

Definiteness of Body Part Terms in Spanish and Portuguese

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1. Introduction

The uniqueness effects in definite noun phrases have been the subject of much debate (Heim 1983, Kadmon 1990, Roberts 2003, Szabó 2000). Some claim uniqueness is part of the semantics of the definite article, while others derive it pragmatically. Both sides assume that the uniqueness condition is binary, and so the only thing that matters is whether the number of equally salient candidates is one or more.

In this paper I examine the usage of the definite article with body part terms in a number of constructions in Spanish and Portuguese. I check how the cardinality of the body parts affects the choice of the article used with the body part terms. The obtained data are important for evaluation of the different theories of definiteness.

The structure of the paper is as follows. Section 2 contains the survey of the previous literature. Section 3 contains the presentation of the discussed phenomena with the Spanish data, and Section 4 is devoted to Brazilian Portuguese. The results are summarized and their importance for the theories of definiteness is explained in Section 5. Section 6 addresses the question of appraising the size of the corpus accessible to a search engine. Section 7 contains the conclusions and suggestions for further research.

2. Previous literature: Uniqueness and definiteness theories

2.1 Uniqueness and definiteness

Many analyses of the definite article involve the notion of *uniqueness*. It has been claimed that felicitous use of the definite article requires the referent of the noun phrase to be unique or uniquely identifiable (Roberts 2003, Russell 1905). According to these claims, uniqueness is part of the semantics of the definite article and its presence or absence determines a noun phrase's being definite or indefinite. In other theories it is *familiarity*, the presence of the referent within the discourse (Heim 1982), that leads to unique identifiability and using the definite article.

The definite article is usually accompanied by the *uniqueness effect*, the implication that the intended referent is unique. For example, (1) suggests that there is exactly one clown in the puzzle.

- (1) Teacher, giving directions: On the next page, you will find a puzzle. Find the clown in the puzzle. [example (3) in Roberts (2003)]

The following sentence shows that only the definite article is appropriate if the description is semantically unique:

- (2) Last weekend we climbed the/#a biggest mountain in West Virginia. [example (11) in Roberts (2003)]

The following question suggests that there was only one inventor of calculus:

- (3) Who is the inventor of calculus? [example (8) in Szabó (2000)]

* I would like to thank an anonymous reviewer for the thorough comments.

2.2 Early uniqueness theories

2.2.1 Russell (1905)

An early semantic account of uniqueness is stated in Russell (1905). According to Russell, the existence and uniqueness of the referent of a definite noun phrase are part of the truth conditions of the sentence. For example, the sentence “ x was *the* father of Charles II” asserts not only that x and Charles II were in a certain relation, but also that no individual other than x was in this relation.

Formally speaking, any phrase of the kind “the F is G ” is interpreted as “there is one and exactly one F , and this F is G .” If the existence and uniqueness condition does not hold, so that there is no F , or more than one F , then any sentence of the kind “the F is G ” is false. Therefore, both the sentence “The present king of France is bald” and the sentence “The present king of France is not bald”¹ are false.

2.2.2 Strawson (1950)

Strawson (1950) addresses Russell’s (1905) claim that existence and uniqueness of the referent are part of the assertion of the sentence containing the definite description. He agrees that in order for the sentence to be true the existence and uniqueness condition must hold. The disagreement is in the case those conditions do not hold. Discussing the sentence “The king of France is wise,” Strawson argues that the sentence is not false, but rather is neither true nor false, that is, it has no truth value. The view that existence and uniqueness are part of what the sentence *presupposes*, and not of what it asserts, has since then become the accepted view. It is worth noting that Frege (1892) also described existence and uniqueness as the presuppositions of using a definite description.

2.3 Explaining the counterexamples

There are many counterexamples to the uniqueness based theories of definiteness. Such counterexamples are felicitous sentences with definite noun phrases, in which the intended referent is not unique. The articles described in this section discuss sentences in which the definite noun phrase contains a non-unique body part term, and propose explanations for such usage. Löbner (1985) tries to save uniqueness by narrowing the domain so that the intended referent is unique in the domain. Both Ojeda (1993) and Epstein (1999) claim that the definite noun phrase does not refer directly to the non-unique object: according to Ojeda, the referent of the singular noun phrase can also be a group of individuals; for Epstein, the referring is to the *role* of the object in the frame.

