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Nominal Number in Sign Languages

Número nominal em línguas de sinais

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Abstract: This study describes the manifestation of the category of number in sign languages, aiming to identify the values, the main forms and strategies available and some intramodal and intermodal manifestation patterns, considering the noun phrase. To this end, we worked with a sample of 10 sign languages, from different regions and historical groups. Based on secondary data, we identified that some sign languages have optional number marking, which presupposes the presence of the general number, and that other sign languages have obligatory number marking. In sign languages where number marking is optional, the general form is similar to the singular form, expressed by zero. The values of the category of number are singular, plural and dual, expressed by syntactic and morphological strategies, but preference is given for the former. This preference suggests that sign languages are isolating languages with regard to the category of number, differing typologically from spoken languages in this respect. Furthermore, the number system in sign languages appears to be phonologically driven.

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The supposed trial and quadral values can be expressed by using the iconic plural, in a process of repetition of the singular form in the sign space, with a distinctive and localized pause. Therefore, they were considered to be an instance of direct counting and would be outside the number category. This strategy could create values that go beyond the amount of expected values for the category, in a typological perspective. Also, when mentioned, these values can be substituted for the plural. From the descriptions, morphological strategies suggest an implicational hierarchy, with mouthing being a rarely used strategy and reduplication with displacement being the most prevalent strategy. Another intra-modal feature is the spatial arrangement of the referent, expressed in the category of number.

Keywords: sign language typology; universals; number; plurality.

Resumo: Este estudo descreve a manifestação da categoria de número em línguas de sinais, com o objetivo de identificar os valores, as principais formas e estratégias disponíveis e alguns padrões de manifestação intramodal e intermodal, considerando o sintagma nominal. Para tanto, trabalhamos com uma amostra de 10 línguas de sinais de diferentes regiões e grupos históricos. Com base em dados secundários, identificamos que algumas línguas de sinais possuem marcação de número opcional, o que pressupõe a presença do número geral, e que outras línguas de sinais possuem número obrigatório. Nas línguas de sinais em que a marcação é opcional, a forma geral é semelhante à forma singular, expressa por zero. Os valores da categoria de número são singular, plural e dual, expressos por estratégias sintáticas e morfológicas, com predileção das primeiras sobre as segundas. Essa preferência sugere que as línguas de sinais estão isolantes no que diz respeito à categoria de número, diferindo tipologicamente das línguas orais. Além disso, o sistema de número nas línguas de sinais parece ser orientado fonologicamente. Os supostos valores trial e quadral podem ser expressos a partir do plural icônico, em um processo de repetição da forma singular no espaço de sinalização, com uma pausa distinta e pontual. Por isso, foram considerados como uma instância da contagem direta e estaria fora da categoria número. Essa estratégia poderia criar valores que extrapolam a quantidade de valores esperada para a categoria, em uma perspectiva tipológica. Além disso, quando mencionados, estes valores podem ser substituídos pelo plural. A partir das descrições, as estratégias morfológicas sugerem uma hierarquia implicacional, com o uso do *mouthing* manifestando-se como uma estratégia rara e a reduplicação com o deslocamento sendo a estratégia mais prevalente. Outra característica intramodal é o arranjo espacial do referente, expresso na categoria de número.

Palavras-chave: tipologia de línguas de sinais; universais; número; pluralidade.

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1 Introduction

This article examines the category of number in sign languages from a typological perspective. Sign Languages Typology has been consolidated as a disciplinary field with the growing number of descriptive studies on these languages. One of its objectives is to survey similarities and differences between sign languages and between sign languages and spoken languages, thus identifying manifestation patterns both within and across language modalities.

In general, our conception of the category of number refers to our ability to group and quantify, in terms of an intuitive distinction between a single entity and a number of entities. In this process, we conceptually conceive sets which sometimes are made up of a single referent and sometimes of more than one referent.

In languages, the manifestation of this category varies evidencing the existence of a system, whose values cannot be subsumed under a simple opposition between singular and plural. According to Steinbach (2012), a comprehensive typological study on the subject in sign languages is still lacking, although there are descriptions of pluralization in individual sign languages. In this article, we present some similarities and differences in the manifestation of the category in terms of referents and, therefore, our focus is on the manifestation of nominal number.

Our objectives were to identify the values for the category of number in sign languages, considering the noun phrase, and to describe the strategies for manifesting these values, considering preference, restriction and distribution. This allowed us to identify trends in sign languages and compare them with other findings for (spoken) languages around the world. To this end, we surveyed the topic in ten sign languages using secondary data. We probably had access to prototypical constructions in these languages corresponding to the most reported phenomena.

2 Nominal number in (spoken) languages

According to Corbett (2000), some languages have complex systems that include many different number values, while in other languages number is optional, irregular and inferred by the context. Furthermore, there are languages in which number is manifested in combination with other properties.

In languages where number is optional, nouns can be expressed in a neutral way that would be outside the number system. Corbett (2000) calls this possibility "general form" or "general number," and it depends on the speakers' perception of the relevance of marking (or not) some number value. This and other phenomena may be restricted to part of the noun repertoire. Typologically, the general form is not widespread in languages.

Bayso is a language that allows nouns to be expressed in a general way, in situations where the manifestation of the category of number is irrelevant.

(1) Bayso language (Dick Hayward's personal communication to Corbett, 2000, p. 11)

lúban **foofe**
lion.general watched
'I watched lion (one or more lions).'

lúban-titi **foofe**
lion-sg watched
'I watched a lion.'

lúban-jaa **foofe**
lion-paucal watched
'I watched (a few) lions.'

lúban-jool **foofe**
lion-pl watched
'I watched (a lot of) lions.'

In languages where number marking is obligatory, the meaning of the general form can be inferred by context and is shared with the singular form. A system in which the general form shares meaning with the plural form is considered non-existent, as explained by the principle of markedness. On this topic, Greenberg (1963) indicates that non-singular values are considered marked in relation to the singular value and, if a language has a neutral value for number, this must be considered the unmarked form. If singular and plural forms can also be used to express a neutral value, it is expected that the singular form is used. Turkish and Tagalog are languages that use singular/general and plural forms.

