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**On the relation between language and abstract
thought: a cross-linguistic analysis on Infinity and
its origins**

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ABSTRACT

Delving into the study of abstract concept development from an interdisciplinary perspective, mainly philosophical and linguistic, the main purpose of the thesis is to examine the interrelation between linguistic phenomena and the emergence and development of one very specific (although highly complex and multifaceted) abstract concept: infinity. Following the hypothesis that the abstract notion of infinity is a linguistically modulated concept, this research aims to investigate the potentially substantial role that language may have played in the emergence and evolution of the infinity concept by examining whether morphological and syntactic processes may have facilitated or promoted its development.

Through the analysis of all the words used in modern English to designate infinity, whether temporal, limitless, numerical and so on, and through the cross-linguistic examination of the infinity words and phrases in the New Testament across English, Spanish, Latin and Koine Greek (the original language), several findings were obtained. Firstly, the detection of a pattern of lexicalisation across the languages: beyond the general notion of infinity as a lack of limits or measurability, the specific notions of power-related infinity and, most noticeably, temporal infinity have been largely lexicalised, manifesting a cultural need to discuss, reflect and talk about omnipotence and, especially, eternity. The prominence of temporal infinity is also evidenced by the fact that the only simple lexemes referring to infinity directly, and not resulting from lexicogenic operations, are words designating temporal infinity. All other expressions bring about the meaning of infinitude from compositional processes, in particular, morphosyntactic processes of negation, universal quantification and the depiction of forward motion across a temporal medium. While it has not been possible to confirm the hypothesis whether these linguistic processes are necessary or influential for the inception of the abstract concept, given that the four analysed languages share the same mechanisms, the findings open new research paths. Particularly, this methodology can be replicated for other languages, thus building a large cross-linguistic database of infinity words and expressions in the New Testament, aiming at a better understanding of the interrelation between language and cognition, particularly in abstract thought. Ultimately, the prominence of temporal infinity, from which other notions of specific infinitude and the general concept of infinity itself probably arose, constitutes a topic worth exploring.

KEYWORDS: Abstract concepts; infinity; thought/language interface; weak linguistic relativity.

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LIST OF ABBREVIATIONS

BM	Bound morpheme
CD	Cambridge Dictionary
CF	Combining form
ENG	English
GR	Greek
I _I	Immeasurable infinity
LAT	Latin
L _I	Limitless infinity
MW	Merriam-Webster Dictionary
NT	New Testament
OED	Oxford English Dictionary
OLD	Oxford Learner's Dictionary
P _I	Potent infinity
SP	Spanish
T _I	Temporal infinity

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1. INTRODUCTION

One of the most remarkable human traits is the ability to communicate ideas through symbols, whether spoken, signed or written. Language enables humans to describe and portray our surrounding world by transferring into words the mental representations obtained from experience. But language lexicons are constituted by far more than just words conveying concrete concepts, i.e., concepts representing perceptually identifiable single referents (such as ‘cat’, ‘Jimi Hendrix’ or ‘Times Square’). Human cognition also allows a very different type of concepts: abstract concepts, a particular kind of mental representations (such as ‘love’, ‘democracy’ or ‘the set of all natural numbers’) which do not bear correspondence with any particular, physical or bounded phenomena of the world. Language, in its capacity to express thought, is as much able to convey ideas which mirror the perceivable world as of expressing that which isn’t there, at least not in presence, but which is meaningfully construed by collective understanding.

As fascinating as this linguistic capability is in the human species, the nature of abstract concepts is equally intriguing. Recently, theories of cognition have increasingly paid more attention to the questions regarding the acquisition, processing and representation of such concepts, and some of them have highlighted the paramount role of linguistic and social factors (Borghi et al., 2017).

It is this research’s aim to analyse the peculiar intersection between language and abstract concepts. There is one fundamental question I wish to raise: does language influence cognition in a positive way for the development of abstract concepts?

To analyse the above, this project focuses on the intriguing and apparently ubiquitous abstract concept of the infinite. It is a notion of a convoluted nature, since it seems to encompass a variety of subnotions which, without exactly being synonyms of each other, imply infinitude in one way or another. Although the concepts within, e.g., ‘forever’, ‘boundless’ and ‘omnipotent’ are not synonyms, they all rely on the idea of infinity, whether applying it to a spatial, temporal, numerical or power-related dimension.

The research I wish to develop is based on the hypothesis that the abstract concept of infinity is a linguistically modulated concept. The project’s goals are to:

- (I) Examine the language uses of the terms referring to infinity in modern English, in order to:

- a. Categorise the distinct but related concepts originating from infinity and provide a conceptual scheme to comprehend the concept as a whole.
 - b. Identify linguistic processes inducing the meaning of infinitude.
- (II) Conduct a cross-linguistic corpus analysis, using the New Testament in Spanish, English, Koine Greek (the language of the original manuscripts) and Latin, of words conveying infinity to carry out a comparative examination of morphosyntactic mechanisms in the different languages, in order to:
- c. Detect and analyse the linguistic mechanisms which induce the meaning of infinitude within words and phrases across the four languages.
 - d. Identify similarities and potential discrepancies among the mechanisms used across the different languages.

By analysing the impact of linguistic factors on abstract concept cognition through the case study of infinity, this project aims to help us better understand the interrelation of language and cognition, particularly in abstract thought.

2. METHODOLOGY

2.1. Terminological clarifications

This research will refer to the idea of infinity in multiple ways: the concept of infinity which resides in human minds, the words used to convey such a concept, and the actual intangible phenomenon of infinity. To avoid misunderstandings, hereinafter, I will use:

- Single quotation marks (‘ ’) to mention, not use, a word. E.g.: ...*although ‘endless’, ‘forever’, ‘boundless’ and ‘omnipotent’ are not synonyms...*
- Small caps (INFINITY) to refer to a concept. E.g.: ...*TEMPORAL INFINITY and POTENT INFINITY are subnotions of INFINITY...*
- Normal font to designate the phenomenon of the infinite. The concept INFINITY represents the infinite, and the word ‘infinity’ refers to it.

2.2. Methods

The analysis of the terms conveying the infinite in modern English (objective I) is to be addressed in the creation of Data Tables 1 & 2 and their examination. Data Table 1 consists of an exhaustive table featuring all of the words employed in modern English expressing INFINITY. To find them, I have searched for synonyms of and related words to ‘infinity’ in three of the most well-known English language dictionaries: Merriam-Webster Dictionary (MW), Oxford Learner’s Dictionary (OLD), and Cambridge Dictionary (CD). I have used MW’s Thesaurus and synonyms functionalities, OLD’s synonyms and nearby words function, and CD’s smart vocabulary functionality to find all of the words with an implication of infinitude¹.

The table includes columns for the different lexical categories of Noun, Adjective, Adverb and Verb. A small abbreviation of each dictionary possessing the specific part of speech in its lexicon has been added next to every word in the table. Different words deriving from the same root² constitute a *word-family* and have been grouped in the same row. A brief description of each follows: although their meanings may differ in some nuances, a general meaning can be

¹ I have excluded those words whose *main* meaning isn’t related to INFINITY’s core idea of a lack of limits and/or measurability (definition explored in section 3).

² A root is the smallest morphological unit with lexical information that can’t be divided into further morphemes. E.g.: the words ‘unboundedness’_N, ‘boundlessness’_N, ‘unbounded’_{Adj}, ‘boundless’_{Adj}, ‘boundlessly’_{Adv} all derive from the root ‘bound’.

extracted from each group of words by examining the meanings denoted by their constituent morphemes. The point of adding a brief description to each word group on the basis of their bases is to simplify the subsequent classification of all of the words in the table into categories.

The etymological analysis of the English infinity-lexicon (Data Table 2) has been carried out with the help of the Oxford English Dictionary (OED), a historical dictionary providing information on etymology, word frequency, meaning and use, among other resources. The resulting analysis has identified all of the different etymons -whether combining forms, prefixes, suffixes and bases- from which each modern English infinity-lexeme has been borrowed, compounded or derived.

The analysis of the etymons has been simplified by abbreviating those morphemes which are not relevant in construing the sense of infinitude. E.g.: *unfathomed* < *un-* + *fathom* + *s.*, where the irrelevant morpheme ‘-ed’ has been abbreviated with ‘*s.*’ as in ‘suffix’, in contrast to the prefix ‘*un-*’ whose affixation to the root ‘fathom’ generates the meaning of infinitude which the word conveys and which we are interested in.

