performance, and the researchers supported the regulatory role of inner speech in reading acquisition. The conclusions of Liva and colleagues reinforce Vygotsky's idea that inner speech has a general cognitive role in problem-solving, aligning with the constructivist approach that I favor in this paper. More specifically, inner speech solves the problem of making letter units privately audible to produce overt reading. Ellis and Young introduced this possibility of internal speech, considering feedback from what they call "the phoneme level" to "the auditory analysis system", which means that phonemic sequences are heard by oneself. Thus, acoustic images can be used internally in the case of silent comprehension of written words.<sup>39</sup> If this is the case, I believe that in reading acquisition, inner speech appears to be related to the grapheme-to-phoneme conversion. Let me emphasize that this relationship would be fundamental for the story of the content that I am attempting to convey. Now, let's return to the topic of mental content.

#### 4 Proto-mental content

According to the idea proposed here, inner speech regulates the transition from orthographic to phonological information in silent reading. It is the specific way in which inner speech functions that leads me to postulate proto-mental content in young children. In agreement with Ehrich,<sup>40</sup> I view inner speech as a "problem-solving device" used in the reading process. Especially in the case of young readers, inner speech addresses the sub-lexical challenge of decoding the sounds of words (/d/ /o/ /g/) solely from the provided orthographic information ("dog"). How does inner speech operate, and what kind of information does it use to fulfill this cognitive role? In this section, I will introduce what I call the "phonological rehearsal" concept of inner speech, which aims to answer these questions.

Fernyhough proposed that inner speech can take two different forms: condensed inner speech, which includes the semantic and syntactic infor-

mation that accompanies internalization, and expanded inner speech, in which internal speech retains many of the phonological properties of overt speech.<sup>41</sup> In Fernyhough's model, the default setting for inner speech is condensed, with the transition to expanded inner speech resulting from cognitive challenges.<sup>42</sup> Ehrich views inner speech as the space where word meanings are elicited to enhance reading performance.<sup>43</sup> In this sense, Ehrich appears to include condensed inner speech in reading models. However, Ehrich's interpretation suggests that inner speech is associated with the lexical route of reading, where word meanings are manipulated. In contrast, my proposal is focused on the relationship between inner speech and the sub-lexical route. This is because reading acquisition strongly relies on the sub-lexical route.

Sokolov offers empirical evidence that during reading, inner speech becomes abbreviated when encountering familiar text, and conversely, when more complex text is encountered, inner speech becomes more expanded.<sup>44</sup> If this is the case for children, then they must use expanded inner speech during the reading process. In fact, Alderson-Day and Fernyhough state that:

Children's adoption of inner speech is evidenced relatively early in development in the apparent emergence of the phonological similarity effect around age 7 (Gathercole, 1998). The effect is typically evidenced when visually presented items that are phonologically similar prove harder to recall than phonologically dissimilar items, due to interference between item words that sound the same. When children are asked to learn a set of pictures, those aged 7 and over tend to exhibit a phonological similarity effect, suggesting that visual material is being recoded into a verbal form via sub-vocal rehearsal (i.e., inner speech).<sup>45</sup>

This early phonological similarity effect shows that infants' inner speech includes phonological information that could be useful for the grapheme-phoneme conversion involved in reading processes. When children are faced with challenges during silent reading, access to phonological information stored by inner speech could serve as a sub-vocal rehearsal that aids in word retrieval. Baddeley,<sup>46</sup> in his working memory model, incorporates this type of rehearsal within the phonological store through a mechanism referred to as "the phonological loop". In the context of reading acquisition processes, I believe that such a mechanism could be termed "phonological rehearsal", which guides the search for the sounds to be read.

The idea is that the phonological information stored by inner speech guides the mapping between written words and their sounds. In the case of transparent languages (such as Spanish), pho-

nological information is involved in the direct projection from the lexical expression to the corresponding sounds. In the case of opaque languages (such as English), where there is an indirect projection, phonological information guides the selection of the correct sound. This is consistent with evidence from Polish 9-year-old readers, who demonstrated that vocabulary learning is strongly influenced by phonological strategies.<sup>47</sup>

