Article

Logical pluralism and linguistic relativism: a hypothesis about the relationship between logic, language and thought

Pluralismo lógico e relativismo linguistico: uma hipótese sobre a relação entre lógica, linguagem e pensamento

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ABSTRACT

This paper aims to connect two debates about the relation among language, reasoning and thought that belong to different theoretical and disciplinary fields, but that are closely linked. On the one hand, the philosophical debate about logical pluralism. And, on the other hand, the linguistic debate around the Sapir-Whorf hypothesis. We propose a hypothesis compatible with a version of logical pluralism and linguistic relativism that makes it possible to explain the differences between thoughts expressed

in different languages. This hypothesis, at the same time, supports the possibility of understanding and even translating different logical and linguistic variants. From a position akin to logical expressivism, we claim that there exists a proto-logic underlying all natural languages. The minimal logical operators proper of this proto-logic can be made explicit in a precise way in different formal systems. This gives rise to logical pluralism. We also offered an empirically informed philosophical argument in favor of this hypothesis.

Keywords: linguistic relativism, logical pluralism, Sapir-Whorf hypothesis, logical expressivism, logic, language and reasoning.

RESUMO

Este artigo pretende conectar dois debates sobre a relação entre linguagem, raciocínio e pensamento que pertencem a campos teóricos e disciplinares diferentes, mas que estão intimamente ligados. Por um lado, o debate filosófico sobre o pluralismo lógico. E, por outro lado, o debate linguístico em torno da hipótese Sapir-Whorf. Propomos uma hipótese compatível com uma versão do pluralismo lógico e do relativismo linguístico que permite explicar as diferenças entre pensamentos expressos em diferentes línguas. Esta hipótese, ao mesmo tempo, sustenta a possibilidade de compreender e até traduzir diferentes variantes lógicas e linguísticas. De uma posição semelhante ao expressivismo lógico, afirmamos que existe uma protológica subjacente a todas as línguas naturais. Os operadores lógicos mínimos próprios desta protológica podem ser explicitados de forma precisa em diferentes sistemas formais. Isso dá origem ao pluralismo lógico. Também oferecemos um argumento filosófico empiricamente informado em favor desta hipótese.

Palavras-chave: relativismo linguístico, pluralismo lógico, hipótese Sapir-Whorf, expressivismo lógico, lógica, linguagem e raciocínio.

1 Introduction

This paper aims to investigate the relationship between two related debates about reasoning and thinking that belong to different theoretical and disciplinary approaches: On the one hand, the philosophical debate about logical pluralism and monism (Arazim, 2020; Beall and Restall, 2006; Cook, 2010; Eklund, 2020) and, on the other hand, the linguistic debate around the Sapir-Whorf hypothesis (Boroditsky and Prinz, 2012; Fausey *et al.*, 2010; Thibodeau *et al.*, 2017; Winawer *et al.*, 2007).

The aim is to open a field of reflection that brings both discussions closer. Although in the field of philosophical logic, the concept of reasoning is strictly defined and does not completely coincide with the concept of thought used in linguistics, it is possible to glimpse a productive link between both. In particular, some interesting questions arise from the link between these fields: If different languages determine different ways of thinking, is this because they have different logical bases? Or is it because they have a common logical basis but the grammatical differences determine different ways of thinking? It could even be postulated that these differences do not have their origin in logic or grammar, but they are due to the fact that the vocabulary of each language includes different historical-cultural concepts, experiences and categories.

These debates face different aporias: If there is no common logical basis between plural logical principles, how can we understand someone who uses a different logic? Similarly, strong linguistic de-

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terminism leads to the problem of how it is possible to understand someone who thinks in a different language. In both cases, there is a problem of commensurability: logical or linguistic pluralism in the strong sense makes the comparison of logic and languages an almost impossible task. Now, if we postulate partial incommensurability, it would be necessary to distinguish between common and different aspects, but does this task not already presuppose a common logical or linguistic basis?