2.4 Familiarity and file change semantics

Heim (1982, 1983) proposed a theory of definite and indefinite noun phrases called File Change Semantics. It is based on the notion of *familiarity* used by Christophersen (1939). The metaphor Heim uses for modeling the interpretation of the utterances is a mental file containing cards. A card contains information about a particular object. The difference between definite and indefinite noun phrases is in their relation to the cards: an indefinite noun phrase creates a new card; a definite noun phrase refers to an already existing one. These conditions are called, respectively, Novelty and Familiarity. Szabó’s (2000) formulation of these two constraints is given in (4) and (5).

- (4) Novelty: For every indefinite description, start a new card.
- (5) Familiarity: For every definite description, if there is an appropriate old card in the file, update it; otherwise start a new card.

¹ In the relevant sense; for Russell, this sentence also has the meaning “It is not the case that the present king of France is bald”, in which case it is true.

Heim does not stipulate uniqueness as a necessary condition for using a definite description. The uniqueness presuppositions are explained by the following update constraints, (again, in Szabó's formulation).

- (6) Non-redundancy: When filing an utterance, don't create redundancy.
- (7) Non-arbitrariness: When filing an utterance, don't make arbitrary choices.

The non-redundancy constraint limits the usage of the indefinite noun phrases; without this constraint indefinites would be felicitous in any case. The non-arbitrariness constraint is the one explaining the uniqueness presupposition of the definite noun phrases; indeed, in order for the choice of the card not to be arbitrary, it must be known to the hearer which card to choose; that is, the intended object must be uniquely identifiable. These constraints can be seen as a special case of Grice's (1975) conversation maxims.

Roberts (2003) adopts Heim's familiarity condition for the use of definite noun phrases. However, the familiarity she proposes is different from the usual view of familiarity, requiring the referent to be mentioned or known by the hearer. Instead, she proposes the notion of *weak familiarity*, in which the existence of the referent is required to be entailed by the context. The uniqueness effect is explained by Gricean principles (Grice 1975), similar to the way it is explained within Heim's approach.

2.5 Lyons (1999)

Lyons (1999) distinguishes between definiteness as a grammatical notion and semantic/pragmatic definiteness. Grammatical definiteness is a grammaticalization of the semantic/pragmatic definiteness, but "the correspondence between a grammatical category and the category of meaning it is based on is never one-to-one" (1999:274). This means that not all the cases of definiteness can be explained by the same semantic/pragmatic notion. This is an expected result of grammaticalization, as the newly created grammatical category can acquire new usages.

Lyons discusses whether the grammatical definiteness is a grammaticalization of *identifiability* or *uniqueness/inclusiveness*. According to the identifiability condition, the definite article signals that the hearer can identify the referent of the noun phrase (1999:5-6). It is a refining of the familiarity condition, stating that the definite article signals that the denoted entity is familiar. According to Lyons, "This view of definiteness does not altogether reject familiarity. Rather, familiarity, where it is present, is what enables the hearer to identify the referent" (1999:3).

Lyons gives two reasons in favor of identifiability (1999:278). First, the semantic/pragmatic notion of definiteness plays a role even in languages with no overt marking of definiteness. In these languages it is identifiability that matters, and not uniqueness. Second, demonstratives and personal pronouns are typically treated as definite, and this is better explained by identifiability than by uniqueness.

3. Definiteness of body part terms in Spanish

3.1 Body parts in previous literature and in this paper

Most examples in the literature include names of body parts that are either unique (*head, nose*) or dual (*hand, leg*) in the human body (Demonte 1988, Kliffer 1983). The body part terms discussed in this paper and the cardinality of the body parts they denote are listed in Table 1. They include the words *finger* and *tooth*, denoting body parts with cardinality higher than two.