As a result, phonological rehearsal encourages and prevents certain reading outcomes. In the following discussion, I will argue that these operations might manipulate proto-content. In my view, proto-contents are inner mental states that exhibit the property of aboutness. Most philosophers agree that mental states are contentful because they involve a form of intentionality, which is the characteristic of pointing, designating, or being about something.<sup>48</sup> As Ramsey states: «it is hard to see how something could qualify as a representational mental state in the ordinary sense unless it was about something - unless it in some way stood for something else».<sup>49</sup>

The phenomenon of aboutness or intentional directedness appears to entail a certain kind of relation between an item and a relatum.<sup>50</sup> Usually, mental contents attributed to thoughts, beliefs, and desires are directed toward various types of entities, including properties, abstract entities, individuals, relations, and states of affairs. For instance, my belief that Buenos Aires is the capital of Argentina is contentful because it pertains to Argentina, its seat of government, the city of Buenos Aires, and the relationship between these entities.

Although the relationship between inner speech and the reading process does not involve mental states such as thoughts, beliefs, and desires, it reveals a directedness between phonemes and graphemes, which allows for the attribution of proto-contents. Properly understood, the phonological rehearsal mechanism demonstrates that phonemes are utilized as constituent elements representing a relevant target domain of graphemes. In this context, "standing for" characterizes a mapping relationship where phonological information (/cat/) serves as representations of the written words ("cat"). This correspondence from phonemes to graphemes deserves further exploration. Firstly, it's important to note that this mapping is not based on any structural resemblance. Contrary to what one might think, this is not a resemblance-based proposal since phonemes and graphemes are symbols, and, as Cummins points out, «nothing is more obvious than that symbolic data structures don't resemble what they represent».<sup>51</sup> Hence, phonemes need not resemble graphemes, and the "standing for" relation constitutes a mapping between non-pictorial "arbitrary objects".<sup>52</sup>

Secondly, the mapping displays an asymmetrical relation between phonemes and graphemes.

In reading processes, phonological information serves as a representation of grapheme information, but the opposite is not the case. Why does this asymmetry occur?

When considering the mapping between phonemes and graphemes, inner speech enhances the conversion thanks to phonological rehearsal. The operations of inner speech seem to improve the cognitive task in question by resolving the conversion problem. In my proposal, inner speech functions as a consumer mechanism that exploits an observer-dependent mapping. Following Milkowski:

We cannot tell what we need to consider when determining whether there is a mapping if we do not already know that there should be a mapping between two entities. But to know that there is a mapping we should have to know these two entities; the notion of representation was supposed to tell us which entity the representation is related to. For this, we could use external observer.<sup>53</sup>

In other words, we need to know how to select the target of the phoneme-grapheme conversion independently of the conversion itself. This is the familiar idea that a representation must represent something to a cognitive system, either as a whole or to its parts.<sup>54</sup> It's helpful to relate this conception of representations to Peirce's original analysis of (non-mental) representations, which identifies three necessary components: a sign, an object, and an interpreter. Within a cognitive context, an interpreter can be understood as a subpersonal mechanism that checks the information processed by other subpersonal mechanisms. Particularly in the reading context, the mapped items must be ready to be utilized in a representational way by an evaluation mechanism such as inner speech.

The presence of inner speech as an evaluation mechanism reveals that the connection between phonemes and graphemes includes the normative dimension of error. As Bickhard states, error is important as far as it can be detected by the agent, and for that, the agent needs to have an interest.<sup>55</sup> The debate over how to understand error in cognitive systems is often framed in terms of how to account for misrepresentation.<sup>56</sup> The idea is that the capacity to represent is engaged with the capacity to misrepresent, and therefore, we need to specify conditions under which there are misrepresentations. In the described reading process, the system can fail to behave appropriately when it designates the wrong phoneme (/b/) to a target grapheme ("p").

Inner speech indicates these errors by performing the phonological rehearsal. In the model I suggest that misrepresentation should be conceived of as the failure of phonological information to adequately stand for its targets, a failure which is

identified thanks to the operations of inner speech. This account of error captures Cummins' proposal, according to which error is a form of misapplication of the correct representation.<sup>57</sup> Ramsey describes it in the following passage:

Suppose the system is a chess-playing program with sub-systems that generate board states corresponding to actual elements of the game (these Cummins refers to as "intenders"). Suppose further that one such sub-system generates a slot that is supposed to be filled with a representation of the next board configuration, which happens to be P2. P2 is thus the target for representation. If all goes well, the slot will be filled with a representation of P2, i.e., RP2. This slot-filling (variable binding) is what Cummins calls the application of the representation. Now, suppose the slot is instead filled with a representation of a different board position, namely, P3. An error would thereby occur because the intended target (P2) would not be represented by the representation that is applied (RP3). This sort of error is possible only when there is a mismatch between representation and target. Error is thus a form of misapplication of a representation with a fixed content to the wrong target.<sup>58</sup>

To summarize, the proposed reading mechanism exhibits a directedness accompanied by the possibility of error or misapplication. Inner speech constitutes a third element between phonemes and graphemes needed to point out these errors. One might argue that what I have been referring to as "proto-content" actually constitutes full-blown content, considering that it exhibits the typical conditions of satisfaction found in contentful states. To counter this interpretation, I will argue that proto-content possesses the property of internal graded aboutness. The explained reading processes demonstrate what I consider a degree of directedness that resides in the mind and is grounded in purely internal resources. In the case of full-blown aboutness, the relata of contents are widely regarded as external objects and events in the world. However, proto-contents exhibit a degree of aboutness in the sense that one part of the cognitive machinery is related to another part of the mind. While proto-contents have a certain degree of aboutness restricted to the internal nature of the relata, mental contents do not display this restriction.

This graded directedness emerges as a result of the operations of the subpersonal systems that transform phonemes into graphemes. In this sense, internal aboutness differs from full-blown aboutness because there is no connection between the symbols and the external world. The interconnected domain of phonological items with their

grapheme targets is contained within a mechanical engine, such as the human brain. This leads me to believe that reading processes do not involve full-blown content representing properties of the external and social world. However, I am not suggesting that proto-content has a kind of narrow content as opposed to wide content. According to the internalist approach (in the internalism/externalism debate in the philosophy of mind and language), the content of representation is determined within the cognitive system. Content supervenes on intrinsic properties, in contrast to positions that focus on content reference.<sup>59</sup> Proto-content should not be considered as either wide or narrow content. The internalism/externalism debate centers on the determination of content, but my proposal regarding the origins of content does not address this explanatory need simply because full-blown content has not yet emerged.

Why do young minds include proto-contents with internal aboutness? From a developmental perspective, I can hypothesize that these proto-contents might serve as the precursors required for the development of full-fledged contentful minds in adults. Mental content may be acquired, in part, through the involvement of states with a different degree of aboutness. Sharing a common foundational structure, proto-contents enable minds to gain meaning within the world. However, it's important to note that proto-contents are not connected to elements from the external world. This leads me to view them as intermediate mental states in the process of development. It is possible that these proto-contents, especially in early reading acquisition, facilitate the development of more complex linguistic content that emerges in social interactions.

I'd like to emphasize that this model of the mind successfully avoids both the gap problem, which was raised in opposition to radical enactivists, and the hard problem of content, which posed challenges for cognitivists. To begin with, proto-contents bypass the gap between non-contentful and contentful minds, as they are constructed on a cognitive framework that doesn't differentiate between basic and non-basic mental capacities. In this context, the process of reading acquisition is recognized and should be regarded as a hybrid capacity, where cognitive and cultural elements intertwine. Furthermore, proto-contents effectively address the hard problem of content by deviating from the assumptions put forth by informational theories. Notably, proto-contents possess conditions of satisfaction, and the subpersonal processes underpinning reading abilities are influenced by misapplications that are detected by inner speech.

To wrap up, the way I perceive proto-contents, they serve as a facilitating element in the cognitive development of children, gradually fading away as individuals transition into adulthood. To grasp

this concept better, consider the idea of precursors to the theory of mind, as proposed by Baron-Cohen.<sup>60</sup> According to this notion, attention plays a crucial role as a precursor, enabling individuals to comprehend the beliefs of others, particularly in young children. However, unlike attention, which is presented as a necessary condition for the development of a theory of mind, proto-contents do not hold such a central functional role. They do not make mental content possible, but rather, they facilitate it. In fact, the capacity for minds to convey meaning can manifest in various circumstances where neither inner speech nor literacy are involved. This extends to cases involving blind, mute, and deaf individuals, as well as those who are illiterate. These instances illustrate that proto-contents contribute to the promotion of mental content, yet they do not determine it.