(2) Turkish language (CORBETT, 2000, p. 14)

ev	**ev-ler**
house	house-pl
'house/houses'	'houses'

(3) Tagalog Language (David Gil's personal communication to Corbett 2000, p. 16)

aso	**mga**	**aso**
dog/dogs	pl	dog/dogs
'dog/dogs'	'dogs'	

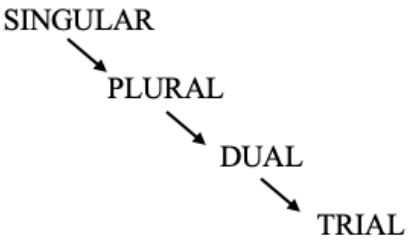
In Turkish, the form *ev* can mean *house* or *houses*, while the plural form *evler* must means *houses*. In Tagalog, the form *mga* indicates plurality, but its absence in the noun phrase leaves the possibility of singular or general meaning. Therefore, in (3) the form *aso* can indicate *dog* or *dogs*. In this type of language, the distinction between singular and general can be made, for example, by using articles and numerals.

In languages where number expression is obligatory, nouns are expressed within the values available for the category. According to Corbett (2000), languages can have the following number systems: (i) singular and plural; (ii) singular, dual and plural; (iii) singular, dual, trial and plural; (iv) singular, paucal and plural; (v) singular, dual, paucal and plural; and (vi) singular, dual, trial, paucal and plural. Thus, the category of number is expected to have maximum of five number values.

It is interesting to consider that in languages that have a *singular/plural* system, the plural form can mean both "more than one" and "two or more." The existence of other values also implies the plural meaning. In languages that have a *singular/dual/plural* system, for example, the plural form has the meaning of "three or more real world entities". Also according to the author, both the trial and the (rare) quadral values would be better understood as paucal, as they end up being used in other contexts.

Greemberg (1963) presents an implicational hierarchy regarding the values of the category of number. According to the author, no language has a trial number unless it has a dual, and no language has a dual number unless it has a plural. This implicational hierarchy is illustrated in Image 1.

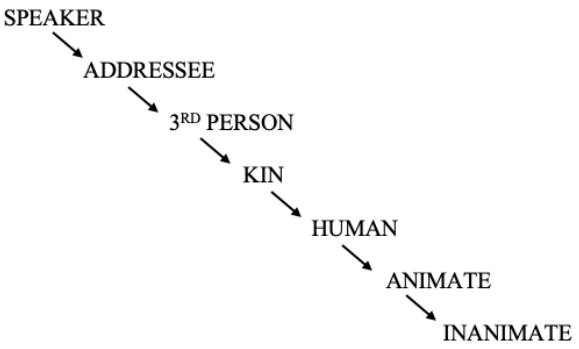
Image 1 - Implicational hierarchy of number values



Source: prepared by the authors based on Greenberg (1963, p. 74).

In languages in which number is expressed in part of the noun repertoire, animacy is an important feature for determining number marking (CORBETT, 2000; DRYER, 2013; HASPELMATH, 2013). According to Corbett (2000), personal pronouns are given preference over nouns and the first person pronoun even more so. Considering animate referents, kin-related terms are given preference over human-related terms, which, in turn, are given preference over other animate referents. Finally, the least marked class is that of inanimate referents. Image 2 illustrates this hierarchy, also considering the pronominal system.

Image 2 – Implicational hierarchy for number expression in nouns



Source: Corbett (2000, p. 57) – adapted by the authors.

Also with regard to preferences in the category of number, Haspelmath (2013) presents six possibilities of manifestation of plural

markers in the languages of the world[1], which varies along the animacy and obligatoriness dimensions. These possibilities are the following: (1) no nominal plural[2], (2) plural only in human nouns, optional; (3) plural only in humans, obligatory; (4) plural in all nouns, always optional; (5) plural in all nouns, optional in inanimates, and (6) plural in all nouns, always obligatory.

In the animacy dimension, the most important contrast is between animate (mainly human) and inanimate nouns. Human nouns are more likely to have plural marking than non-human (especially inanimate) nouns, which is evidenced by the fact that other logically possible values were not attested: (7) plural only in inanimate nouns, obligatory; (8) plural only in inanimate nouns, optional, and (9) plural in all nouns, optional in human nouns.

Also regarding the manifestation of the plural, according to Dryer (2013), (spoken) languages vary with some using primarily morphological strategies, which involve the use of affixes, stem change, tone change and reduplication, and other primarily syntactic strategies, which involve the use of free morphemes, including both plural words and clitics. There are also languages that use more than one strategy, none of which are considered primary. According to the author, (in spoken languages) the use of morphological strategies prevails over syntactic strategies, with the use of suffixes being the most prevalent and widespread strategy throughout the world. The following data illustrate these strategies, respectively.

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[1] The author only considers full nouns, that is, excluding personal pronouns.

[2] Also according to the author, the non-occurrence of plural marking in languages does not mean that there is no manifestation of plural meaning. A language of type (i) having no nominal plural does not mean that only a singular meaning can be expressed, but that a non-number-marked noun form is used for both a single referent and a group of referents (general number). One example is Shigatse (Tibet), in which speakers are vague about the number of entities. The noun *ri* can mean either *mountain* or *mountains*. If they wish to be explicit, they can use numerals or quantity words (HASPELMATH, 2013). According to Dryer (2013), with regard to languages without a nominal plural, plurality can be coded on the verb.