Name	Cardinality
nose, head	1
hand, arm, leg, foot, eye, ear	2
finger	10
tooth	up to 32

Table 1: Body part terms discussed in this paper

3.2 Preliminary discussion: Native speakers' judgments

In this section I present the results of a preliminary examination of the articles used with body part terms in Spanish. I asked native speakers of Spanish to construct sentences with the verb *doler* 'hurt' reporting a new pain in a particular body part. This made it possible to obtain comparable data for different body parts. The results were as follows:

For unique body parts, only the definite article can be used (8). For dual body parts, the definite article is preferred (9). For fingers, both the definite and the indefinite article can be chosen (10). Interestingly, if the finger is named so that there are only two body parts with that name, the definite article is preferred (11). For teeth, the definite article suggests that the tooth that hurts was salient in some way (12).

(8) *Me duele la/*una cabeza/nariz.*

Me hurts the/a head/nose.

'My head/nose hurts.'

(9) *Me duele la/²una mano.*

Me hurts the/a hand.

'My hand hurts.'

(10) *Me duele el/un dedo.*

Me hurts the/a finger.

'My finger hurts.'

(11) *Me duele el/²un dedo índice.*

Me hurts the/a finger index.

'My index finger hurts.'

(12) *Me duele[#]el/un diente.*

Me hurts the/a tooth.

'My tooth hurts.'

3.3 Corpus experiment: Data

In order to get more precise data regarding the usage of the articles with the body part terms, I conducted a corpus search. The search was performed on the World Wide Web using the Google search engine. I chose to use the Web instead of the traditional corpora because of the difference in the corpus size. The total size of the Spanish web pages accessible to Google is to the order of magnitude of 10 billion words (see Section 6 for the description of the technique used to appraise this number). For comparison, one of the biggest Spanish corpora, www.corpusdelespanol.org, contains 100 million words, i.e., 100 times less.

I looked for the phrases of the template "*duele* 'hurts' + article + body part term" and "*se rompió* 'he/she broke' + article + body part term." Some corpus examples:

(13) Si te *duele el diente* insoportablemente, un endodoncista puede quitarte el dolor sin quitarte el diente. [<http://www.amad21.org/Documentos/Articulos/Endodoncia.html>]

'If your tooth hurts unbearably, an endodontist can remove the pain without removing the tooth.'

(14) ¿Si me *duele un diente* debo tomar sólo analgésicos?

[<http://www.geocities.com/sixtodont/sixto.htm>]

'If my tooth hurts, should I take analgesics only?'

Table 2 and Table 3 below contain the results of the corpus search. In some cases the combination “article + body part term”, e.g., *la mano* ‘the hand,’ were part of a larger uniquely identifying noun phrase, such as *la mano derecha* ‘the right hand’ or *la mano izquierda* ‘the left hand.’ In this case the definite article is obligatory. I excluded such cases from the results.

Body part	Occurrences with the indefinite article	Occurrences with the definite article	Percentage of indefinite use
<i>cabeza</i> ‘head’	1	808	0%
<i>nariz</i> ‘nose’	0	68	0%
<i>mano</i> ‘hand’	5	206	2%
<i>brazo</i> ‘arm’	6	172	3%
<i>pierna</i> ‘leg’	20	152	12%
<i>oído</i> ‘ear’	13	70	16%
<i>pie</i> ‘foot’	29	138	17%
<i>ojo</i> ‘eye’	27	112	19%
<i>dedo</i> ‘finger’	18	80	18%
<i>diente</i> ‘tooth’	47	30	61%

Table 2: Use of articles in the template “*duele* ‘hurts’ + article + body part term”

Body part	Occurrences with the indefinite article	Occurrences with the definite article	Percentage of indefinite use
<i>cabeza</i> ‘head’	1	79	1%
<i>nariz</i> ‘nose’	0	89	0%
<i>mano</i> ‘hand’	26	43	37%
<i>brazo</i> ‘arm’	103	111	48%
<i>pierna</i> ‘leg’	273	171	61%
<i>dedo</i> ‘finger’	70	37	65%
<i>diente</i> ‘tooth’	39	4	91%

Table 3: Use of articles in the template “*se rompió* ‘he/she broke’ + article + body part term”

Figure 1 shows the percentage of the indefinite article usage with each of the constructions.