## 5 Conclusion

In this paper, I have endeavored to provide an initial exploration of the cognitive origins of linguistic mental content, with a primary focus on the role of inner speech in the early stages of reading acquisition. Inner speech has been noted to exhibit variations in its phonological, semantic, and syntactic properties, ranging from condensed to expanded forms, and is also considered highly personal and idiosyncratic. However, I firmly believe that inner speech presents a promising avenue for further research. By concentrating on expanded inner speech, I have outlined some key features of a reading model where inner speech collaborates with graphemes-to-phonemes conversion rules. Proto-content, in this framework, would represent the mental states that supervene upon these operations, demonstrating a form of internal aboutness. As inner speech functions as an intermediary mechanism, and proto-content serves as an intermediate state, my proposed explanation aligns with an intermediate account of content, incorporating elements of cognitivism, enactivism, and constructivism in the theory of the mind.

As presented, reading is a capacity that, on one hand, relies on internal cognitive elements and, on the other hand, is deeply embedded in socio-cultural practices. Consequently, reading demonstrates that both internalism and enactivism can coexist. In the hybrid developmental approach proposed in this paper, internalism aligns with a more ecological perspective of the mind, suggesting that linguistic social practices are in part prompted by a particular cognitive architecture during childhood. I aimed to clarify that internalism and enactivism, on their own and independently, offer limited explanations for understanding mental content.

What I have developed is a subpersonal form of inner speech that involves mechanistic relation-

ships among reading components. As I outlined, in this context, there are minimal correctness conditions that arise in the grapheme-to-phoneme mapping process. How might this relate to the development of reflective metalinguistic abilities in children? Inner speech, as a personal capacity, serves as a reflective tool used for thinking and problem-solving, facilitating the inter-comprehension necessary to recognize ourselves as members of a linguistic community. The core idea is that these early correctness conditions that emerge from the inner cognitive machinery lay the groundwork for more advanced correctness conditions. The proto-contents formally facilitate the recognition of errors within a social environment, as the latter may replicate the structure of the former. Through the acquisition of reading skills, our mental machinery develops the structural relationships required for more complex and socially meaningful interactions. More specifically, in these early stages, inner speech functions as a subpersonal consumer mechanism that utilizes an observer-dependent mapping, and this structure might be mimicked later.<sup>61</sup> This intriguing idea deserves deeper investigation in future research.