(4) Portuguese language – affixing (suffixing) strategy (CUNHA; CINTRA, 2007, p. 195)

mesa	**mesa-s**
book	book -pl
'book'	'books'

(5) Maricopa Language – noun stem change strategy (GORDON 1986, p. 29 in DRYER, 2013, n.p)

humar	**humaar**	**nchen**	**nchiin**
'child'	'children'	'older sibling'	'older siblings'

hat haat		**mhay**	**mhaa**
'dog'	dogs'	'boy'	'boys'

(6) Ngiti Language – tone strategy (KUTSCH LOJENGA, 1994, p. 135 in DRYER, 2013, n.p)

kamà	**kámá**	**màlàyikà**	**màlàyíká**
'chief'	'chiefs'	'angel'	'angels'

màlimò	**màlímó**	**adˋɔdu**	**adˊɔdu**
'teacher'	'teachers'	'my brother'	'my brothers'

(7) Indonesian Language – reduplication strategy (SNEDDON, 1996, p. 16-17 in DRYER, 2013, n.p)

rumah	**rumah ~ rumah**	**perubahan**	**perubahan~perubahan**
house	house ~ pl	change	change ~ pl
'house'	'houses'	change	'changes'

(8) Tagalog Language – free morpheme strategy (David Gil's personal communication to Corbett (2000, p. 134)

mga	**bahay**	**mga**	**tubig**
pl	house	pl	water
'houses'		'cups of water'	

(9) Cayuvava Language – clitic strategy (KEY, 1967, p. 50 in DRYER, 2013, n.p)

mɛ=rišɔ **rab iri**
pl new paddle
'new paddles'

Number values can also be expressed by zero and thus inferred by context. The use of the numeral also seems to dispense with number markers in some languages, even where those markers are obligatory. Number manifestation can also be determined by certain pragmatic situations: topic versus non-topic, first mention versus subsequent mention, referential versus non-referential use, human versus non-human, definite versus indefinite (CORBETT, 2000; ELSON; PICKETT, 1978; HASPELMATH, 2013).

Still on zero expression, Greenberg (1963, p. 74) states that "there is no language in which the plural does not have some nonzero allomorphs, whereas there are languages in which the singular is expressed only by zero. The dual and trial are almost never expressed only by zero."

In this section, we present the values and strategies of manifestation of the number category in the (spoken) languages of the world, in a typological perspective. Next, we present the methodological procedures and the languages that made up the sample.

3 Methodology

Research in linguistic typology requires a broad definition of grammatical categories in terms external to the system, thus enabling a comprehensive, reliable identification of specific linguistic phenomena, as well as the comparability between languages. In this sense, it is essential to adopt semantic and functional criteria during the investigation.

The study sample consisted of ten sign languages from diverse historical groups and areas. Grouping sign languages according to historical relationship relied on data obtained in the literature consulted, as well as on the evolution of sign languages over the 19th and 20th centuries (POWER; GRIMM; LIST, 2019). Table 1 illustrates the groups of historically related sign languages that make up the sample and indicates the data sources consulted.

Table 1 – Groups of historically related sign languages and sources consulted

Historical Relationship	Sign Language	Data Source
French SL Group	Libras (Brazil)	Ferreira (2000; 2010); Finau (2014); Lara (2017); Sanchez-Mendes; Xavier (2016); Sanchez-Mendes; Segala; Xavier (2017); Quadros; Karnopp (2004); Xavier; Barbosa (2015).
	LSM (México)	Cruz-Aldrete (2008); Smith-Stark; Cruz-Aldrete (2008)
	ISL (Ireland)	Leeson; Saeed (2012)
	NGT (Netherlands)	Zwitserlood and Nijhof (1999),
Austrian SL Group	GDS (Germany)	Steinbach (2012), Pfau; Steinbach (2005b; 2006); Herbert (2015)
	ISL (Israel)	Meir and Sandler (2008); Stavans (1996)
British SL Group	Auslan (Australia)	Johnston and Schembri (2006).
	IPSL (India, Pakistan, Nepal)	Zeshan (2003)
Russian SL Group	ESL (Estonia)	Miljan (2003)
Isolated SL	IUR (Canada)	Schuit (2013)

Source: prepared by the authors

With respect to signing communities, nine of the sign languages are national languages that, in general, are legally recognized and have maintenance and dispersal policies and tend to be used by bilingual deaf people. Only IUR (Canada) is a village sign language.

Data for analytical and comparison purposes were collected using secondary sources. We surveyed the literature for information about noun phrases, sign formation processes, general morphological processes, word class, pronouns and classifiers. We were also attentive to the data collected. Languages for which there were many gaps in the descriptions obtained were excluded from the sample.

At first, we sought data on (1) optionality of the category and the presence of general number, (2) obligatoriness, (3) values, (4) forms and strategies available for value manifestation, (5) articulatory and semantic

constraints, and (6) the presence of other properties in the manifestation of the category.

We were attentive to diverse possibilities of manifestation. In certain cases, it was necessary to adapt and standardize the terminologies used by the various sign language researchers to enable comparison within modalities. It was also necessary to (re)adapt the terminologies for performing inter-modal comparisons.

Forms and strategies were identified gradually over the process of collecting the descriptions of the category of number for the various languages. The list of forms and strategies was thus created simultaneously with data collection, that is, the parameters were listed as the analysis took place, and then we reexamined the available material using a cyclical approach (PALFREYMAN; SAGARA; ZESHAN, 2015).

Syntactic strategies include (1) juxtaposition with numeral signs, (2) juxtaposition with quantifiers and (3) juxtaposition with entity classifiers, which also included juxtaposition with pointing signs. Morphological strategies include (1) reduplication with displacement, which includes alternating (re)duplication, sweeping movement and doubling, (2) reduplication without displacement, (3) mouthing and (4) zero marking. The lexical strategy corresponds to the existence of signs expressing collective referents. Table 2 illustrates the list of parameters.

Table 2 – List of parameters for data collection on sign languages.