The plan of this paper is as follows: In the first section, we point out the differences between the stricter notion of reasoning and the broader one of thought. In sections 2 and 3, we briefly expose the debates on logical pluralism and linguistic relativism, respectively. Next, we suggest a hypothesis compatible with a version of logical pluralism and linguistic relativism that would explain the differences between reasoning or thoughts expressed in different languages and, at the same time, support the ability to understand and even translate different logical and linguistic variants. Finally, in section 5, we present an empirically informed philosophical argument in favor of our hypothesis.

2 Thought and reasoning

Thought, in a broad sense, as it is understood in the linguistic hypotheses that we will analyze, can be considered as conscious mental content (Boroditsky and Prinz, 2012). When we say, for example, "I thought of you last night" we are using it in this broad sense and not in the restricted sense that we give to reasoning.

However, "thought" has also been defined in a more precise and restricted way. Frege defines logic in terms of the laws of thought (Frege, 1893, xv), but, while "thought" can and often does refer to psychological processes, Frege did not aim to refer to psychological processes at all. He understood the laws of logic as laws about abstract entities that do not describe psychological processes but must nevertheless guide thought (Mezzadri, 2015). This Fregean idea of thinking is compatible with a narrower concept assimilable to the strict concept of reasoning that refers to mental or cognitive processes involving inferences, i.e., derivations of beliefs or information (conclusions) from a set of prior beliefs or information (premises).

If we understand thought in a broad sense, as any mental or cognitive process occurring in the mind, then not all thought is reasoning. However, reasoning is a type of thought that involves inferences. Logic is not interested in the psychological process of reasoning. It is interested in certain relationships between the propositional content of those inferential processes. Specifically, logic aims to determine, in an argument, (the final product of a reasoning process), if the relationship between the premises and the conclusion is adequate, i.e., if the truth of the conclusion is guaranteed from the truth of the premises (Beall and Restall, 2006). More than with the psychological process of reasoning, logic deals with the procedures or structures that underlie reasoning and allow it to be justified. The question then would be, do different procedures and logical operations underlie different languages?

It is possible to distinguish three levels of analysis in which language can affect or influence thought. (1) A superficial level related to vocabulary, that is, the types of concepts that a language has and that sometimes do not find equivalents in another. (2) An intermediate level related to the different grammar of the languages. And (3) a deep level related to the logical core underlying the different languages.

3 Logical Pluralism and Logical Monism

Some philosophical perspectives about logic maintain that this discipline, despite dealing with abstract entities, has a normative role in reasoning insofar as it establishes restrictions or gives permissions on the beliefs that can be accepted or that must be rejected. Thus, it is argued that reasoning is a social process mediated by linguistic interactions (Mackenzie, 1989). Logic is involved in reasoning as it pre-

scribes how to behave in these linguistic interactions. Specifically, logic establishes interaction rules that define appropriate connections between the sentences (truth-bearers) with which those interactions are performed. In this way, logic is a set of rules that govern rational social interactions (Dutilh-Novaes, 2021).

Nowadays, there exists a variety of logical systems that characterize the relationship of logical consequence. This variety of systems has generated a philosophical debate about which of them should be considered correct, adequate or true. Or, by contrast, if there are several correct approaches to logical consequence. On the one hand, logical monism states that there is a single adequate logical system (Priest, 2006; Read, 2006). However, there is no coincidence about which of all these existing systems is correct. On the other hand, logical pluralism claims that there is more than one correct logical system (Beall and Restall, 2006). But there are different ways to understand and make sense of this idea of logical pluralism.

The first distinction that can be established is between linguistic and non-linguistic logical pluralism (Arazim, 2020; Eklund, 2020). Linguistic logical pluralism is based on the idea that different formal languages allow for defining different rules, thus obtaining different logical systems. These formal languages offer diverse characterizations of the relation of logical consequence in natural language. In this way, it is possible to obtain two different formal languages, L_1 and L_2, each one defining a different relation of logical consequence $\vDash_1$ and $\vDash_2$ (Cook, 2010). A paradigmatic example of this kind of pluralism was supported by Rudolf Carnap (1959), who in his principle of tolerance established that all people are free to create their own logic. The only requirement is that syntactic rules must be offered instead of purely philosophical arguments. From this point of view, it is not possible to ask the question about which is the correct logic from the outside of a logical system. Because once a formal language has been adopted, all questions about the logic that governs it are internal to that linguistic framework. In short, logical linguistic pluralism maintains that there are as many correct logics as formal languages have been created.