To tackle the second objective (II), the cross-linguistic analysis of infinity-lexemes (Data Table 3), this research intends to use one specific corpus which not only has been widely translated and digitalised (which opens the door to countless resources), but contains many instances of infinity-words due to the nature of its topic: the New Testament (NT). With over 2800 partial translations and 733 complete translations in 2023 (United Bible Societies, 2023), the Bible is the most translated text in the world. It is also the source text for the most extensive multilingual parallel corpus, with 100 translations available in Christodouloupoulos & Steedman’s corpora and, therefore, 4950 unique bitexts (2014), which can be useful for further continuing research.

This cross-linguistic analysis of the interface between linguistic mechanisms and INFINITY has the potential to bring crucial insight to the discussion by detecting both the commonalities and the differences in the way different languages express such an abstract concept. I have chosen to conduct the analysis across Spanish and English, two of the most spoken languages in the world, Koine Greek, the language of the original texts constituting the NT, and Latin, the *lingua franca* of science, philosophy and, particularly, Christian religious authority in Europe throughout most of our current era (*cf.* section 4.5). Furthermore, although these four languages are all Indo-European, they belong to mostly different branches: Romance (within Italic), Germanic, Hellenic and Italic. The editions used for each language can be found in Table 1.

Table 1

New Testament editions used for each language

SPANISH *Sagrada Biblia: Versión Oficial de la Conferencia Episcopal Española*
(SP) (2022/2010).

It mentions in the introduction using the ‘original biblical texts’ for the translation.

ENGLISH *Holy Bible, New International Version* (2011/1973)
(ENG)

Based on Nestle-Aland’s critical edition *Novum Testamentum Graece*, the standard edition used by most scholars and modern translations.

KOINE *Novum Testamentum Graece* (1993/1898), within *Nou Testament Grec-Llatí-*
GREEK *Català* (1995)
(GR)

Also using Nestle Aland’s *Novum Testamentum Graece*.

LATIN *Biblia Sacra iuxta Vulgata[m] versionem* (1994/1969), within *Nou Testament*
(LAT) *Grec-Llatí-Català* (1995)

Also known as the *Stuttgart Vulgate*, this book is a critical edition of the Vulgate, a Latin translation of the Bible dating back to the 5th century.

In order to identify the expressions, both words and phrases, conveying INFINITY (in any of its multiple dimensions) featuring in the New Testament, I first read the NT in Spanish and manually identified and annotated each and every single expression relating to a lack of limits or measurability regarding time, space, numbers or power, writing down the context sentence and its location (book, chapter and verse). See Figure 1:

Figure 1

Extract from Data Table 3

TEMPORAL INF	MT, 19:16	"heredará la vida eterna"	eterna	"will inherit eternal life"	eternal	αἰώνιον	aeternam
	Book	Chapter					
		Verse					

Already in possession of all the SP words, I looked for the infinity-expression in the ENG, GR and LAT editions by examining each annotated location (e.g.: ‘Rom, 16:25’). BibleGateway’s Reverse Interlinear tool, which shows the GR transliterated word beneath the expression in the English New International Version edition was very useful, as well as Zerwick & Grosvenor’s reference book consisting in a grammatical analysis, word for word, of the Greek NT (see bibliography).

Lastly, the etymological information in the Oxford English Dictionary and in Bagster and Sons' dictionary of the complete Greek New Testament's lexicon (see bibliography) proved highly valuable in the posterior linguistic analysis.

For online access to Data Tables 1, 2 & 3, see Appendix section C.

3. UNDERSTANDING INFINITY

Before delving into the study of the words and expressions used to refer to infinity, it is necessary to understand that to which they refer to; but understanding and defining the concept of INFINITY is not a simple task. Instead, it poses several challenges. Firstly, given that it is both an object of study and a tool in multiple and very different fields of knowledge, hoping for a holistic understanding of the concept requires at least some minimal knowledge on how these branches of knowledge use it, define it and relate to it. Secondly, the multiplicity which INFINITY encompasses is not exclusive to its uses in science: everyday language possesses many various words (e.g.: ‘infinite’, ‘eternal’, ‘endless’, ‘immeasurable’, ‘almighty’, ‘immortal’, ‘unlimited’) which relate to infinity in one sense or another, contributing, in each nuance, to conceptualise INFINITY as a whole. These words do not all function as synonyms, but rather as distinct words which pick out different specific domains of infinity. Lastly, in contrast to concrete concepts, which do possess definite, perceptually recognisable referents, the meanings of abstract concepts are generally more unstable, inconsistent, context-dependent and culturally grounded (Borghi et al., 2017). It is necessary to take into account all of these considerations to provide an accurate and holistic analysis of INFINITY in the following sections. So, what does ‘infinity’ really stand for?

INFINITY is often accounted for by listing its *presumed* synonyms³. In an extensive book on the infinite, A. W. Moore begins with: “The infinite is standardly conceived as that which is boundless, endless, unlimited, unsurveyable, immeasurable” (1993). This statement refers to the more exploited mathematical-philosophical tradition. There exist, however, not one but two rivalling traditions, both stemming from philosophy, which have deeply shaped the historical development of the concept, informing the current notion with various meanings, further accentuating the plurality of the concept. The first tradition is the mathematical one, whose interpretations and implementations of infinity have been used by the other sciences, whilst the other one is the theological tradition.

3.1. Scientific and philosophical interpretations and uses of the infinite

The first philosophers and mathematicians in Western history were interested in infinity right from the start. Greek philosopher Anaximander of Miletus coined ‘the infinite’ [τὸ ἄπειρον; *to*

³ While true synonyms can be used interchangeably in one same sentence, this is not always the case with infinity-lexemes.

apeiron] and introduced it as a clearly- and well-defined concept for the first time in the 6th century BCE, and he elevated it to divine status as the origin of all things (see Appendix section A for a brief introduction to Anaximander’s *τὸ ἄπειρον*). But, in spite of this initial moment of reverence to the infinite, once Zeno of Elea had formulated his famous paradoxes⁴ regarding the infinitely small and spatial divisibility a century later, a hostility and uneasiness around the idea of recognising the infinite in reality settled in early Greek thought and has remained until today. Nonetheless, the concept has still been implemented in mathematical, empirical and philosophical theories over time, and not in unimportant ways. It is necessary to identify at least a few of the conceptual revolutionary shifts which have determined our contemporary understanding of the concept. We will focus on (i) Aristotle’s paramount contribution, (ii) on the general use of infinite idealisations in the sciences, on (iii) the two ‘infinistic revolutions’ in the history of mathematics, and, very briefly, on (iv) infinity’s role in theology.

The first of these substantial contributions was provided by Aristotle in the 4th century BCE, when he made the crucial conceptual distinction between *potential infinity* and *actual infinity*, following a dilemma on the possibility of its existence. Aristotle recognised the presence of infinity in certain phenomena as an undeniable fact, such as in the passing of time, the endless divisibility of magnitudes and in numbers, which can be counted *ad infinitum* (*Physics*, III, 4, 206a9); but he was also aware of the paradoxes and inconsistencies its physical existence raised: “the problem of the infinite is difficult: many contradictions result whether we suppose it to exist or not to exist” (*Physics*, III, 4, 203b31). Luckily, Aristotle possessed in his philosophical system a resource of his own making which allowed him, in a way, to deny the existence of the infinite without annihilating it completely: the distinction between to be potentially and to be in fulfilment (i.e.: actuality). In the Aristotelian system, something *is* potentially when it holds the “capacity to be in a different and more completed state”, that is, in fulfilment (Cohen & Reeve, 2020). For instance, a block of marble has the potentiality of becoming a statue in fulfilment (or the corner stone of a temple, or a kitchen counter, etc.). As to the infinite, Aristotle only accepted the existence of *potential infinity* (*Physics*, III, 4, 206a17), which can be understood as an infinity “whose infinitude exists, or is given, *over time*” (Moore, 1993), and denied the existence of actual infinity, an infinitude happening “all at once” (Easwaran et al., 2024). One can claim that numbers are infinite, but they are only so potentially, given that a person cannot ever actually complete the process of counting: not only

⁴ Such as the paradox of Achilles and the tortoise, or the paradox of the arrow.

wouldn't they have enough ink, paper or time; if they ever were to finish the process, that would imply having arrived to a *limit* and, hence, that would not, in fact, be infinity. Aristotle's potentiality/actuality distinction has undoubtedly constituted a paramount contribution to the discussion of the infinite in all fields of knowledge, whether philosophy, science or theology.