Strategies	Parameters
Syntactic	Noun + Numeral
	Noun + Quantifier
	Noun + Descriptive verbs
Morphological	Reduplication with displacement
	Reduplication without displacement
	Mouthing
	Zero
Lexical	Lexicon

Noun + Pointing Signs

Alternating (re)duplication
sweeping movement
duplication

4 Nominal number in sign languages

Values and strategies in nouns

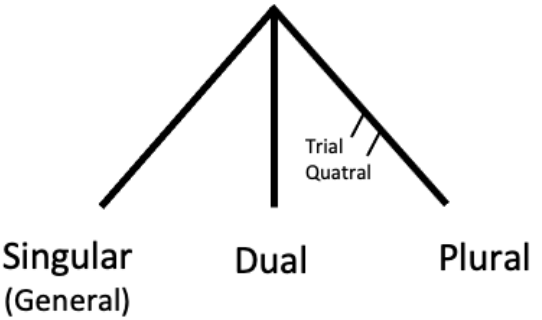
IPSL (India, Pakistan and Nepal) is a general number language, i.e. nouns can be expressed outside the category of number, while ESL (Estonia) is a language with obligatory number marking, i.e. nouns can only be expressed within the category. The descriptions we had access for the other sample languages do not provide information regarding general number.

Data on optionality and the presence of zero marking suggests the existence of general number in IUR (Canada), LSM (Mexico), Libras (Brazil), NGT (Netherlands), GDS (Germany) and Auslan (Australia). In these languages, as well as in IPSL (India, Pakistan and Nepal), the general number form coincides with the singular form. The descriptions of ISL (Ireland) and ISL (Israel) do not provide information on zero marking and optionality. Therefore, we identified sign languages where number marking is optional and others where it is obligatory.

The values we found for nominal numbers include the singular, the plural and the dual. The trial and the quadral were also mentioned, but deserve to be considered separately and will be discussed later. They are instances of the iconic plural and can be replaced with the plural. According to Zeshan (2003), iconic plural refers to a specific number above one and can represent either the number of referents or the spatial arrangement of referents or both. For example: three pointing signs (indexes) in a horizontal line representing three siblings; only the number of referents is indicated, not their spatial arrangement; three pointing signs in a vertical line representing the levels of a three-story house; both number and arrangement are indicated. About IPSL (India, Pakistan, Nepal) "in principle there is no limit to how many referents can be iconically represented, but in practice most occurrences concern numbers up to about five" (p. 185).

The singular form corresponds to the form zero and, in sign languages with the general number, the singular form also covers it. Image 3 illustrates the values and the optionality/obligatory nature of the category of number in sign languages.

Image 3 – Values for the category of number in sign languages



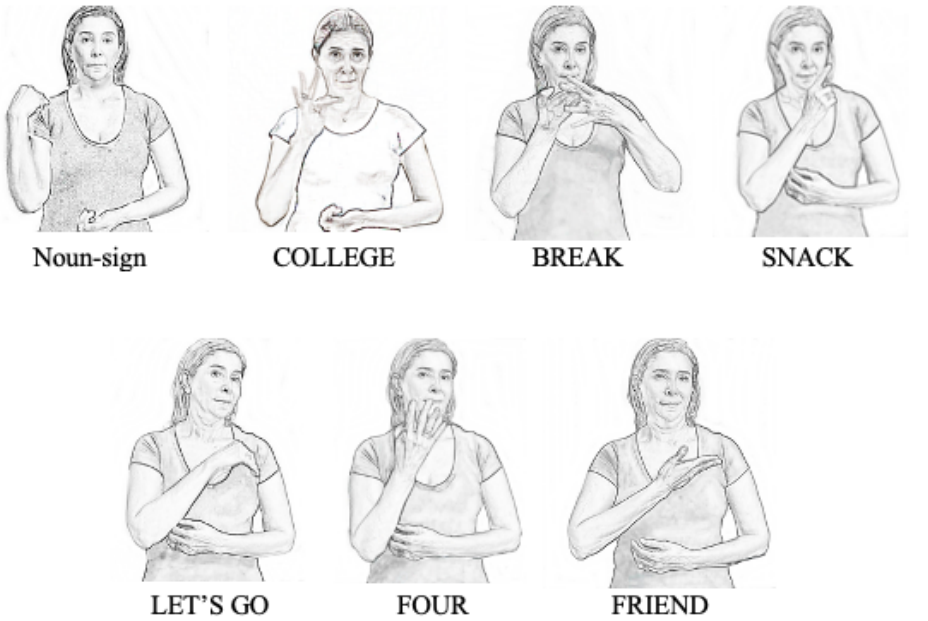
Source: prepared by the authors.

The plural is present in all sign languages and is expressed through syntactic and morphological strategies. The syntactic strategies we identified for marking the plural were the juxtaposition of nouns and (1) numerals, (2) quantifiers, and (3) descriptive verbs, and they are present in all sign languages. There are no articulatory constraints on the use of these strategies for expressing plurals. Juxtaposition of nouns and descriptive verbs[3] involves the reduplication of the (verbal) form with displacement in the sign space. We also included in this strategy the juxtaposition with pointing signs as it presents the same reduplication pattern.

[3] Different authors used different terminology for the strategy described above. We paid attention to the data presented in the descriptions, to ensure that they were the same phenomenon, and we chose to standardize the terminology. We adopt Liddell's terminology (2003): "depicting verbs, like verbs in general, encode meanings related to actions and states. What distinguishes depicting verbs from other verbs is that, in addition to their encoded meanings, these verbs also depict certain aspects of their meanings" (p. 261). Also according to the author, "depicting verbs can be divided at least three broad categories. The first consists of verbs signifying the presence of an entity at a place. Verbs in the second category signify the shape and extent of a surface or the extent of a linear arrangement of individual entities. Verbs in the third category signify movements of actions" (p. 262). Here, we refer to the first category. As it is a verbal form, according to Liddell (2003), it can refer the reader to the idea of pluracionality, which refers to the notion of plural events/actions, event/action performed by several agents, or even, event/action performed in several patients, or even a combination of these notions (CORBETT, 2000). Despite the use of the terminology "descriptive verbs", we consider this strategy as an instance of the nominal number.