On the other hand, non-linguistic logical pluralism maintains that it is possible to define different relations of logical consequence within the same formal language. Thus, for a language L, it is possible to characterize two different consequence relations $\vDash_1$ and $\vDash_2$ (Cook, 2010). According to Beall and Restall (2006), there are different cases in which a relation of logical consequence, that is necessary, formal and normative, can be adequately characterized. The cases refer to different semantic interpretations that can be given to the sentences (truth-bearers) of the language, be it models, possible worlds or situations. As some aspects of the relation of logical consequence in natural language are not completely closed and defined, when this notion is formally codified, it can acquire different characterizations. In this way, the same formal language can give rise to different logical systems depending on the semantic characterizations that they offer of the notion of logical consequence.

Another relevant position regarding logical pluralism refers to the contexts or domain of application. Traditionally, logic was conceived as a discipline neutral regarding the topic or domain of reasoning. However, it has been argued that in order to determine if a logical system is correct, the specific domain of application of that system must be taken into account. This gave rise to contextualist logical pluralism (Caret, 2021; Kouri Kissel, 2021; Shapiro, 2014). Following this position, each argumentative domain has its particular aims. Hence, some logical systems are better than others for regulating argumentative exchanges in these specific contexts. In this way, the plurality of logical systems responds to a variety of reasoning contexts. This kind of pluralism, with a notable affinity with Carnap's proposal, can be understood as a way of making sense of linguistic pluralism: the different linguistic frameworks emerge as a consequence of the different contexts of reasoning.

Finally, another way of understanding pluralism occurs within the framework of logical expressivism (Brandom, 2000). In this framework, the main goal of logic is to make explicit the rules of inference that are implicit in our linguistic interactions. These rules are constituted from the normative attitudes of the linguistic community involved in these practices of social interaction. Thus, the normative attitudes of the speakers create meaningful expressions that remain open to a certain extent (Arazim, 2020). In this sense, it is not possible to determine the meaning of the inference rules univocally since the set

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of normative attitudes is not unique or complete. Furthermore, these attitudes can change over time. Although it is possible to think in a general concept of negation or disjunction, present in different languages, there is something open and indeterminate regarding the meaning of these two logical operators. One way to explain the meaning of negation and disjunction is from the disjunctive syllogism rule, but it would be possible to explain the meaning of these terms without characterizing this logical rule. Pluralism emerges as a consequence of the different ways in which rules of inference can be made explicit. Natural language does not restrict this formal characterization to a single system of rules.

4 Determinism and linguistic relativism

The discussion around the relationship between language and thought has a long tradition. However, in the 20th century, this debate gained notoriety in linguistics, anthropology and philosophy with the hypotheses of Edward Sapir (Sapir, 1949, p. 69) and Benjamin Whorf (Whorf 1956, p. 212) based on their ethnographic studies with native American people (Sapir, 1949, p. 69).

The hypothesis is based on a statement that is difficult to put into question: language and thought interact in different ways. However, it is not so evident how each particular language influences the thoughts and actions of its speakers. The controversy raised by the "Sapir-Whorf Hypothesis" lies in the scope of the assumption. In the weak formulation, also known as linguistic relativism, particular languages partially affect our thinking and perception of the world. In the strong version, also known as linguistic determinism, the languages we speak determine our reasoning and actions completely.

The first interpretation finds examples that strengthen it. In many languages, there is one single word referring to the color (or colors) that in English are called blue and green (Kay and Maffi, 2013). A South American example of this phenomenon is Paraguayan Guarani (Tupi Guarani) with the word *hövy* which means blue/green (Guasch, 1976). The absence of this distinction shows a different categorization of the chromatic spectrum for the speakers of the language. Language codifies a way of seeing the world that promotes a certain categorization of the environment for the subjects socialized through that language.