## Notes

- <sup>1</sup> Cf. J.A. FODOR (1987). *Psychosemantics*.
- <sup>2</sup> Cf. D. HUTTO, E. MYIN, *Evolving enactivism. Basic minds meet content*.
- <sup>3</sup> Cf. D. HUTTO, E. MYIN, *Radicalizing enactivism: Basic minds without content*; D. HUTTO, E. MYIN, *Evolving enactivism. Basic minds meet content*.
- <sup>4</sup> D. HUTTO, E. MYIN, *Evolving enactivism*, p. xviii.
- <sup>5</sup> R. MENARY, *Mathematical cognition: A case of enculturation*, p. 3, footnote 5.
- <sup>6</sup> Cf. S. HARNAD, *To cognize is to categorize: Cognition is categorization*; HARNAD, S. (2002). *Symbol grounding and the origin of language*; HARNAD, S. (1992). *Grounding symbolic representation in categorical perception*.
- <sup>7</sup> Cf. C. BROWN, *Narrow mental content*.
- <sup>8</sup> Cf. D. HUTTO, E. MYIN, *Evolving enactivism. Basic minds meet content*.
- <sup>9</sup> Cf. R. MENARY, *Mathematical cognition: A case of enculturation*.
- <sup>10</sup> Cf. T. FROESE, E. DI PAOLO, *Sociality and the life-mind continuity thesis*.
- <sup>11</sup> Cf. H. DE JAEGHER, T. FROESE, *On the role of social interaction in individual agency*.
- <sup>12</sup> Cf. T. FROESE, E. DI PAOLO, *Sociality and the life-mind continuity thesis*.
- <sup>13</sup> Cf. D. HUTTO, E. MYIN, *Radicalizing enactivism: Basic minds without content*.
- <sup>14</sup> Cf. J. HAUGELAND, *Truth and rule-following*.
- <sup>15</sup> Cf. D. HUTTO, G. SATNE, *The natural origins of content*.
- <sup>16</sup> Cf. R.A. WILSON, *Cartesian psychology and physical minds: Individualism and the sciences of mind*.
- <sup>17</sup> B. GERTLER, *Understanding the internalism-externalism debate*. p. 51.
- <sup>18</sup> J. COLLINS, *Noam Chomsky*, p. 176.
- <sup>19</sup> Cf. R. CUMMINS, *Functional analysis*.
- <sup>20</sup> Cf. D. BICKERTON, W. CALVIN, *Lingua ex machine. Reconciling Darwin and Chomsky with the human brain*.
- <sup>21</sup> C.L. MORGAN, *An introduction to comparative psychology*, p. 53.
- <sup>22</sup> Cf. J.L. BERMÚDEZ, *Thinking without words*.
- <sup>23</sup> Cf. U. FRITH, *Beneath the surface of developmental dyslexia*, pp. 301-303.
- <sup>24</sup> S. DEHAENE, *Reading in the brain*, p. 253.
- <sup>25</sup> Cf. M. COLTHEART, K. RASTLE, C. PERRY, R. LANGDON, J.C. ZIEGLER, *DRC: A dual route cascaded model of visual word recognition and reading aloud*; A.E. ELLIS, A.W. YOUNG, *Human cognitive neuropsychology*.
- <sup>26</sup> Cf. I. RAPHIQ, Y. HAITHAM, A. AYAT, K. ASAD, *Electronic reading and writing in spoken and written arabic: A case study*.
- <sup>27</sup> L. HENDERSON, *The psychology of morphemes*; G. HUMPHREYS, L.J. EVETT, P.T. QUINLAN, *Orthographic processing in visual word identification*.
- <sup>28</sup> Cf. C. ZABELL, J. EVERATT, *Surface and phonological subtypes of adult developmental dyslexia*.
- <sup>29</sup> Cf. A.E. ELLIS, A.W. YOUNG, *Human cognitive neuropsychology*.
- <sup>30</sup> Cf. B. ALDERSON-DAY, C. FERNYHOUGH, *Inner speech: Development, cognitive functions, phenomenology and neurobiology*.
- <sup>31</sup> Cf. M.C.M. GUERRERO, *Going covert: Inner and private speech in language learning*.
- <sup>32</sup> Cf. L.S. VYGOTSKY, *Thought and language*; S. GEVA, C. FERNYHOUGH, *A penny for your thought: Children's inner speech and its neuro-development*.
- <sup>33</sup> Cf. D.W. CORCORAN, *An acoustic factor in letter cancellation*.
- <sup>34</sup> Cf. R. ÖZDEMİR, A. ROELOFS, W.J.M. LEVELT, *Perceptual uniqueness point effects in monitoring internal speech*.
- <sup>35</sup> Cf. L.R. SLEVC, V.S. FERREIRA, *In single word production: A test of the perceptual loop theory of speech monitoring*.
- <sup>36</sup> Cf. A. VICENTE, F. MARTINEZ-MANRIQUE, *Inner speech: Nature and functions*.
- <sup>37</sup> Cf. E.S. SPELKE, *What makes us smart? Core knowledge and natural language*; A.D. BADDELEY, *Working memory*; A.S. LAW, S.L. TRAWLEY, L.A. BROWN, A.N. STEPHENS, R.H. LOGIE, *The impact of working memory load on task execution and online plan adjustment during multitasking in a virtual environment*; K.J. GILHOOLY, *Working memory and strategies in reasoning*; J. HARDY, *Speaking clearly: A critical review of the self-talk literature*.
- <sup>38</sup> A. LIVA, E. FIJALKOW, J. FIJALKOW, *Learning to use inner speech for improving reading and writing of poor readers*, p. 322.
- <sup>39</sup> A.E. ELLIS, A.W. YOUNG, *Human cognitive neuropsychology*, p. 227.
- <sup>40</sup> Cf. J.F. EHRICH, *Vygotskian inner speech and the reading process*.
- <sup>41</sup> C. FERNYHOUGH, *Alien voices and inner dialogue: Towards a developmental account of auditory verbal hallucinations*.
- <sup>42</sup> Cf. B. ALDERSON-DAY, C. FERNYHOUGH, *Inner speech: Development, cognitive functions, phenomenology and neurobiology*.
- <sup>43</sup> Cf. J.F. EHRICH, *Vygotskian inner speech and the reading process*.
- <sup>44</sup> Cf. A.N. SOKOLOV, *Inner speech and thought*.
- <sup>45</sup> B. ALDERSON-DAY, C. FERNYHOUGH, *Inner speech: Development, cognitive functions, phenomenology and neurobiology*.
- <sup>46</sup> Cf. A.D. BADDELEY, *Working memory*.
- <sup>47</sup> Cf. M. MARECKA, J. ZSEWCZYK, A. JELEC, D. JANIS-

ZEWSKA, K. RATAJ, K. DZIUBALSKA-KOŁACZYK, *Different phonological mechanisms facilitate vocabulary learning at early and late stages of language acquisition: Evidence from Polish 9-year-olds learning English*.