In (10), the sign FRIEND in Libras (Brazil) is juxtaposed with the numeral four, which yields the plural reading.

(10) Libras (Brazil) - Juxtaposition with numeral sign (plural)



'Maria, during a break between classes in college, while having a snack, called four friends.'

Source: Miranda (2020), personal collection – adapted

In (11), the DRINK and FOOD signs in Libras (Brazil) have a plural reading and are juxtaposed with the VARIOUS quantifier sign. It illustrates a syntactic strategy for expressing the plural.

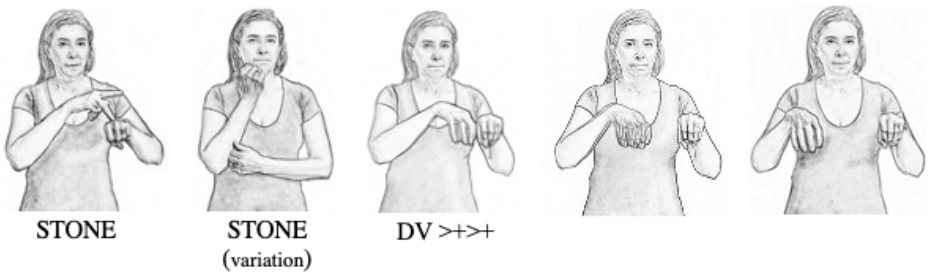
(11) Libras (Brazil) – Juxtaposition with quantifier (plural)

'(…) selling food and drinks.'

Source: Entrance Examination for the Libras Undergraduate Program – UFSC Ead (2008 Edition). Available at <http://antiga.coperve.ufsc.br/ead2008/libras/provasegabaritos.html>. Access on: Jan. 15, 2020. – adapted

In (12) and (13), the plural is expressed using the juxtaposition of noun and descriptive verbs and the juxtaposition of noun and pointing signs, respectively.

(12) Libras (Brazil) – Juxtaposition with descriptive verbs (plural)



'Stones'

Source: Entrance Examination for the Libras Undergraduate Program – UFSC Ead (2008 Edition). Available at <http://antiga.coperve.ufsc.br/ead2008/libras/provasegabaritos.html>. Access on: Jan. 15, 2020. – adapted

(13) NGT (Netherlands) - Juxtaposition with pointing signs (plural)

'Aples'

Source: Zwitserlood and Nijhof (1999, p. 70) – adapted

The morphological strategies for marking the plural are (1) reduplication with displacement, which includes alternating (re) duplication, sweeping movement and doubling, (2) reduplication without displacement, (3) mouthing and zero marking. Pointing verbs[4] also mark the plural, through a sweeping movement and reduplication with displacement. The following items illustrate reduplication with displacement and without displacement, respectively.

(14) HOUSE in ISL (Ireland) - reduplication with displacement (plural)

'houses'

Source: Leeson and Saeed (2012, p. 96) – adapted

[4] We adopt Liddell's terminology (LIDDELL, 2003), which seems to name the agreement verbs of indication verbs

(15) NGT (Netherlands) – Reduplication without displacement

'Problems.'

Source: Zwitserlood and Nijhof (1999, p. 61) – adapted

Regarding the number of repetitions, there seems to be a triplication, as mentioned by Steinbach (2012) and Zwitserlood (1999), although this number is irrelevant as a morphological manifestation[5].

The use of zero marking for expressing the plural seems to be prevalent in sign languages and suggests the presence of general number, as mentioned earlier. The plural expressed by mouthing is reported only in ESL (Estonia) (MILJAN, 2003). This strategy corresponds to two forms, originating in the nominative plural form (-d), as well as in the genitive plural form (-de) of the Estonian language, which suggests a linguistic loan of grammatical forms between modalities. This strategy is widespread in ESL (Estonia)[6].

Lexical forms for plural marking were not reported in the sample data. In ESL (Estonia) there is a sign for GROUP, a collectivity marker that also yields this meaning when juxtaposed with other signs. Table 4 illustrates the strategies for expressing plurals in the sample's sign languages.

[5] The authors do not detail in which contexts or subcategories of names, the number of repetitions would or wouldn't be relevant.

[6] Miljan (2003) reports mouthing as a strategy used for number marking, but does not present data.

Table 4 – Strategies for expressing plurals

Sign Languages / Strategies	IUR Canada	LSM Mexico	Libras Brazil	ISL Ireland	NGT Netherlands	GDS Germany	ESL Estonia	ISL Israel	IPSL India/Pakistan Nepal	Aulan Australia
Noun + Numeral	+	+	+	+	+	+	+	+	+	+
Noun + Quantifier	+	+	+	+	+	+	+	+	+	+
Noun + Descriptive Verbs	+	+	+	+	+	+	+	+	+	+
Reduplication with Displacement	+	+	+	+	+	+	+	+	+	+
Reduplication without Displacement	+	-	-	-	+	+	+	+	+	-
Mouthing	-	-	-	-	-	-	+	-	-	-
Zero	+	+	+		+	+	-		+	+
Lexical	-	-	-	-	-	-	-	-	-	-

Source: prepared by the authors.

All syntactic strategies were found in all sign languages in the sample, but not all morphological strategies. According to Haspelmath (2013), languages that use only by syntactic strategies for number marking, for example by using numerals and quantifiers, or even by inference, are considered languages with no nominal plural. This is not the case with sign languages, as all sign languages use at least one morphological strategy.

Reduplication with displacement is a strategy found in all languages. But reduplication, both with displacement and without displacement, has articulatory and syntactic constraints and seems not to be widespread as a plurality strategy, which reflects in a restricted distribution.

In general, articulatory characteristics such as body-anchored signs and repetition of signs, as well as the presence of numerals and quantifier in the noun phrase, block reduplication (STEINBACH, 2012; ZESHAN, 2013). Syntactic blocking seems to obey some principle of economy in morphological marking for plural (NEIDLE; NASH, 2012; PFAU; STEINBACH, 2005; 2012). But ESL (Estonia) has no syntactic constraints that block reduplication. In this language, reduplication can happen in the presence of numerals and quantifiers (MILJAN, 2003).