As to mathematics and the empirical sciences, INFINITY has been present from the start in any iteration process (even if only *potentially*), such as those regarding numbers or magnitudes. Toward the late 17th century, mathematics lived the first of its two 'infinitistic revolutions' when the notions of the infinitely small and the infinitely large inspired Leibniz and Newton to develop infinitesimal⁵ calculus, later refined by the introduction of limits, which allow us to define infinitary operations, such as unending increasing sequences or operations of unending addition or multiplication, and are used in many functions, as well as in calculus (Easwaran et al., 2024; Rucker, 2019). Calculus, with its infinitary foundations, is today one of the main branches in mathematics, and it extends the presence of the infinite to all those sciences which use it, such as engineering, physics, economics and other social sciences. Furthermore, most sciences make use of infinitesimal and infinite idealisations in their theories, which can be understood as intentional distortions of specific aspects of a system using parameters with infinite value in order to simplify the analysis of the system (Fletcher, 2019; Liu, 2019). In general terms, as Easwaran et al. highlight: "any field that employs mathematics at least flirts with infinity indirectly, and in many cases courts it directly" (2024).

In the 19th century, mathematics experienced its second 'infinitistic revolution' when mathematician and philosopher Georg Cantor addressed the issue- probably the most revolutionary contribution to the development of INFINITY after Aristotle's, Newton's and Leibniz's work. The discovery of the calculus and limits had rendered Zeno's paradoxes less relevant. However, some other paradoxes regarding equinumerosity⁶ presented a lasting challenge. In the early 17th century, Galileo Galilei had formulated a paradox of the infinite which has come to be known as 'Galileo's paradox': there seems to be a one-to-one correspondence between each natural number and each perfect square, as though both sets were equinumerous; but intuition tells us that there are more natural numbers (1, 2, 3, 4...) than perfect squares (1, 4, 9, 16...). Galileo had started to reveal that infinite sets don't quite behave in the same way finite sets do, that the traditional notions of 'equality', 'greater than' and

⁵ The concept of infinitesimal reflects the infinitely small. An infinitesimal is a number which is smaller than any positive real number: it is the closest value to zero without ever being equal to zero.

⁶ A one-to-one bijection between the elements of two sets.

‘smaller than’ and the Euclidean axiom of the whole being bigger than the part don’t quite apply to infinite sets (Rucker, 2019; Easwaran et al., 2024).

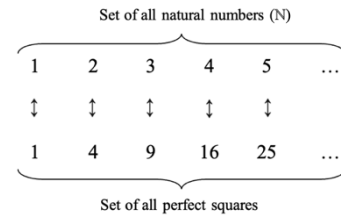
Cantor’s revolutionary breakthrough consisted in defining an infinite set as a set whose elements can be put in a one-to-one correspondence with a proper subset, i.e., with a part, which means that set and proper subset have the same cardinality⁷; therefore, that whole and part are the same in size (Robinson, 1993), breaking apart from the Euclidean axiom. He made the paradigm-shifting discoveries that there are countable⁸ infinities, uncountable⁹ infinities and different sizes of infinities¹⁰, developing transfinite mathematics for such measurements (Moore, 1993; Easwaran et al., 2024). Ultimately, Cantor proved that there is not *one* infinity; there are, in fact, infinite infinities.

Last, but not least, there is a longstanding metaphysical and theological tradition which has focused on infinitude in its relation to the first cause or God. If the mathematical-philosophical tradition interconnects the ideas of ‘endlessness’, ‘boundlessness’ and ‘immeasurableness’ and so on, “the infinite has also been conceived as that which is complete, whole, unified, absolute, perfect” (Moore, 1993) by theologians. Although this discussion is crucial in the study of INFINITY in the broader and extended sense which includes the history of philosophy and theology, we do not consider the theological related senses to be implied in individuals’ *ordinary* uses of infinity-related terms, which is why I won’t delve into it with further detail.

All of the groundbreaking conceptual advances introduced in this section have undeniably conditioned our understanding of INFINITY throughout the centuries and, although they may likely be far from the knowledge of most people using terms such as ‘eternal’, ‘infinite’ or

Figure 2

Equinumerosity between natural numbers and perfect squares



⁷ Two sets have the same *cardinality* if their elements are in a one-to-one correspondence. E.g.: the set of natural numbers (\mathbb{N}) and the set of perfect squares.

⁸ An infinite set is *countable* if it has the same cardinality as that of \mathbb{N} , i.e. if its members can be put in a one-to-one correspondence with \mathbb{N} ; a cardinality which Cantor defined as ‘aleph-null’ (\aleph_0). All countable sets have the same size or cardinality.

⁹ An infinite set is *uncountable* if it cannot be put in a one-to-one correspondence with \mathbb{N} , which means it has a *bigger* cardinality than \aleph_0 . E.g.: the set of all real numbers (\mathbb{R}).

¹⁰ Infinities with different cardinality. A notably famous case is Cantor’s discovery that the set of points of the real line (i.e.: the continuum), or \mathbb{R} , is a higher degree of infinity than \mathbb{N} . (Rucker, 2019)

‘countless’ in their ordinary contexts, their acquaintance is almost mandatory in a discussion of the infinite.

3.2. A general definition of infinity

Scientific and philosophical interpretations of the infinite help in our understanding of the concept, rendering awareness on its complex nature as well as on its enormous potential. Now, can the *ordinary* use of words conveying the infinite in everyday life tell us something about its conceptualisation? Can it reveal ways and tendencies through which humanity has approached a conceptualisation of infinity?

A selection of dictionary entries on ‘infinity’ is a good starting point in showing its nuanced nature:

- (i) “Infinity: unlimited space, time, or amount, or a number large beyond any limit” (Cambridge Dictionary, n.d.)
- (ii) “Infinite: immeasurably or inconceivably great or extensive” (Merriam-Webster, n.d.)
- (iii) “Infinity: a large amount that is impossible to count” (Oxford Learner’s Dictionaries, n.d.)

The first of these three definitions reflects the concept’s essential meaning: a lack of limits or edges, whether applied to the dimensions of space and time, to quantities or to uncountable entities. The etymological origin of ‘infinite’ reveals this sense: originating in the Latin term ‘*infīnītus*’, its literal translation means ‘unbounded’ or ‘unlimited’. The word is composed by the negating or privative prefix ‘*in-*’ and the lexeme ‘*fīnītus*’, meaning ‘end, limit’ (Oxford English Dictionary, n.d.).

The second definition sheds light onto a second substantial sense of the word: the impossibility of measurement, which, in fact, is a direct consequence of limitlessness. Immeasurability stems either from boundless extension (whether infinitely large or small, e.g., as usually predicated of space), from an absence of an ending limit (e.g.: such as the endless process of counting numbers) or from something being unquantifiable in nature (e.g.: God¹¹). The possibility of

¹¹ The theological tradition has long used the comparison of God as a perfect and infinite being as opposed to the human creature, which is imperfect in the sense of *fīnite*.

measuring is due to the presence of defining limits. Devoid of boundaries, physical or abstract entities become immeasurable.

These two notions together express the *primordial meaning of INFINITY*. They can be identified as the two ‘strict senses’ of the term’s usage and meaning in contrast to a third ‘loose sense’ reflected by the third definition: the use of the word in a hyperbolical manner (Easwaran et al., 2024), exaggeratedly suggesting the vastness or immense quantity of something which, technically, does have an end or can be measured. For instance, in sentences such as ‘Odysseus’s *infinite* journey back to Ithaca’ or ‘the *infinite* number of books written in human history’, the terms implying infinitude are an exaggeration, since Odysseus did arrive to Ithaca after all, and the number of written books is, in fact, finite.

These three senses are not exclusive to the word ‘infinity’, but rather belong to the concept of INFINITY, which is why all of the many words used to convey the infinite in different contexts, such as ‘boundless’, ‘unending’, ‘fathomless’ and many more, allow these three uses, being able to emphasise something’s (i) lack of limits, (ii) the impossibility of its being measured or its (iii) vastness. Which, then, are all of these words used to convey the infinite and what information can their linguistic analysis provide?

4. A LINGUISTIC ANALYSIS OF THE INFINITY-LEXICON IN MODERN ENGLISH

See **Data Table 1. The infinity-lexicon in modern English** in Appendix section C.

4.1. Infinity categories, frequencies and lexical generalness/specificity

All of the words present in Data Table 1 refer to an absence of limits or to immeasurability (i.e.: to the general notion of INFINITY), but they do not all function as synonyms: although, e.g., ‘almighty’ and ‘never-ending’ both convey a sense of infinitude, they cannot be used interchangeably. The reason is that infinity, as well as being conveyed as a lack of limits, is usually predicated of some dimension, such as space, time or power, and while many words in modern English have been formed to simply denote the general notion of INFINITY, many others have evolved to denote this dimension-specificity in their lexical structures.