<sup>48</sup> Cf. F.C. BRENTANO, *Psychology from an empirical standpoint*.

<sup>49</sup> W. RAMSEY, *Representation reconsidered*, p. 16.

<sup>50</sup> Cf. A. MORGAN, *Representations gone mental*.

<sup>51</sup> R. CUMMINS, *Meaning and mental representation*, pp. 30-31.

<sup>52</sup> D. WILLIAMS, L. COLLING, *From symbols to icons: The return of resemblance in the cognitive neuroscience revolution*, p. 1942.

<sup>53</sup> M. MILKOWSKI, *Explaining the computational mind*, p. 151.

<sup>54</sup> Cf. M. MILKOWSKI, *Explaining the computational mind*; R. CAO, *A teleosemantic approach to information in the brain*; R.G. MILLIKAN, *Language, thought, and other biological categories*.

<sup>55</sup> Cf. M.H. BICKHARD, *Representational content in humans and machines*.

<sup>56</sup> J. LEE, *Structural representation and the two problems of content*.

<sup>57</sup> R. CUMMINS, *Representations, targets and attitudes*.

<sup>58</sup> W. RAMSEY, *Representation reconsidered*, p. 105.

<sup>59</sup> Cf. M. MILKOWSKI, *Explaining the computational mind*.

<sup>60</sup> Cf. S. BARON-COHEN, *Precursors to a theory of mind: Understanding attention in others*.

<sup>61</sup> Cf. M. MILKOWSKI, *Explaining the computational mind*.