Likewise, some examples go beyond the lexical domain such as verbal marking. Spanish, like many European languages, encodes time with a verbal morpheme. To express an action or event, it is necessary to locate them in a temporal spectrum. That is to say, I cannot express ambiguity as to whether he ran yesterday, today, or will run tomorrow. But I can be ambiguous about whether I actually know that the event happened because I saw it or because they told me. Besides, many Amerindian languages do not encode temporal information in the verb but mark the source of the information. When a speaker of Mbyá Guarani uses the particle *ra'e* in a clause that reports on a certain event or situation, they may have acquired this knowledge by any means other than direct visual evidence. The Mbyá, then, can express a statement with ambiguity about the temporal location of the action but it cannot avoid the explicitness of the source of information (Dolzani, 2016). This different encoding of linguistic material influences the modes of thought of its speakers. As Boroditsky (2001) points out, languages guide us to attend to certain aspects of our experience, making them grammatically obligatory, which can bias modes of attention and encoding of experience when thinking and speaking.

The deterministic formulation is more difficult to support. In the above examples, although languages encode information differently, this does not impact the ability of their speakers to understand temporal indexing or the source of information. If language determined thought totally, translation and mutual understanding would be practically impossible tasks. Even if a language lacks a term for a certain concept, a speaker can understand it if it is explained with the right number of words. One of the questionable consequences that linguistic determinism can lead us to is to consider that there are languages that are superior to others because they can express a greater number of concepts or concepts of a supposed greater complexity.

This debate shows that the diverse configuration of natural languages influences our way of perceiving and conceptualizing the world. Linguistic processing is persistent in the most fundamental domains of thought. What we call 'thought' is, in this perspective, a complex set of collaborations between linguistic and non-linguistic representations and processes (Boroditsky, 2006). However, the possibility of intelligible translation between languages, despite their formal and lexical differences, is also striking. It is worth considering, then, the existence of a set of operations common to all natural languages that support this possibility of translation not only of a lexicon but also of thoughts and/or reasoning, which will be investigated in the following sections.

5 Determinism and monism, relativism and pluralism

Our interest in linking the proposed debates is to analyze whether logical pluralism is linked to linguistic pluralism in such a way that different languages could give rise to the characterization of different logics. Or if, on the contrary, there is a unique logic that underlies different languages.

Determinism and linguistic relativism propose different degrees in which language influences thought. Determinism could be compatible with logical monism if a particular hierarchy between languages is proposed, in such a way that some "higher" languages would be able to translate, understand and conceptualize other lower-level ones, but not vice versa. In this hypothesis, it could be argued that there is only one correct logical system that lower-level languages would possess in an incomplete or degraded way, unlike those at the higher levels of the hierarchy. The monistic position regarding logical systems defends the correct character of a single logical system over the rest that could be thought of as superior insofar as it is the only one that can be considered good, correct or adequate. A hypothesis of hierarchy between languages, however, is completely lacking in consensus in the scientific community for obvious ethical reasons, and due to the theoretical-scientific impossibility of justifying it. Furthermore, if the determination of thought by language were total and necessary, mutual translation between different languages would be impossible and we would fall into linguistic solipsism.