In IUR (Canada), reduplication is blocked in balanced bimanual non-body anchored signs, in addition to being blocked by the articulatory characteristics described above. However, at least one body anchored sign can be reduplicated (with displacement). This is the CHAR signal, a type of fish. Example (16) shows this sign.

(16) IUR (Canada) – body anchored sign with reduplication with displacement.

CHAR >+>+

'Chars' (kind of fish)

Source: Schuit (2013, p. 39) – adapted

In languages with no articulatory constraints, the data discussed by the authors suggest at least one prototypical characteristic. Therefore, even the reduplication with displacement that is present in all sign languages occurs only in part of the lexicon.

Zeshan (2003) presents an interesting overview of reduplication in IPSL (India, Pakistan, Nepal). Reduplication is a strategy belonging to the category of number and occurs in part of the lexicon, due to articulatory constraints. Semantic effects arising from reduplication will depend on the syntactic function of the reduplicated sign. According to the author, signs that make up the open classes are multifunctional, sometimes functioning as nouns, sometimes as verbs, even though they show a preference for one domain or another. Reduplication without displacement (iterative form) in verbs implies repeated action, and in nouns it implies several referents. Reduplication with displacement (distributive form) in verbs implies action repeated and distributed by places and, in nouns, implies several referents in various places[7].

[7] According to Corbett (2000), the notion of iteractivity is usually treated in the aspect category, which refers to how an event is executed, while the tense category refers to when an event is executed. But, the notion of iterativity can be considered by the number category as an instance of pluracionality.

In sign languages, sweeping motion yields a collective plural, while reduplication with displacement yields a distributive plural. The use of space also activates a property related to the spatial relations of the pluralized referent. Quantifiers can also be reduplicated with displacement in the sign space.

Reported strategies suggest that sign languages have an analytical preference rather than synthetic and, therefore, appear to isolate the category of number. Considering the constraints discussed by the authors, we also suggest that sign languages are guided by articulatory characteristics.

The dual value is mentioned for all sign languages and is expressed through the doubling of hands, either through the doubling of the sign itself as a morphological strategy, or through the juxtaposition of duplicated descriptive verbs as a syntactic strategy. In the ESL (Estonia), for example, dual refers to two members of the class identified by the noun and the distinction for dual can be shown by two hands, "which have a classifier handshape and stand for the number 'two'" (MILJAN, 2003, p. 206).

The presence of two manual articulators favors dual number marking. The juxtaposition of descriptive verbs, in the doubled form, marks the dual and has no constraints, whereas the doubling of lexical signs is restricted to monomanual signs, that is, it only occurs in a part of the lexicon.

Doubling in noun signs can indicate both the dual and the plural (BÖRSTELL, 2011; MILJAN, 2003; XAVIER; BARBOSA, 2015; ZESHAN, 2003). In the case of verb signs, doubling is related to actions performed by dual/plural participants, as well as to reciprocity, which also indicates dual participants (JONSHTON; SCHEMBRI, 2007; PFAU; STEINBACH, 2005a; QUADROS; KARNOPP, 2004; SANCHEZ-MENDES; XAVIER, 2017; SANCHEZ-MENDES; SEGALA; XAVIER, 2017; WILBUR, 2005; KLIMA; BELLUGI, 1979; ZESHAN, 2003).

According to Miljan (2003), if two entities are mentioned in ESL (Estonia), the dual is normally used to mark them and the dual is almost never replaced by the plural. The trial and quadral values, on the contrary, are facultative and are often replaced by the plural.

The dual can also be manifested by using a strategy called the iconic plural, which is also employed for the trial and the quadral. Although some authors call this process reduplication, this strategy deserves a brief examination.

This strategy constitutes a repetition of the singular form in the sign space, or even a localized reduplication, different from the reduplication mentioned so far, which is articulated in a non-localized way, although it also yields a spatial arrangement of the pluralized referent. The repetition of a singular form in a localized way is an instance of this iconic plural in sign languages (SCHLENKER; LAMBERTON, 2019, ZESHAN, 2003; ZWITSERLOOK; NIJHOF, 1999).

The iconic plural refers to the manifestation of non-singular values through the spatial arrangement of forms individually repeated. The number of repetitions and the distinctive pause between them can indicate a value for the category of number. In the ESL (Estonia), according to Miljan (2003), in addition to the spatial arrangement and the distinctive pause between the repetitions, there is also the eye gaze of the signer directed towards this construction.

This strategy can be used to describe the spatial arrangement of a large number of referents, which would generate a large number of values for the category. The iconic plural is therefore perhaps best understood as a direct counting. In principle, there is no limit to how many referents can be iconically represented, but according to Zeshan (2003), in IPSL (India, Pakistan and Nepal) most occurrences refer to numbers up to five.

Numeral incorporation has a very restricted distribution in the lexicon of these languages. This strategy allows for a direct quantification of the referent involved. Auslan (Australia), for example, allows the incorporation from 2 up to 12, which would be a number of values far beyond what is typologically observed for the category of number. Therefore, this strategy is also more like a direct counting than an indirect one. In IPSL (India, Pakistan and Nepal), there is considerable individual and dialectal variation across different signs as to the extent of numeral incorporation. Figure (17) illustrates the incorporation of the numeral seven in YEAR in ISL (Israel) to illustrate the large number of possible values.