An examination of the meanings denoted by the words’ roots and derivational morphemes reveals *four categories* which are transversal to the concept as a whole: *potent infinity* [P_I] (words conveying ‘unlimited power’¹²), *immeasurable infinity* [I_I] (words denoting the meaning ‘not measurable’), *limitless infinity* [L_I] (words expressing ‘no end or limit’) and *temporal infinity* [T_I] (words referring to existence ‘for all time’¹³). While words in categories L_I and I_I refer to the general concept (to the concept’s first sense of limitlessness and to its second sense of immeasurability, respectively), words in P_I and in T_I include the aforementioned specificity in their morphosemantic structure: an infinitude of power and an infinitude of time, respectively. Interestingly, in spite of *space* being one of the dimensions of which infinity is typically predicated, there is no “spatial infinity” category. *Prima facie*, the words in the L_I category could be classified as expressing “spatial infinitude” (e.g.: words as ‘boundless’, ‘infinite’, etc.), given that limits are frequently conceived in a physical, material or spatial sense. However, boundaries can be equally often understood in relation to abstract entities (such as numbers, which are ‘boundless’). Infinity, earlier described as a ‘lack of limits’, is so in a general sense, whether these limits are spatial, temporal or referred to abstract things, such as power or a quantity. Hence, it is more appropriate to categorise all of the

¹² The two descriptions of ‘unlimited capability to be everywhere’ and ‘unlimited understanding’ are considered as subtypes of ‘unlimited power’.

¹³ Whether of a living creature which does not die or of a non-living entity, such as spacetime.

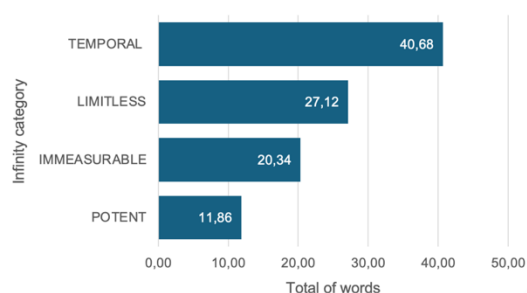
lexemes whose roots denote the notion of boundary as a *limitless infinity* rather than as ‘spatial infinity’, which, without being incorrect, would be less accurate.

Although words in categories P_I and T_I possess specificity already in isolation (their specified meaning can be extracted simply from their bases and morphemes), words in the categories L_I and I_I gain specificity within context, by modifying another word or phrase. This phenomenon provides these words with higher versatility, being able to be used in multiple contexts. For instance, the literal, denoted meaning of the constituting morphemes in ‘boundless’ simply express an absence (‘-less’) of limits (‘bound’), which is why it is categorised as L_I. Nonetheless, the word can be applied to a variety of dimensions.

As Figure 3 below shows, in terms of relative frequencies, the words denoting the general notion (L_I and I_I) encompass a relevant 47,4% of the totality of words (with a 27,1% corresponding to the first sense, L_I, and a 20,3% corresponding to the second sense, I_I). But, with only *half* of the words denoting the primordial and general meaning of the notion, the other 52,5% of the words have dimension-specificity, and while the words related to P_I constitute the smallest group of words (11,8%), T_I alone is, by far, the category with the highest frequency (40,6%).

Figure 3

Relative frequency of infinity category (%)

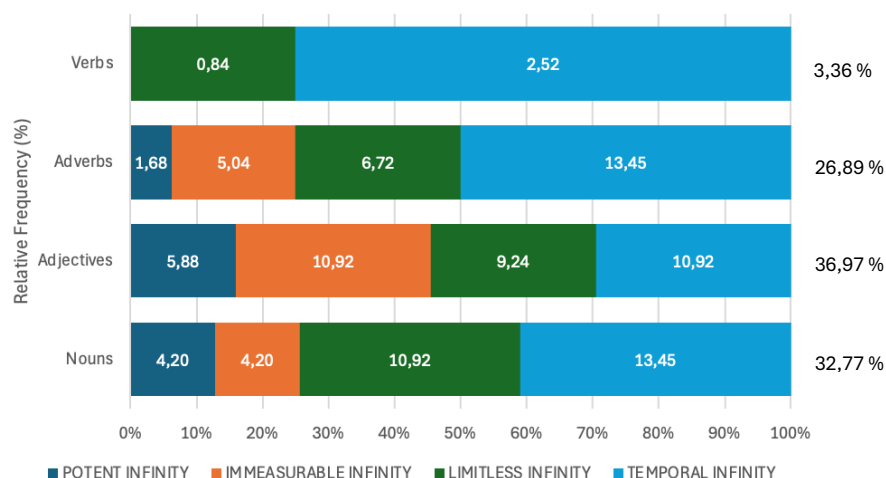


4.2. Crossed frequencies: lexical categories and infinity categories

Words in Data Table 1 can also be classified in terms of lexical categories. The 112 lexemes (which have been grouped into 30 word-families, according to common roots) include 41 adjectives, 37 nouns, 30 adverbs and 4 verbs. An examination of these four lexical categories manifests three potentially interesting phenomena. Firstly, in contrast to the number of nouns, adjectives and adverbs, the presence of verbs relating to or conveying INFINITY is noticeably lower (3,3% relative frequency). Secondly, whereas nouns, adjectives and adverbs are used in all four infinity categories, verbs are only found in two categories: L_I (‘*infinitise*’) and T_I (‘*eternalise*’, ‘*immortalise*’, ‘*perpetuate*’). Furthermore, 75% of these occurrences belong to T_I; given the low number of occurrences, however, this cannot be considered determining. Thirdly, the occurrences of adverbs in the T_I category are noticeably higher, with a 50% of all the adverbs belonging to this category alone.

Figure 4

Infinity category distribution in relation to lexical category



4.3. Lexicogenic operations: word-formation mechanisms, borrowing, bases and bound morphemes

See **Data Table 2. Etymological analysis of the infinity-lexicon in modern English** in Appendix section C.

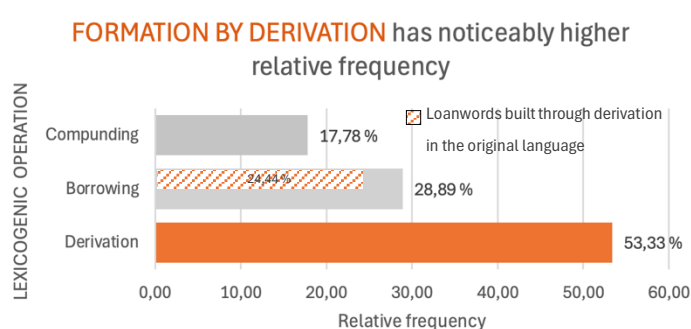
All languages create novel words by means of many different lexicogenic operations. The analysis of infinity-lexemes in modern English has identified the usage of three processes: derivation and compounding, which constitute the two traditional word-formation mechanisms, and borrowing, a non-morphological process which is also commonly used. While derivation consists of the affixation¹⁴ of a single lexeme to create a new word (e.g.: *bound* + *-less*), compounds are formed by uniting independent existing lexemes (e.g.: *ever* + *lasting*) which come together to work as a single syntactic head (Booij, 2007; Miller, 2014). Both derivation and compounding, as word-formation mechanisms, are rule-based. Borrowing, instead, is possible thanks to intercultural contact: it brings new vocabulary to the language, not by creating new words following a rule system, but rather by integrating a word from a foreign language which already possesses a term for the concept in question (Ten Hacken & Panocová, 2020). In the case of the English infinity-lexicon, formation by derivation accounts

¹⁴ Affixes are not lexemes, they are bound morphemes: they *need* to be added to roots and stems; thus, they cannot be considered lexemes. There are four types of affixes: prefixes (which go before the root or stem), suffixes (which go after), infixes (which go in the middle of the word; they are rarely found in English) and circumfixes (a prefix and suffix pair).

for more than half of the lexicogenic operations, followed by borrowing, indicating strong intercultural influence, and, lastly, compounding. 11 out of the 13 loanwords (24,4% within the 28,8% of borrowings) resort to derivational mechanisms too, which means that a total 77,7% of all infinity-words are formed by unifying a lexeme and a bound morpheme, whether within English or the original source language. See Figure 5:

Figure 5

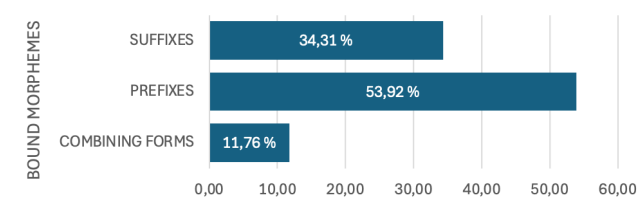
Lexicogenic operation frequency



and do not require other morphemes. In contrast, the other three types are *bound morphemes* (BMs): they need to be added to a lexical morpheme to occur (Booij, 2007). An examination of the word-formations resorting to BMs (whether in English or in the origin language in the case of loanwords) shows that the most common process is *affixation of a prefix to a base* (53,9% relative frequency), followed by the *affixation of suffixes* (34,3%), as Figure 6 shows.