In the case of relativism, it is understood that a language determines an easier path for a certain bias or style of thought. In the aforementioned case of Mbyá Guarani, the grammar facilitates ambiguity concerning time but makes ambiguity for the source of information very difficult, contrary to what happens in Spanish. This tendency to facilitate certain options to conceptualize and express facts in one way or another influences the way we think about reality. While it is possible to be ambiguous about the source of the information in Mbyá Guarani and about the time, in Spanish, this is more expensive, requires more detours, more effort, and usually more words. Thus, the different languages seem to facilitate a path, a series of options, concerning others. This saves the possibility of translating. That is, the relativist position assumes some common territory or component between the different languages that makes possible the process of translation and mutual understanding, of language in general and the thoughts and reasoning of the speakers in particular. This idea of a common territory seems to be compatible with the pluralistic perspective defended from logical expressivism, insofar as it can be thought that there are basic concepts, such as negation or disjunction, present in all languages, and yet these concepts can be characterized formally from different rules of inference thus giving rise to different logical systems. In this sense, it is possible to combine this version of logical pluralism with linguistic relativism that supposes, at least, a common base, or proto-logic, that allows the formulation of different logics and, at the same time, preserves the possibility of translation between languages and underlying logics.

Although linguistic relativism could also be compatible with the linguistic pluralism enunciated by Carnap and his principle of tolerance, a weak point of this philosophical position, already noted by Quine (1936), is the difficulty for translation between formal languages, since it is difficult to see what

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common tools or procedures might exist outside of each formal linguistic framework that does not already assume a common logic.

For this reason, regarding the requirement to preserve the possibility of translating reasoning between different languages, it is necessary to assume that the logical basis, in addition to being minimal, should be common to the languages that are inter-translatable (Santos *et al.*, 2020). There should be some common element, even minimal, that enables the translation. That is to say: the minimum elements that allow the construction of syntactic rules in order to propose different logics must be common to the languages that are inter-translatable. Given these premises, we assume that the minimum and common elements must be very simple and to select them we resort to two criteria, one logical-theoretical and the other linguistic-empirical that we state below.

6 Negation and concatenation in natural languages

Every natural language is capable of formulating truth-bearers, i.e., sentences, statements or propositions that predicate about the world. It is also evident that every language has specific words or grammatical mechanisms to express conjunction, disjunction, negation and other functions called logical operators or connectives.

It is possible to define a logical operator out of other logical connectives. In a formal language, some of these operators can be taken as primitives and, from them, the rest of these connectives can be defined. This property of certain formal systems is called functional completeness. Formal systems usually choose disjunction and negation or conjunction and negation as primitive operators. It is plausible to argue that every language has at least some of these pairs of logical functions.

It is difficult to conceive of a language without the negation function. Something similar happens with conjunction and disjunction functions. The universality of conjunction and negation could be accepted without much controversy. There is a related debate on the idea of recursion, referring to the ability to subordinate one sentence to another and repeat this in a theoretically infinite way. Recursion is postulated by Chomsky's generative grammar as one of the fundamental aspects of human language (Chomsky, 1995). However, this claim has aroused controversy. The Pirahã language (an Amazonian language) seems to defy this statement by not presenting recursion in this sense of *matryoshka* which excludes, for example, the typical conditional form (if... then...) that requires the ability to subordinate a sentence (antecedent) to another (consequent). Everett (2008) affirms that in Pirahã there is no evidence of a clause included in another one. Moreover, a sentence has a maximum expressive possibility that cannot be exceeded. Nested clauses, which are possible to express in Spanish or English, require several concatenated independent sentences in Pirahã. What is interesting for the purpose of this article is that compositionality, i.e., the possibility of concatenating sentences, requires at least conjunction or disjunction, and this possibility is not questioned even in a language as particular as Pirahã.

If we interpret the conclusions of this debate in *contrario sensu*, the minimum requirement for every human language would be, more than recursion, the possibility of concatenating sentences, so the need for conjunction or disjunction appears as even more fundamental than recursion. Having one of these functions is a minimum requirement. Thus, it is plausible to claim that all languages possess it as long as they can concatenate statements.

These minimal logical operators of natural languages assumed a proto-logic, which can then be made explicit and precisely defined in a formal system (Peregrin and Svaboda, 2017). However, a prerequisite for the construction of a logical system is the existence of a language with a proto-logic, that is, a logic that is not explicit, but that is embedded in the linguistic practices of the speakers. This proto-logic is not a closed system. On the contrary, it is vague and remains open in natural languages.