(17) ISL (Israel) – numeral incorporation

YEAR

'one year'

SEVEN – YEAR

'seven years

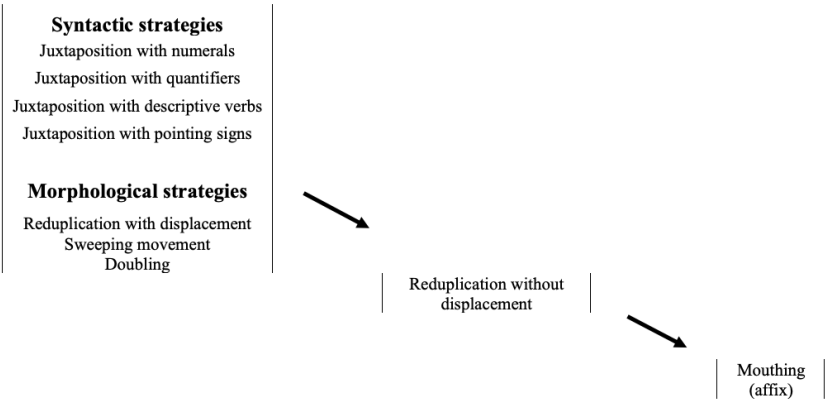
Source: Meir and Sandler (2008, p. 104) – adapted

As mentioned above, sign languages show a preference for syntactic strategies over morphological strategies for the manifestation of the category of number. Syntactic strategies are present in all sign languages, have a wide distribution and have no constraints. Morphological strategies, despite being present in all languages, are subject to distribution constraints, both in the sample languages and within the lexical repertoire of individual languages.

Reduplication with displacement, although used in all the sample's sign languages, presents articulatory constraints and a limited distribution in the lexicon of sign languages. Reduplication without displacement is not present in all languages and is also subject to articulatory constraints, as well as having a limited distribution. Furthermore, reduplication tends to be blocked by the presence of numerals and quantifiers in the noun phrase. Mouthing is considered an affixal strategy and is present in only one sign language, showing a wide distribution in ESL (Estonia).

Image 4 illustrates an implicational hierarchy of number manifestation strategies in sign languages. The diagram does not include zero marking.

Image 4 – Implicational hierarchy of number manifestation strategies in sign languages.



Source: prepared by the authors.

The implicational hierarchy indicates that syntactic strategies are considered primary and, regarding morphological strategies, mouthing (affix) is seldom used and presupposes the use of reduplication without displacement, which, in turn, presupposes reduplication with displacement.

A comparison between modalities shows that sign languages and spoken languages are typologically distinct. Sign languages favor syntactic strategies, while spoken languages favor morphological strategies.

With regard to morphological strategies, sign languages favor reduplication while spoken languages favor affixation. This may be an intrinsic effect of each modality, since in sign languages a non-concatenative morphology prevails. Another modality-related effect is the use of spatial strategies. Sign languages can yield the referent's spatial arrangement in strategies based on the use of sign space.

Spatial strategies prevail over non-spatial strategies, which also suggests an implicational hierarchy. In sign languages, the use of non-spatial strategies presupposes the use of spatial strategies for the manifestation of number.

Sample data does not provide information on the manifestation of number in mass nouns. In brief, mass nouns in LSM (Mexico) and ESL (Estonia) are coded based on their physical dimension, using descriptive verbs that express the signers' conception of the real world referent's shape and size (CRUZ-ALDRETE, 2008; MILJAN, 2003). In ISL (Israel), quantifiers tend to denote intensity when juxtaposed to mass nouns (STAVANS, 1996).

All examples of strategies, as reported in the descriptions we had access to, were based on countable referents. Therefore, in sign languages, prototypicality seems to be present at least in countable referents for the expression of number. Although the manifestation of number in mass nouns was not reported in our survey, this category of nouns can become countable and behave in such a way as to allow the use of the same strategies (WACHOMICZ, 1997; WINTER; SCHA, 2015).

From a typological perspective, considering only nouns, animacy is an important feature in determining the manifestation of number. In the case of our sample's sign languages, there is no mention of any semantic preference/constraint for the manifestation of number in nouns. Based on the examples presented by the authors, we suggest that sign languages are not subject to semantic constraints. According to the data collected, the manifestation of number occurs in discrete referents, both animate and inanimate.

Values and strategies in pronouns

According to Corbett (2000), personal pronouns are given preference over nouns in the manifestation of number. The first person pronoun would be given an even stronger preference.

The personal pronoun system of Lihir, a language spoken on Lihir Island in Papua New Guinea's New Ireland Province, presents the maximum number of values expected for the category of number. Table 5 illustrates Lihir's pronominal system

(18) Lihir Language

Table 5 - Independent Pronouns in Lihir

	singular	dual	trial	paucal	plural
1 exclusive	*yo*	*gel*	*getol*	*gehel*	*ge*
1 inclusive	-	*kito*	*kitol*	*kitahel*	*giet*
2	*wa*	*gol*	*gotol*	*gohet*	*go*
3	*e*	*dul*	*dietol*	*diehet*	*die*

Source: Ross (1988, p. 258 in COBERTT, 2010, p. 25).

The strategies for the manifestation of number in personal pronouns, in general, differ from those for the manifestation in nouns.

The first, second and third person pronouns can also have different manifestations (COBERTT, 2000; DANIEL, 2013; HASPELMATH, 2013). According to Haspelmath (2013), the manifestation of number in pronouns in (spoken) languages usually involves stem changes, differing from the manifestation in nouns, which generally involves affixation. Stem changes in nouns for the manifestation of number are rare.

The manifestation of number in sign language pronominal systems involves numeral incorporation. Changing the handshape to incorporate numerals in pronouns allows for the expression of singular, dual, trial, quadral and plural values. According to Zeshan (2003), this strategy seems to be an instance of the iconic plural. The difference would reside in its paradigmatic organization.

If we consider numeral incorporation as an instance of stem change (MASSONE; JOHNSON, 1991; MASSONE; MACHADO, 1994), the pattern of manifestation of number in pronouns in sign languages is similar to that of spoken languages (HASPELMATH, 2013). Sign languages and spoken languages can thus be considered typologically similar. Stem change can be considered an inter-modal pattern of manifestation of number in pronouns.

In ISL (Israel), according to Meir and Sandler (2008), the pronominal system shows a strong tendency to incorporate numerals, limited only by the number of fingers, so that it allows denoting from 2 to 10 referents. This would illustrate a device outside the category of number.