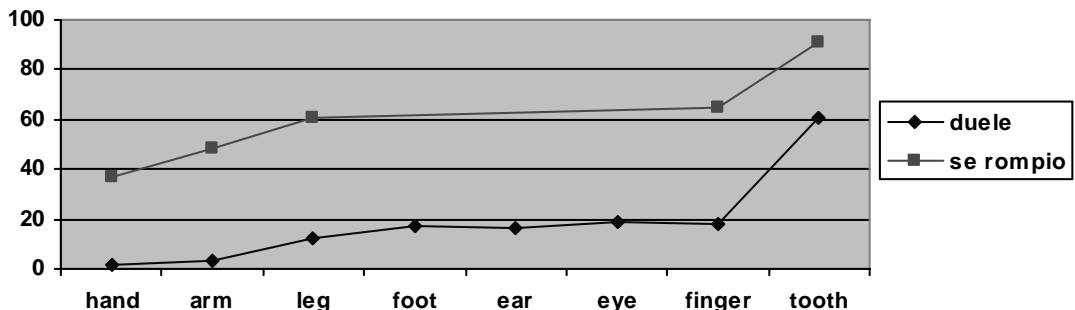


Figure 1: Percentage of indefinite article usage with body part terms in some Spanish constructions.

3.4 Corpus experiment: Discussion

The usage of the indefinite article with the *doler* construction is as follows:

1. *mano* ‘hand’ and *brazo* ‘arm’: used almost exclusively with the definite article
2. *pierna* ‘leg,’ *pie* ‘foot,’ *ojo* ‘eye,’ *oído* ‘ear,’ *dedo* ‘finger’: 10%-20% of the sentences have the indefinite article.

3. *diente* ‘tooth’: more than 50% of the sentences have the indefinite article.

In this case, the major trend in the data is due to *cardinality*: the higher the cardinality, the more frequent is the indefinite article.² However, another factor intervenes. Why are *mano* ‘hand’ and *brazo* ‘arm’ used less with the indefinite article than the other dual body parts, while *dedo* ‘finger’ has approximately the same percentage as the dual body parts?

A possible explanation would be the different *visual saliency* of the body parts. Hands, arms and fingers are close to the speaker’s view. On the other hand, feet, legs, eyes and ears are further from the speaker. Both factors affecting the article frequency in this case, cardinality and visual saliency, can be subsumed by the notion of *distinguishability*, the ability to *individuate* (Birner & Ward 1998) the intended referent from the others. The distinguishability is higher for body parts with lower cardinality and for those that are more visually salient (‘hand’ and ‘arm’ vs. the other). The higher the distinguishability, the less probable the choice of the indefinite article.

In this case, and in the other cases discussed in this paper, I checked the influence of the cardinality and the visual saliency of the body part term on the indefinite article usage. This was done by performing a linear regression analysis with SPSS. The cardinality and the visual saliency were the independent factors, and the article used in each case was the dependent variable. For Spanish, both factors have a statistically significant contribution; for a detailed description of the statistical analysis, see Section 5.1.

4. Brazilian Portuguese

The structure of the Brazilian Portuguese sentences I checked is similar to Spanish:

(15) *Me dói a/uma mão.*

Me hurts the/a hand.

‘My hand hurts.’

(16) *Quebrou o/um braço.*

Broke-3sg the/a arm.

‘He broke his arm’ or ‘She broke her arm’

The Web search results are summarized in Table 4 and Figure 2.