Figure 6

Type of bound morpheme frequency



64,7% of English infinity-words built upon BMs (77,7%), which means that 50,3% of all English infinity-lexemes have been formed by adding a BM (either the prefixes ‘un-’, ‘im-’, ‘in-’, ‘il-’, ‘per-’, or the CF ‘omni-’) *before* the lexical morpheme.

All of these lexicogenic operations act upon constituent morphemes to build the infinity-words: combining forms (CFs), prefixes, suffixes and bases (a general term for roots and stems). Bases are *lexical* or *free morphemes*, which means they constitute words by themselves

Interestingly, although CFs differ from affixes¹⁵, a 10,7% within the 11,7% frequency for CFs stands for the CF ‘omni-’, which, akin to prefixes, is added to a base *before* it. Hence, the linguistic mechanism of adding a BM *before* a base accounts for a relevant

¹⁵ Combining forms are more lexically significant than affixes. They also differ from affixes insofar they either came from independent words or they can form a lexeme with another affix without the need of a base.

Within derivation, suffixation also appears considerably relevant. In fact, the privative Germanic suffix ‘-less’ is by far the most frequent BM (and not some particular prefix, as could be expected), accounting for over a quarter of all the BMs occurrences (26,4%). See Appendix B.1 for all the relative frequencies of each individual BM.

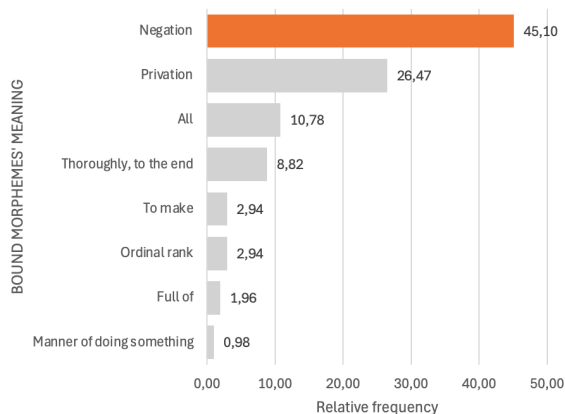
4.4. Semantic information and linguistic mechanisms interface

Two crucial questions arise. As mentioned before, a very relevant 77,7% of all infinity-lexemes are constituted upon a base and a BM. What information do these BMs add to the bases they modify, and what information does each base convey that linguistically and conceptually precedes the novel word representing INFINITY?

The extraction of the general meaning of each BM and their grouping together (e.g.: ‘in-’, ‘un-’, ‘im-’ and ‘il-’ under ‘Negation’) shows that a 71,5% of all BMs reflect a negative, privative sense (see Figure 7). Interestingly, 10,7% have the opposite effect, carrying a positive sense of plenitude, of “all-ness”. A logical reading of these data reveals that 71,5% of these lexemes

Figure 7

Relative frequency of bound morphemes’ general meanings



rely on the logical operation of negation (\neg), while a 10,7% relate to the logical operation of the universal quantifier (\forall)¹⁶. Thus, a striking 82,3% of the words resorting to BMs, (that is, 64,0% of *all* infinity-lexemes), rely on two of the most basic operations both in first-order logic and in natural languages: negation and universal quantification.

¹⁶ E.g.: ‘Omnipotent’: $\forall(x), P(x)$. For every x , P holds for x , where x is belongs to the domain of all possible powers, and P is the property ‘being possessed by the subject’.

In relation to compounding (which unites lexical morphemes together and doesn't resort to BMs), universal quantification and negation also feature. Furthermore, some of the building lexemes (in bold) of the compounds appeal to temporal infinity $[T_I]$ *per se* to convey infinitude (see Table 2).

Compounds 'never-ending', 'everlasting', 'forever', 'evermore' and 'forevermore' all possess the lexeme 'ever' which self-sufficiently denotes infinitude: temporal infinitude, to be precise. It is the case of a lexical morpheme which does not require any additional linguistic/conceptual mechanism (such as negation, universal quantification or others) to represent INFINITY. An examination of all 31 lexical morphemes or bases constituting all infinity-lexemes reveals that, while almost all bases denote a finite, measurable or specific entity or event, which, as seen, is then modified by other morphemes to bring about a word expressing infinitude, it is exclusively the Germanic base 'ever', alongside with the Latin base 'aeternus' which already refer to infinity on their own accord. Curiously, these lexemes all belong to one of the specified senses of infinity: to the aforementioned *temporal infinity*.

Table 2

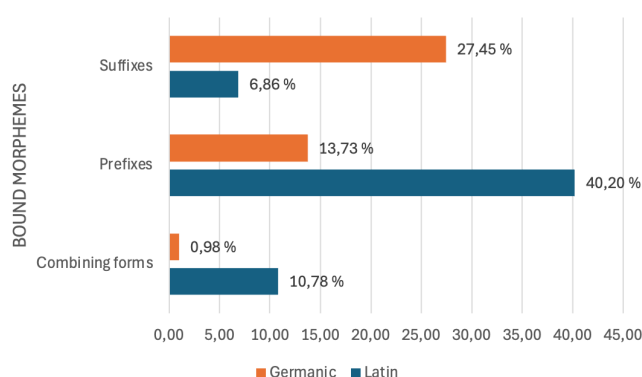
Compounds

All-powerful	\forall
N[ever]-ending	$\neg [T_I]$
Everlasting	T_I
Always	\forall
Forever	T_I
Evermore	T_I
Forevermore	T_I
Almighty	\forall

4.5. Origin language

Figure 8

Crossed frequencies: bound morphemes and source language



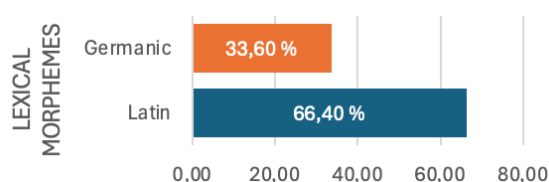
Lastly, an examination of the source language of both bound and lexical morphemes reveals an interesting fact which could be relevant to historical and anthropological interpretations. English, as most European languages, has been largely influenced by Latin, but it is, after all, a Germanic language.

Nonetheless, *Latin* morphemes (with French sometimes as intermediary language) account for 62,5% of all morphemes constituting infinity-lexemes, whereas Germanic morphemes account for 37,4%.

More specifically, while Latin bound morphemes have a frequency of 57,8%, Germanic BMs have a 42,1% frequency. As to lexical morphemes, the difference becomes more acute, with

Figure 9

Crossed frequencies: lexical morphemes and source language



Latin bases constituting two thirds of all lexemes and Germanic lexemes one third of the total (see Figure 9).

Beyond the possible explanation of the large presence of Latin bound morphemes ('in-', 'omni-', 'fic-', etc.) as well as Latin lexical morphemes ('praesēns', 'aeternus', 'mēnsūra', etc.; bearing in mind that

French often constitutes an intermediary language), the relevant usage of borrowings, which constitute a 28,8% of all lexicogenic operations leading to infinity-words, also explains the higher relevance of Latin in the English infinity-lexicon.

There are also two historical and anthropological facts to consider. Firstly, with Roman expansion over most of Europe and beyond, Latin was ubiquitous. The fall of the Roman Empire at the end of the 5th century and the development of the different vernacular languages during the Early Middle Ages did not impede Latin to persist as *lingua franca*, particularly in higher education and professions, but also as a means of communication, for around a millennium, and in fact still remained a key subject in many European and overseas schools until the 20th century. Importantly, knowledge was recorded almost exclusively in Latin up to the 15th century, and a fair portion continued to do so for three more centuries (Leonhardt, 2013), which means that, for centuries long, scientific, philosophical and theological endeavour recurred to Latin to express novel ideas, theories and concepts. Whether INFINITY is and was part of everyday life and conversation or not, it has certainly been of the utmost importance in philosophy, theology, mathematics, physics and the sciences¹⁷, in general. Given Latin's prominence in such spheres for almost a millennium and a half, it is common sense to acknowledge that Latin is essential to the infinity-lexicon.

Secondly, the historical development of Christianity also witnessed Latin become the language of the Church and theological discussion, which meant that essays and philosophical reflection over God's attributes were likely to be written in Latin. As mentioned in previous sections, the

¹⁷ In fact, Latin morphemes are used still today when creating neologisms, specifically those of a more scientific character.

monumental role that INFINITY has played in religious thought (not only in Christianity) cannot be ignored. Not only does infinitude possess its own long line of interpretation in the theological and philosophical tradition, but specific dimensions related to the holistic concept of INFINITY are clearly theological, as is the case of the *potent infinity* category. Finally, the fact that millions of Christians could only attend services in Latin until the Reformation in the 16th century resulted in many centuries of dwelling upon the infinitary attributes of the divine in the Latin language¹⁸, whether it were about boundless power, infinite wisdom, eternal life, and so on.