## Literature

- ALDERSON-DAY, B., FERNYHOUGH, CH. (2015). *Inner speech: Development, cognitive functions, phenomenology and neurobiology*. In: «Psychological Bulletin», vol. CXXI, n. 5, pp. 931-956.
- BADDELEY, A.D. (1986). *Working memory*, Oxford University Press, Oxford.
- BARON-COHEN, S. (1991). *Precursors to a theory of mind: Understanding attention in others*. In: A. WHITEN (Ed.), *Natural theories of mind: Evolution, development and simulation of everyday mindreading*, Basil Blackwell, London, pp. 233-251.
- BERMÚDEZ, J.L. (2003). *Thinking without words*, Oxford University Press, Oxford.
- BICKERTON, D., CALVIN, W. (2001). *Lingua ex machine. Reconciling Darwin and Chomsky with the human brain*, MIT Press, Cambridge (MA).
- BICKHARD, M.H. (1993). *Representational content in humans and machines*. In: «Journal of Experimental and Theoretical Artificial Intelligence», vol. V, n. 4, pp. 285-333.
- BRENTANO, F.C. (1973). *Psychology from an empirical standpoint*, translated by B. MÜLLER, Routledge & Kegan Paul, London (or. ed. F. BRENTANO, *Psychologie vom empirischen Standpunkte*, Dunker & Humblot, Leipzig 1874).
- BROWN, C. (2022). *Narrow mental content – substantive revision*. In: E.N. ZALTA (ed.), *Stanford encyclopedia of philosophy*, Spring edition - URL: <https://plato.stanford.edu/entries/content-narrow/>
- CAO, R. (2011). *A teleosemantic approach to information in the brain*. In: «Biology and Philosophy», vol. XXVII, n. 1, pp. 49-71.
- COLLINS, J. (2011). *Noam Chomsky*. In: B. LEE (ed.), *Philosophy of language: The key thinkers*, Continuum, London, pp. 159-178.
- COLTHEART, M., RASTLE, K., PERRY, C., LANGDON, R., ZIEGLER, J.C. (2001). *DRC: A dual route cascaded model of visual word recognition and reading aloud*. In: «Psychological Review», vol. CVIII, n. 1, pp. 204-256.
- CORCORAN, D.W. (1966). *An acoustic factor in letter cancellation*. In: «Nature», vol. CCX, n. 5036, pp. 658.
- CUMMINS, R. (1975). *Functional analysis*. In: «The Journal of Philosophy», vol. LXXII, n. 20, pp. 741-756.
- CUMMINS, R. (1989). *Meaning and mental representation*, MIT Press, Cambridge (MA).
- CUMMINS, R. (1996). *Representations, targets and attitudes*, MIT Press, Cambridge (MA).
- DE JAEGER, H., FROESE, T. (2009). *On the role of social interaction in individual agency*. In: «Adaptive Behavior», vol. XVII, n. 5, pp. 444-460.
- DEHAENE, S. (2009). *Reading in the brain. The new science of how we read*, Penguin, London.
- EHRICH, J.F. (2006). *Vygotskian inner speech and the reading process*. In: «Australian Journal of Educational and Developmental Psychology», vol. VI, pp. 12-25.
- ELLIS, A.E., YOUNG, A.W. (1992). *Human cognitive neuropsychology*, Psychology Press, London.
- FERNYHOUGH, C. (2004). *Alien voices and inner dialogue: Towards a developmental account of auditory verbal hallucinations*. In: «New Ideas in Psychology», vol. XXII, pp. 49-68.
- FODOR, J.A. (1987). *Psychosemantics*, MIT Press, Cambridge (MA).
- FRITH, U. (1985). *Beneath the surface of developmental dyslexia*. In: K. PATTERSON, J. MARSHALL, M. COLTHEART (eds.), *Surface dyslexia: Cognitive and neuropsychological studies of phonological reading*, Erlbaum, Hillsdale, pp. 301-303.
- FROESE, T., DI PAOLO, E. (2009). *Sociality and the life-mind continuity thesis*. In: «Phenomenology and Cognitive Sciences», vol. VIII, n. 4, pp. 439-463.
- GERTLER, B. (2012). *Understanding the internalism-externalism debate: What is the boundary of the thinker?*. In: «Philosophical Perspectives», vol. XXVI, n. 1, pp. 51-75.
- GEVA, S., FERNYHOUGH, CH. (2019). *A penny for your thought: Children's inner speech and its neurodevelopment*. In: «Frontiers in Psychology», vol. X, Art.Nr. 1708 - doi: 10.3389/fpsyg.2019.01708.
- GILHOOLY, K.J. (2005). *Working memory and strategies in reasoning*. In: E. NEWTON, M. ROBERTS (eds.), *Methods of thought: Individual differences in reasoning strategies*, Psychology Press, Hove, pp. 57-80.
- GUERRERO, M.C.M. (2018). *Going covert: Inner and private speech in language learning*. In: «Language Teaching», vol. LI, n. 1, pp. 1-35.
- HARDY J. (2006). *Speaking clearly: A critical review of the self-talk literature*. In: «Psychology of Sport and Exercise», vol. VII, n. 1, pp. 81-97.
- HARNAD, S. (1992). *Grounding symbolic representation in categorical perception*, Princeton University, PhD Thesis.
- HARNAD, S. (2002). *Symbol grounding and the origin of language*. In: M. SCHEUTZ (ed.), *Computationalism: New directions*, MIT Press, Cambridge (MA), pp. 143-158.
- HARNAD, S. (2005). *To cognize is to categorize: Cognition is categorization*. In: C. LEFEBVRE, H. COHEN (eds.), *Handbook of categorization*. Elsevier, Amsterdam/