It is worth noting that our hypothesis relies on functional completeness, i.e., the possibility of defining some logical operators from others. However, certain non-classical logics, such as intuitionistic logic, lack functional completeness. This might lead one to believe that our hypothesis only works under the assumption that natural language connectives behave classically. Nonetheless, there exist non-classical systems which are functionally complete, as is the case with many-valued logic (Malinowski, 2005). In these systems, it is possible to characterize non-classical negations. For this reason, our hypothesis is consistent with logical pluralism and does not force us to a classical interpretation of natural language operators.[1]

In the following, we will present empirical evidence on the presence of the most basic logical operators in natural languages. In this sense, the search for "linguistic universals" has been part of the linguistics agenda from different perspectives. Linguistic typology has been dedicated to postulating universals by making generalizations based on the observation of particular languages. (Greenberg, 1963).

The first of the logical operators that we will analyze is negation. In the section on negation morphemes of *WALS* (Dryer, 2013), on a sample of more than a thousand languages, no cases were found without a mode of open expression of negation. Negation constitutes an implicational linguistic universal: the operator can be expressed in all known languages.

The cases of conjunction and disjunction are quite similar. Both types of connectors are within the coordination spectrum. All languages have coordinate constructions of some kind, although not every language has an independent word or particle with copulative or disjunctive meaning. In Maricopa, for example, the meaning of disjunction is conveyed by an uncertain verb suffix (Aloni *et al.*, 2018). Languages can either display an explicit marker with the functional meaning of the operator or use some non-specific strategy that allows the function to be conveyed.

The case of conditional is special. Diachronically, there have been languages without inclusion relationships between clauses, characterized as paratactic as opposed to the hypotaxis that characterizes subordinate languages. Hypotactic languages tend to present inclusion and dependency between clauses. That is, a clause can in turn be an argument or adjunct of another clause and present a grammatically degraded form and therefore cannot function as a main clause. For its part, a paratactic language tends to present the same information through independent and non-inclusive clauses. Although typological comparison presents them as opposite poles, parataxis and hypotaxis function more like a gradient in which languages approach more or less one of the extremes of the scale. Paratactic languages are usually considered to be in an evolutionary stage prior to that of hypotactic languages, but today we can find languages without subordination such as the case of the aforementioned Pirahã. It is impossible to find conditional embedded clauses in paratactic languages. However, the meaning of the condition can be expressed through coordination, that is, through conjunction or disjunction. A sentence like "It's hot and I ask for an ice cream" is interpreted by listeners as clauses joined by a conditional relation.

A brief observation of the languages of the world allows us to affirm that through open and specific morphology or by making use of more general resources and using certain inferential mechanisms, all languages find a way to express the most common logical operators in their grammars. These minimal components, or operators, present in the analyzed languages are part of the inferential processes of the speakers. According to logical expressivism, there are different ways of formally defining the rules that characterize the behavior of these expressions of natural language. This would give rise to a non-cultural pluralism but linked to the various reasoning contexts that include culture and language.

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[1] We would like to express our gratitude to an anonymous reviewer who brought this objection to our attention.

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7 Conclusions

The reached conclusion may seem somewhat trivial. We propose that there is a common minimum proto-logical basis that is supported by widely known facts about which there is no controversy or debate. Languages can predicate and form a class or set from a predicate, they can also negate and can concatenate sentences with conjunction or disjunction. This minimal logical basis makes it possible to explain different logics, whether or not dependent on the context, which, in turn, allows us to distinguish correctness from incorrectness. In this way, the possibility of translating reasoning (and more broadly thoughts) from one language to another remains plausible.

Our hypothesis may seem trivial because it is based on facts that apparently do not represent anything new. However, we believe that by uniting these facts with the conclusions of separate but extensively worked debates in each disciplinary area, we contribute to the understanding of the relationships between logic, language, thought and reasoning, and this constitutes a novel contribution. The novelty resides in the proposal of a simple and verifiable common logical or proto-logical base that makes logical pluralism possible and is compatible both with linguistic diversity and with the possibility of translation and interlinguistic understanding.

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