¹⁸ However, given that access to Latin was limited, vernacular languages faced the need to develop or spread their own infinity-lexicon too.

5. CROSS-LINGUISTIC ANALYSIS OF THE INFINITY-LEXICON IN THE NEW TESTAMENT

The previous analysis of the infinity-lexicon in modern English has shed light to four different existing categories of infinity, different aspects contributing to the holistic conceptualisation of INFINITY. It also has highlighted a prominence of *temporal infinity* in several ways, as well as underpinning the relevance of negation and universal quantification in conveying infinitude, operators lexicalised through affixes and combining forms.

The following section focuses on the cross-linguistic analysis of the infinity-lexicon in the New Testament across Spanish, English, Koine Greek and Latin.

See **Data Table 3. Infinity words in the New Testament** in Appendix section C.

159 expressions have been identified in each language¹⁹ to convey infinitude (whether L_I, I_I, T_I or P_I). Considering the reoccurrence of most of the expressions (most noticeably of the word ‘eternal’ in English and its counterparts in the other languages), each language possesses between 27 and 30 distinct expressions, whether words or phrases. Around 86-89% of these expressions correspond to *temporal infinity* in ENG, GR and LAT, and 75% in SP.

All four languages show a balance between the number of distinct words and distinct phrases. Furthermore, there is a symmetry between the syntactic and the morphological processes: the same semantic mechanisms performed by lexical morphemes (words) can be performed by bound morphemes, and vice versa.

There are three syntactic processes across the four languages conveying infinitude which correlate to three morphological processes: negation and universal quantification (already unravelled in the previous section), and a yet unseen process: forward motion depiction.

5.1. Syntactic processes inducing a meaning of infinitude

Firstly, negation is crucial. All four languages use negating adverbs and negative pronouns:

Table 3

Negation syntactic processes

NEGATION	SPANISH	ENGLISH	GREEK	LATIN
Adverbs	<i>No</i>	<i>Not</i>	<i>Oὐ</i>	<i>Non</i>
		<i>Never</i>	<i>Μη</i>	

¹⁹ Slightly less in some languages, since a few of the translations did not truly convey infinitude.

Pronouns	<i>Nadie</i>	<i>No one</i>	<i>Οὐδεὶς</i>	<i>Nemo</i>
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These negating words appear accompanying words or phrases denoting a *finite* entity or event. For instance, in the phrase ‘no one could count’ (Ap, 7:9), the finite action of counting is negated by means of the negative pronoun ‘no one’, thus providing a new phrase describing something’s infinitude.

The ENG adverb ‘never’ is interesting since it’s the compounding of the negating Germanic lexemes ‘ne’ and ‘ever’, a term intrinsically referring to eternity.

Secondly, universal quantification takes place at the syntactic level by means of adjectives, as the ones shown in Table 4, which typically accompany a noun phrase referring to a period of time. It seems that, in this syntactic context, the quantifier reinforces the sense of a ‘very large period of time’.

Table 4

Universal quantification syntactic processes

UNIVERSAL QUANTIFICATION	SPANISH	ENGLISH	GREEK	LATIN
Adjectives	<i>Todos</i>	<i>All</i>	<i>Πάντας</i>	<i>Omnia</i>

Thirdly, an equally ubiquitous mechanism in these infinity phrase constructions is the presence of prepositions indicating forward motion, as assessed by OED (n.d.) and Zerwick, M. & Grosvenor, M (1993):

Table 3

Forward motion syntactic processes

FORWARD MOTION	SPANISH	ENGLISH	GREEK	LATIN
Prepositions	<i>Por</i>	<i>For</i>	<i>Eῖς</i>	<i>In</i>
	<i>Para</i>			

The prepositions in Table 5 indicating forward movement are all followed by expressions denoting eternity or extremely long periods of *time*, as in ENG ‘for ever and ever’, GR ‘εἰς τοὺς αἰῶνας, *eis tou̓s aiōnas*’ (‘αἰών’ shares the same Indo-European base as ENG ‘eon’, meaning ‘lifetime, long age, generation’), LAT ‘in saecula’ and SP ‘por los siglos de los siglos’ (where the SP word ‘siglo’, now meaning ‘century’, derives from LAT ‘saeculum’, pl. ‘saecula’, meaning ‘generation’).

5.2. Morphological processes inducing a meaning of infinitude

When examining the words instead of the phrases, the same three mechanisms, now morphological, of negation, universal quantification and depiction of forward motion appear, again, in all four languages:

Table 4

Negation morphological processes

NEGATION	SPANISH	ENGLISH	GREEK	LATIN
Prefixes	<i>In-</i>	<i>In-</i>	<i>Α-</i>	<i>In-</i>
	<i>Im-</i>	<i>Im-</i>		
		<i>Un-</i>		
Suffixes		<i>-less</i>		

Morphological negation occurs throughout the four languages through prefixes, mostly, but also via suffixes. In fact, ENG turns out to be the only language using a negating suffix in the infinity-lexicon.

As to universal quantification, whereas in the syntactic context the resulting expressions referred to T_1 , in the morphological context, the roots and combining forms are attached to another base denoting power. Thus, the universal quantifier serves to provide a new term denoting *potent infinity* in the following sense: ‘for every x , where x is in the domain of all possible powers, the subject (whom the adjective complements) possesses x ’.

Table 7

Universal quantification morphological processes

UNIVERSAL QUANTIFICATION	SPANISH	ENGLISH	GREEK	LATIN
Root or combining form	<i>Todo-</i>	<i>Al-</i>	<i>Παντο-, panto</i>	<i>Omni-</i>
		<i>Omni-</i>		
			<i>Πάν-, pan</i>	

Finally, as observed in Table 8 below, in the same way as there are prepositions across the four languages which carry a sense of forward motion across a medium, their morphological counterpart exists too:

Table 8*Forward motion morphological processes*

FORWARD MOTION	SPANISH	ENGLISH	GREEK	LATIN
Starting particle	<i>Per-</i>	<i>Per-</i> <i>For-</i>	<i>Dia-</i>	<i>Per-</i>
Ending particle				<i>-per</i>

The root **per-*, a Proto-Indo-European (PIE) root present in lexemes, prepositions and adverbs across many European languages, indicates movement or direction, as in ‘going forward’ or ‘in front’ (Kahn, 1960). It is this root which is present in SP’s prepositions ‘por’ and ‘para’, and in LAT, ENG and SP’s starting and ending particles ‘per-’ and ‘-per’.

Since infinitude is the absence of limits or measurability, it is not surprising that negation, a basic operator in first-order logic and in languages, is absolutely crucial in building both words and phrases. The use of the universal quantifier to reinforce the idea of a vast period of time (thus bordering a notion of eternity), in the syntactic context, or to denote all-powerfulness, in the morphological context, constitutes a more interesting finding. The truly interesting discovery, however, is the paramount role of particles conveying motion across a medium, a medium which more often than not is the dimension of *time*. It is plausible that the notion of forward movement adjoined to the idea of a vast or indefinite period of time fostered the more precise concept of actual temporal infinity as a period of time without limitations, lexicalising the novel concept into words built with particles able to express such thoughts.

6. CONCLUSIONS

6.1. Main findings

The aim of this research was to study the intersection between language and abstract thought through the case study of one specific abstract concept: INFINITY. The thorough examination of the infinity-lexicon in English and the cross-linguistic analysis of the infinity lexemes and phrases used in the New Testament across English, Spanish, Latin and Koine Greek result in three relevant findings.

Firstly, practically all infinity-lexemes across *all* four languages derive the meaning of infinitude from the binding of its constituents. Almost all lexemes and phrases reveal an inner structure in which something *not* denoting infinitude is modified by *another* morpheme or word (through negation, universal quantification or morphemes describing motion); a modification resulting in a new derived or compounded lexeme, or in a phrase, now signifying infinity; thus manifesting both the linguistic and conceptual pre-existence of terms and notions of finiteness. Therefore, it is compositionality which accounts for the emergence of the meaning of infinitude in practically all expressions and, quite likely, what enables it or, at least, fosters it.