- New York, pp. 21-54.
- HAUGELAND, J. (1998). *Truth and rule-following*. In: J. HAUGELAND (ed.), *Having thought: Essays in the metaphysics of mind*, Harvard University Press, Cambridge (MA), pp. 149-176.
- HENDERSON, L. (1985). *The psychology of morphemes*. In: A.W. ELLIS (ed.), *Progress in the psychology of language*, vol. I, Erlbaum, London, pp. 197-217.
- HUMPHREYS, G., EVETT, L.J., QUINLAN, P.T. (1990). *Orthographic processing in visual word identification*. In: «Cognitive Psychology», vol. XXII, n. 4, pp. 517-560.
- HUTTO, D., MYIN E. (2013). *Radicalizing enactivism: Basic minds without content*, MIT Press, Cambridge (MA).
- HUTTO, D., MYIN E. (2017). *Evolving enactivism. Basic minds meet content*, MIT Press, Cambridge (MA).
- HUTTO, D., SATNE, G. (2015). *The natural origins of content*. In: «Philosophia», vol. XLIII, n. 3, pp. 521-536.
- MARECKA, M., ZSEWCZYK, J., JELEC, A., JANISZEWSKA, D., RATAJ, K., DZIUBALSKA-KOŁACZYK, K. (2018). *Different phonological mechanisms facilitate vocabulary learning at early and late stages of language acquisition: Evidence from Polish 9-year-olds learning English*. In: «Applied Psycholinguistics», vol. XXXIX, n. 1, pp. 1-35.
- LAW, A.S., TRAWLEY, S.L., BROWN, L.A., STEPHENS, A.N., LOGIE, R.H. (2013). *The impact of working memory load on task execution and online plan adjustment during multitasking in a virtual environment*. In: «The Quarterly Journal of Experimental Psychology», vol. LXVI, n. 6, pp. 1241-1258.
- LEE, J. (2018). *Structural representation and the two problems of content*. In: «Mind and Language», vol. XXXIV, n. 5, pp. 606-626.
- LIVA, A., FIJALKOW, E., FIJALKOW, J. (1994). *Learning to use inner speech for improving reading and writing of poor readers*. In: «European Journal of Psychology of Education», vol. IX, n. 4, pp. 321-330.
- MARECKA, M., ZSEWCZYK, J., JELEC, A., JANISZEWSKA, D., RATAJ, K., DZIUBALSKA-KOŁACZYK, MENARY, R. (2015). *Mathematical cognition: A case of enculturation*. In: T. METZINGER, J.M. WINDT (eds.), *Open MIND*, 25(T), Frankfurt a.M. – doi: 10.15502/9783958570818.
- MILKOWSKI, M. (2011). *Explaining the computational mind*, MIT Press, Cambridge (MA).
- MILLIKAN, R.G. (1984). *Language, thought, and other biological categories*, MIT Press, Cambridge (MA).
- MORGAN, A. (2014). *Representations gone mental*. In: «Synthese», vol. CXCI, n. 2, pp. 213-244.
- MORGAN, C.L. (1894). *An introduction to comparative psychology*, Walter Scott, London.
- ÖZDEMİR, R., ROELOFS, A., LEVELT, W.J.M. (2007). *Perceptual uniqueness point effects in monitoring internal speech*. In: «Cognition», vol. CV, n. 2, pp. 457-465.
- RAMSEY, W. (2007) *Representation reconsidered*, Cambridge University Press, Cambridge.
- RAPHIQ, I., HAITHAM, Y., AYAT, A., AS Aid, K. (2013). *Electronic reading and writing in spoken and written arabic: A case study*. In: «Theory and Practice in Language Studies», vol. III, n. 9, pp. 1497-1508.
- SLEVC, L.R., FERREIRA, V.S. (2006). *In single word production: A test of the perceptual loop theory of speech monitoring*. In: «Journal of Memory and Language», vol. LIV, n. 4, pp. 515-540.
- SOKOLOV, A.N. (1975). *Inner speech and thought*, Plenum, New York.
- SPELKE, E.S. (2003). *What makes us smart? Core knowledge and natural language*. In: D. GENTNER, S. GOLDIN-MEADOW (eds.), *Language in mind*, MIT Press, Cambridge (MA), pp. 277-311.
- VICENTE, A., MARTINEZ-MANRIQUE, F. (2011). *Inner speech: Nature and functions*. In: «Philosophy Compass», vol. VI, n. 3, pp. 209-219.
- VYGOTSKY, L.S. (1962) *Thought and language* (1934), translated by E. HANFMANN, G. VAKAR, MIT Press, Cambridge (MA).
- WILLIAMS, D., COLLING, L. (2018). *From symbols to icons: The return of resemblance in the cognitive neuroscience revolution*. In: «Synthese», vol. CXCV, n. 5, pp. 1941-1967.
- WILSON, R.A. (1995). *Cartesian psychology and physical minds: Individualism and the sciences of mind*, Cambridge University Press, Cambridge/New York.
- ZABELL, C., EVERATT, J. (2002). *Surface and phonological subtypes of adult developmental dyslexia*. In: «Dyslexia», vol. VIII, n. 3, pp. 160-177.