The dual has an articulatory characteristic distinct from other incorporated forms and the plural generally involves a sweeping movement (CORMIER, 2012; CRUZ-ALDRETE, 2008; FELIPE, 2007; STEINBACH, 2012; ZESHAN, 2003). LSM (Mexico) has a plural form, based on a handshape with five extended fingers and palm facing down in a circular movement (CRUZ-ALDRETE, 2008).

In IPSL (India, Pakistan and Nepal), both the first person pronoun and non-first person pronouns seem to be not marked for number, that is, IPSL has the general number, since the singular pointing can represent a group of referents (ZESHAN, 2003).

LSM (Mexico) and ISL (Ireland) have initialized pronominal forms, which are infrequently used. In the case of LSM (Mexico), there is a way to indicate first person with a Y-handshape touching the signer's chest, and a way to indicate second person (*usted*), with a U-handshape. The first person plural form can be performed with an "N" handshape,

in which it performs a sweeping arc movement juxtaposed with the MUCHO sign (CRUZ-ALDRETE, 2008).

In ISL (Ireland), according to Leeson and Saeed (2012), there are non-pointing initialized forms not for HE, SHE, THEY and WE, which are also infrequently used. Figure (19) illustrates these signs. The authors did not provide data for the THEY sign.

(19) ISL (Irlanda) – lexicalized forms for HE, SHE and WE.

Source: Leeson and Saeed (2012, p. 156-157) – adapted

5 Final considerations

Linguistic typology is an approach to the empirical study of human language interested in describing the structure and functioning of languages, taking into account the similarities and differences between them. One of its goals is to identify the types of systems that make up languages by comparing the various systems, surveying what varies between them and explaining the observed phenomena. For linguistic typology, sign languages present a much greater diversity than what has been established up to now, and only a systematic investigation can identify all the existing variation.

According to Palfreyman, Sagara and Zeshan (2015) and Zeshan and Palfreyman (2017), typological studies that include hundreds of sign languages are not yet possible, as is the case with spoken languages. The number of sign languages in the world is small and that of documented

sign languages is even smaller[8]. The large-scale typological studies of sign languages carried out so far have involved from 30 to 40 languages. Most studies on the topic are small scale, as in the case of this research.

In this article, we described the manifestation of the category of number in sign languages, with the aim of identifying possible organizational similarities and differences between them. We identified the values, forms and strategies available for use in the noun phrase and some intra-modal and inter-modal patterns were found.

- Some sign languages have optional number marking and others have obligatory number marking.
- In sign languages where number marking is optional, the general form coincides with the singular form, expressed by zero.
- Values of the category of number, in sign languages, are singular, plural and dual.
- Trial and quadral values can be expressed using the iconic plural, which consists of a process of repetition of the singular form in the sign space, with a distinctive and localized pause.
- Values of the category of number in nouns are expressed by syntactic and morphological strategies, with preference given to the former.
- Sign languages seem to be isolating languages in relation to the category of number, thus differing typologically from spoken languages.
- Morphological strategies in sign languages suggest an implicational hierarchy, with mouthing being a rarely used strategy and reduplication with displacement a more prevalent strategy.
- The manifestation of the category of number in sign languages seems to be phonologically driven.

[8] According to the ethnologue (https://www.ethnologue.com/subgroups/sign-language, access on: Apr. 19, 2022), the number of known sign languages would be 157. According to Glottolog (https://glottolog.org/resource/languoid/id/sign1238, access on: Apr. 19, 2022) this amount would be 210.

- Personal pronouns in sign languages have singular, dual, trial, quadral and plural values.
- Numeral incorporation (stem change) seems to be the more prevalent strategy for the manifestation of the category of number in pronouns, with sign languages and spoken languages being typologically similar in this respect.

These generalizations were based on the data to which we had access. More descriptions regarding this topic could certainly be found, as well as forms not yet reported. This is a permanent topic of the linguistic typology agenda, as this is a discipline driven by empirical investigation. In this sense, the continuing search for new data and the review of previously identified patterns are within the linguistic typology's scope. Thus, new findings lead to new generalizations.

In collecting the data, we were careful to reconsider some information obtained from secondary sources, in order to standardize the terminology on the basis of our study parameters. The term reduplication without displacement, for example, was named by some authors as recycling, simple reduplication, or no distinction was made between reduplication with and without displacement. Doubling was also referred to as repetition, chameleon hand, or even reduplication. For this reason, we paid close attention to the reported examples, which were useful to us to establish some parameters.

Terminological adaptation was also necessary for enabling comparisons between modalities, as in the case of mouthing, which was considered an affixal strategy, and articulatory constraints in sign languages, considered phonological constraints in spoken languages.

This study presents the forms and strategies reported in the literature examined regarding the category of number, but does not provide information about the contexts of use, due to the nature of the investigation. New descriptions prepared using language corpora can provide new data, mainly on structures not reported in the sample's languages.

Another research challenge was inaccuracy in the information collected. Once again, we had to rely on reported data to decide whether a certain manifestation strategy was present or not, based on the established parameters. The sources we had access to do not necessarily describe the language from a typological perspective. In some cases, strategies were mentioned without supporting data being presented.

Some generalizations presented here can serve as a basis for describing how the category of number is manifested in other individual sign languages. This study needs to be complemented by further research with data from other sign languages, thus increasing the number of languages in the sample and collecting more data on number expression in nouns, pronouns and entity classifiers.

Finally, sign languages, as they are natural languages, are fundamental for the survey and (re)consideration of structural and functional aspects of languages in general. Sign Language Typology can open new paths for our understanding of human language.

Authorship statement

Bruno Gonçalves Carneiro was responsible for drafting and writing the article proposal, data analysis and textual review. Mônica Veloso Borges was responsible for the textual outline on the number in spoken languages section, data analysis and textual review. Mirosvala Cruz Aldrete was responsible for the textual outline on the number in sign languages section, data analysis and textual review.

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