Secondly, this research has revealed that all four target languages use the *same* morphological and syntactic processes in building expressions representing infinitude, and that there is a correspondence between the morphological and syntactic processes, i.e., the same semantic mechanisms performed by morphemes can be carried out by words in syntactic structures, or vice versa. The most common process is negation, an elemental cognitive, logical and linguistic operator (\neg). Given that infinitude is conceived as a *lack* of limits and measurability, and that, while finiteness can be perceived in our surroundings²⁰, infinitude cannot, that negation is essential in conceptualising the infinite and most frequent in its linguistic expressions is not surprising. Another elemental operator frequently used, particularly to denote potent infinity, is universal quantification (\forall). Morphemes or lexemes expressing universal quantification are attached to a base or complement a syntactic head designating ‘power, might’, thus originating the notion of a subject being in possession of every power in the domain of all possible powers. The frequency and presence of these two processes in all four languages manifests the

²⁰ The ending of things, whether physical, temporal, in number, in capability, and so on, is present everywhere: tables have edges, work finishes at 5PM and objects around us are countable. Even the sea, which seems endless, is met with a visual ending, the horizon.

centrality of the most basic cognitive logical operations in conveying new ideas. Lastly, another mechanism present in all four languages is the use of morphemes or words expressing the notion of forward movement across a medium, usually time²¹. The heads or bases which these morphemes or prepositions complement mostly express notions of a vast period of time. Thus, the forward motion particles seem to represent or, perhaps, enable, the conceptual leap from devising a *large* period of time to conceiving an actually *endless* amount of time.

Thirdly, this research has identified a pattern of lexicalisation, with lexemes originating to denote infinity predicated from two specific domains: power, and, most noticeably, time. More than half of the lexemes in the English infinity-lexicon express, not general infinity, but potent infinity (11,8% of words) and temporal infinity (40,6%). Furthermore, in all four languages, the infinity lexemes and phrases found in the New Testament referring to temporal infinity constitute the vast majority (75-89%). The following question arises for all four languages: when already possessing phrases, as well as lexemes, which denote infinitude, a general infinitude which can then be specified through syntactic processes to be predicated of a specific domain; why would potent and temporal infinities be lexicalised and with such high frequency (particularly the latter)? The lexicalisation of new concepts into language lexicons is not a simple process: expanding a lexicon has a cognitive cost and, so, lexicons cannot grow indefinitely. This need for simplicity, nonetheless, is met with the need for informativeness, two opposing forces resulting in the so-called informativeness-simplicity trade-off. Novel words are lexicalised depending on a linguistic community's need to refer to some domain with more or less precision (Karjus et al., 2021). Hence, the high presence of words describing these two specific infinities manifest a cultural need on behalf of the linguistic communities in which English, Spanish, Latin and Koine Greek evolved to talk and discuss about omnipotence and, above all, eternity. The prominence of temporal infinity in human thought is also evident from the fact that the only few lexemes detected in the data across the four languages to produce the meaning of infinity directly and not compositionally are found in 'ever' (ENG), 'aeternus' (LAT) and 'αἰδῖος' and 'αἰώνιον' (GR). While, technically speaking, these are derivations, 'ever' derives from the Germanic root 'o', which means 'eternity, always'. Furthermore, this base 'o' shares the same Indo-European root found in the Latin term '*aevum*, an age or long time' and in the Greek '*αἰεῖ*, always' and '*αἰών*, lifetime', from where 'αἰδῖος' and 'αἰώνιον'

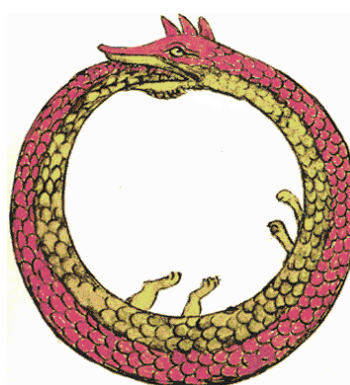
²¹ Expressions such as 'permanent', 'por los siglos' (SP. Literal trans.: 'for the centuries'), 'in omnia saeculum' (LAT. Literal trans.: 'for all generations'), 'εις τοὺς αἰῶνας' (GR. Literal trans.: 'for the ages'), or 'for ever and ever' all convey the idea of movement across time.

derive (Oxford English Dictionary, n.d.). In short, there exists a particle of Indo-European origin which, without any need of negating, quantifying or other particles, succeeds to express TEMPORAL INFINITY autonomously, suggesting a very high need for informativeness and, therefore, awareness on this specific notion, which is not surprising. After all, humanity has dwelled upon its temporal finiteness for millennia, wondering about the possibility of eternal life, and marvelling at the immortality and agelessness of its gods and goddesses. Furthermore, cycles, a form of temporal infinity, have always been ubiquitous in nature and in human

existence, in the cycle of birth and death, in the ceaselessness of the seasons, in night and day. This is illustrated by one of the most ancient symbols to describe eternity, much older than the better-known ‘∞’, which only dates back to the 17th century: the Ouroboros, which has been traced back to the 16th century BCE, almost 4 millennia ago (Barrow, 2010), reflects this very notion of the eternal cycle. The paramount role of temporal infinity suggests the possibility of human communities having first approached and conceptualised INFINITY from the dimension of time, rather than space, numbers, power or any other. Other forms of infinitude, and the general concept as such (an even more abstract notion: merely, ‘lack of limits and measurability’) probably appeared later.

Figure 10

Ouroboros symbol



Note. An ouroboros in a 1478 drawing in an alchemical tract. Theodoros Pelecanos. Source: https://en.wikipedia.org/wiki/Ouroboros#cite_note-1. CC.

6.2. Discussion, limitations and future research

In regard to the thesis’s initial aims, this research has been able to provide a conceptual scheme to understand the concept of the infinite holistically, identifying its general and specific categories. It has also succeeded in finding the morphosyntactic mechanisms behind the inception of infinity-expressions across the four languages. And, finally, it has been able to discern whether the four languages differ or not in these morphosyntactic processes: they do not. This has led to the impossibility of confirming the hypothesis. Since the mechanisms were the same across the four languages, there has not been a *contrast* among them, crucial in confirming or rejecting the hypothesis.

Future research could pursue this path, seeking and comparing languages which may use other mechanisms (different from negation, universal quantification and motion depiction), while looking for differences in lexicalisation patterns. One of this research's limitations has been analysing languages only belonging to the Indo-European family. Further research could largely benefit from studying very distant languages, deriving from different language families.

In spite of not being able to confirm whether the uncovered linguistic mechanisms are determining in conceiving the abstract concept of INFINITY, or influential at least, this research has set a methodological pathway for further investigation on the topic. The New Testament was the chosen corpus of analysis precisely due to its extensive number of translations, as well as to its indexing system, which simplifies enormously the task of finding each expression. The creation of a large data base of a NT infinity-lexicon across much more than just four languages would represent a myriad of research possibilities. Furthermore, with its findings on the linguistic and conceptual prominence of temporal infinity, it suggests other research opportunities in different directions, beyond the linguistics domain.

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APPENDIXES

A. Anaximander's *apeiron*: the emergence of INFINITY in Western thought

Anaximander's infinite substance of the cosmos

The first account of INFINITY in Western thought traces back to the birth of Western Philosophy in 6th century BCE Ancient Greece, when some revolutionary thinkers now known as 'the Presocratics' attempted, for the first time, to provide rational instead of mythical explanations for cosmological, physical and ontological questions. Those first philosophers sought to identify the *ἀρχή* (*arkhē*), the 'first principle', the ultimate cause, the original substance of the cosmos. Anaximander of Miletus, the second Presocratic after Thales, asserted that the first principle of the universe was the infinite, the indefinite, or the unlimited: *τὸ ἄπειρον* (*to apeiron*).

Born in Miletus, in the Greek Ionian region of Asia Minor, Anaximander flourished towards mid 6th century BCE. While there are no surviving texts of his, we know about his philosophy through the doxographic tradition. According to Simplicius' writings, which preserved Theophrastus' summary on Anaximander's theory: "Anaximander, son of Praxiades, a Milesian, the successor and pupil of Thales, said that the principle and element of existing things was the *apeiron* [indefinite, or infinite], being the first to introduce this name of the material cause" (*Phys.* 24, 13; DK 12 A 9; as cited by Kirk, Raven & Schofield, 1983). Hippolytus writes that Anaximander also believed this infinite first substance to be "eternal [*ἀίδιον*] and unageing [*ἀγήρω*]" and as originating "the heavens and the world in them" (*Ref.* I 6, 1-2; DK 12 A 11; as cited by Kirk, Raven & Schofield, 1983), which are "innumerable [*ἀπείρους*]" (Pseudo-Plutarch, *Strom.* 2; DK 12 A 10; as cited by Kirk, Raven & Schofield, 1983). Moreover, the *apeiron* is also responsible for the *cyclical* generation and destruction of the worlds (*ibidem*), because it is said "to encompass all and to steer all" (Aristotle, *Physics*, III, 4, 203b11), i.e., to govern all things. This all-governing power, alongside with the aforementioned traits of being eternal and ageless, makes it very likely for this first principle to have been considered of divine status, which was not uncommon among the Presocratics, and which Aristotle in fact claims in his *Physics*: "they identify it with the Divine, for it is deathless and imperishable as Anaximander says" (III, 4, 203b14). Kirk, Raven & Schofield point out the similarities between the Homeric frequent depiction of the gods as "immortal and free from old age" and Anaximander's akin formula presented by Aristotle. Interestingly, they

suggest a parallelism between the characteristics of Anaximander's *apeiron* and Homer's gods, which would imply, as well as the agelessness of the divine first substance, its "boundless power" too (1983).

Furthermore, this first substance is not any of the elements (it's not water, as Thales claimed, nor air, as Anaximenes would later assert, or any other element), but rather it is distinct, essentially unlimited, or undefined in substance. In this sense, Anaximander's *ἀρχή* is infinite (*apeiron*) in the sense of indefinite. However, it is also infinite in the sense of being an unlimited, never-ending, source of matter, so that the different elements can forever originate from it (Kirk, Raven & Schofield, 1983). Does this imply that Anaximander conceived the *apeiron* as spatially infinite, too? Some scholarly interpretations seem to go in this direction. Burnet writes: "We must picture, then, an endless mass, which is not any one of the opposites we know, stretching out without limit on every side of the world we live in. This mass is a body, out of which our world once emerged, and into which it will one day be absorbed again" (1920). Others, however, like Kirk, Raven & Schofield, have pointed out that the idea of spatial infinity was probably not *fully* developed until the Eleatic School's remarks on extension and divisibility a century later (1983). Nonetheless, as Kahn is correct to stress, the term *ἄπειρον* [*apeiron*] and its related words (*ἄπειρος*, *ἀπείρων*, *ἀπείριτος*, *ἀπειρέσιος*, *ἀπερείσιος*) were already used in ancient Greek literature²² to portray some sort of spatial indefiniteness, usually ascribed to the Sea or the Earth, which, albeit, is not to be equated to a boundlessness, since both the Sea and the Earth are very much bound, both Homer and Hesiod referring to their limits on multiple occasions (1960); perhaps such spatial indefiniteness ought to be understood as a *spatial vastness*, difficult to make sense of or to grasp. Altogether, this point on Anaximander's *apeiron*'s spatial infinitude is debatable, and it is safer to just understand it in terms of an unlimited source of matter, which, perhaps, may have also been envisioned as spatially indefinite, although not necessarily endless.

There are many more details to Anaximander's full theory, but this overview on his original substance suffices to unequivocally summarise his famous *apeiron* as (i) essentially unlimited and as an unending source, (ii) as eternal and (iii) as originating innumerable worlds. The traits regarding (iv) unlimited power and (v) spatial boundlessness have to be considered with special caution. As we have seen, the *apeiron*'s similarity to the Greek gods regarding its immortality and agelessness, alongside its role as the governing cause of the cosmos, allows an

²² Which dates of the late 8th or early 7th century BCE, therefore, it is prior to Anaximander. Homer's and Hesiod's texts are the earliest literary texts from Ancient Greece to have been found.

interpretation which attributes omnipotence to it²³. However, considering the lack of information on Anaximander's theory (which has been reconstructed over time with bits and parts from indirect sources), it can only be suggested with a big question mark aside. In a related way, it could be dangerously anachronistic to impose the property of endless spatial extension to Anaximander's *apeiron*, who may only have had the tools to conceive something incredibly vast as 'undefined' in extension, but not actually all-expanding. What does all this mean?

Although isolated notions of INFINITY's different categories must have existed up to some degree prior to Anaximander's contribution (particularly regarding eternity and probably divine omnipotence), in him we find for the first time a truly distinct concept representing infinitude in all its complexity i.e., as that which lacks limits and measurability in essence, time, number and all-governance.

Linguistic examination of Anaximander's coinage

The philological analysis of Anaximander's coined term, 'τὸ ἄπειρον', consists of three key elements. Firstly, the noun '*apeiron*' is derived by the negating particle 'a-' adjoined to a root. That which the root conveys is as insightful as this privative particle: negation, here expressed by means of the linguistic sign 'a-', constitutes a fundamental cognitive operator when conceptually devising infinitude, since it negates a preexisting concept. And which is this preexisting notion? Most scholars hold that the term 'ἄπειρον' derives from 'πέρας', which, according to the standard dictionaries of Ancient Greek, such as LSJ, means 'end, limit, boundary' (Perseus Digital Library, n.d.). In this sense, the '*apeiron*' is conceived merely as the negation of finiteness. Nonetheless, this traditional view has been challenged. As Kahn (1960) argues:

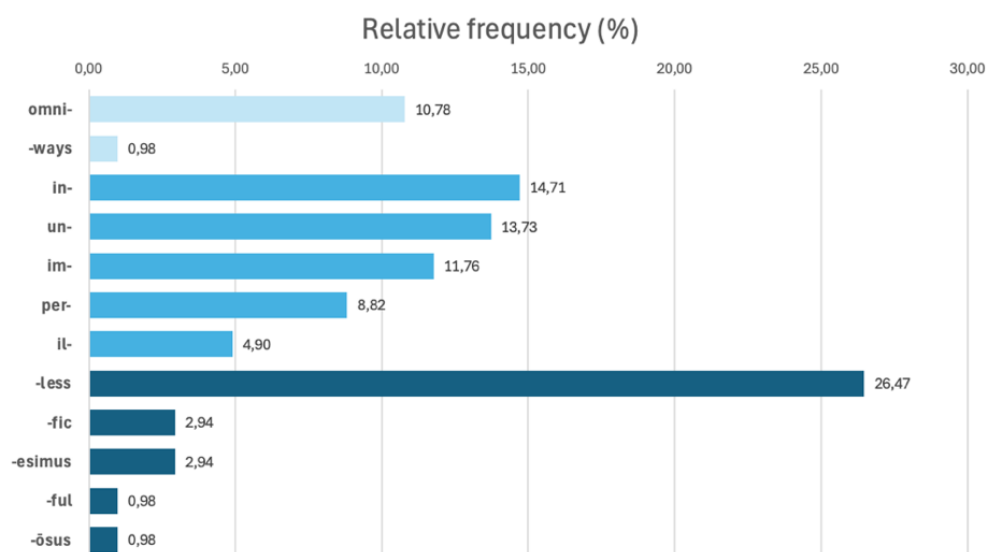
It is not the noun *πέρας* which is negated by the a- privative, but the verbal root **per-* represented in *πείρω*, *περάω*, and *περαίνω*, as well as in a number of Indo-European adverbs and prepositions, all referring in some way to the direction "forward, in front" (Greek *πρό*, Latin *per*, *prae*, etc.). The verbal forms indicate a movement in this direction, and the group of *περάω*, *πέραν*, *περαίνω*, *πεῖραρ* envisages the point at which the forward motion comes to an end. Thus *περάω* (like *περαιόω*) is regularly used of passing over a body of water to reach the other side. (Kahn, 1960, p.232)

²³ There may be an uneasiness in interpreting the *apeiron*'s possible all-powerfulness as 'omnipotence' in the same way as this term is understood in the Jewish-Christian theological tradition. Many scholars have, in fact, deemed it necessary to distinguish the unlimited power of the gods in the Greek pantheon from the omnipotence attributed to God in the monotheistic religions, but others have refused such distinction (cf. Versnel, 2011).

Following Kahn’s alternative suggestion, ‘apeiron’ comes to denote “what cannot be passed over or traversed from end to end” (Kahn, p.232), where the idea of motion across a medium becomes essential.

Lastly, as in other paramount philosophical concepts originating in Ancient Greek philosophy, the article ‘τὸ’ preceding the word in question is relevant to the semantic and grammatical configuration of the word which follows (‘ἄπειρον’). ‘Τὸ’ is the neuter form of the definite article (as many other languages, Ancient Greek has three grammatical genders). In Ancient Greek, abstract nouns are usually introduced by the definite article (unlike English), which fosters definiteness and specificity over ambiguity (Kinchin Smith & Melliush, 1968). The fact of abstract nouns being preceded, not only by an article, but by a *definite* and *neuter* article could foster substantivation and conceptualisation processes. In fact, some authors have claimed that the Greek neuter definite article, precisely, constituted “a mechanism of nominalisation and abstraction” that played an essential role in the birth of Western philosophy (Morey, 1981; own translation), in times, precisely, of Anaximander of Miletus.

B. Figures



Note. Combining forms appear in light blue, prefixes in blue, and suffixes in dark blue.

C. Supporting data

Data Tables 1, 2 & 3 are available on: <https://github.com/annacalongecases/MA-Thesis>