Body part name	Portuguese: <i>dói</i>	Portuguese: <i>quebrou</i>
<i>mão</i> ‘hand’	0% [0/21]	1% [1/97]
<i>braço</i> ‘arm’	0% [0/23]	17% [66/390]
<i>perna</i> ‘leg’	---	21% [128/592]
<i>ouvido</i> ‘ear’	0% [0/32]	---
<i>pé</i> ‘foot’	4% [1/23]	2% [6/384]
<i>olho</i> ‘eye’	0% [0/26]	---
<i>dedo</i> ‘finger’	0% [0/25]	28% [60/214]
<i>dente</i> ‘tooth’	11% [5/44]	61% [88/144]

Table 4: Percentage of indefinite article usage with body part terms in Portuguese constructions

Although the tendency is the same, namely, higher usage of the indefinite article with higher cardinality body part terms, the percentages are much lower than in Spanish. It is possible that in the Portuguese construction the definite article is becoming grammaticalized.

² After this paper was completed, it came to my attention that a similar observation was made, for English, in Birner (1988). Her discussion is based on acceptability judgments and does not involve quantitative data.

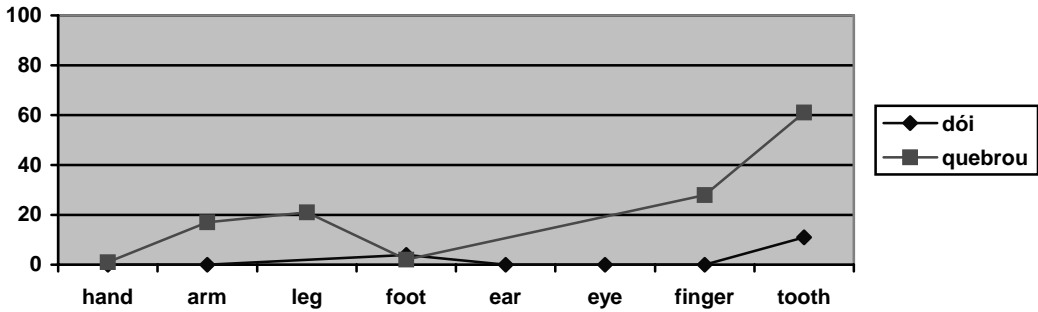


Figure 2: Percentage of indefinite article usage with body part terms in Portuguese constructions

5. The results and their theoretical implications

5.1 Statistics

The statistical method I used in order to check the correlation of the body part cardinality and visual saliency with the choice of the article was linear regression analysis, performed with the SPSS package. The independent factors were the cardinality and the visual saliency of the body part. The article chosen in every particular sentence was the dependent variable. Table 5 below contains an example of the data in the SPSS representation.

body part name	body part id	cardinality	visual saliency	article_id	n
hand	1	2	1	0	206
hand	1	2	1	1	5
arm	2	2	1	0	172
arm	2	2	1	1	6
leg	3	2	0	0	152
leg	3	2	0	1	20
foot	4	2	0	0	138
foot	4	2	0	1	29
finger	5	10	1	0	80
finger	5	10	1	1	18
tooth	6	32	0	0	30
tooth	6	32	0	1	47

Table 5: Representing the data in SPSS. article_id: 0 = definite, 1 = indefinite; n = the number of sentences found in the corpus

In all the cases discussed in the previous sections, the cardinality of a body part was shown to be a statistically significant regressor for the indefinite article frequency. Visual saliency was statistically significant in most cases. In this section I would like to address the following question: to what extent is the difference between the frequencies explained by these factors?

I checked the contribution of the various factors in terms of variance. First, I calculated the variance in the data between the different body parts using the ANOVA procedure. Then, I checked how much of this variance is explained in terms of the difference in the regressors. The variance explained by the regressors is given by SPSS as part of the linear regression analysis. The results are in Table 6.

Case	Variance explained by cardinality (percentage)	Residual variance explained by visual saliency (percentage out of total)
Spanish “duele”	79%	18%
Spanish “se rompió”	54%	32%
Portuguese “dói”	85%	-
Portuguese “quebrou”	73%	-

Table 6: The importance of the regressors in terms of variance

It can be seen from the table that the difference in cardinality accounts for most of the variance in all the cases. On the other hand, the factor of visual saliency is relatively important only for Spanish, but not for Portuguese.

5.2 Results: The factors that influence the choice of the article

The results obtained for Spanish and Portuguese were mostly similar. For unique body parts, only the definite determiner is allowed. For non-unique body parts, there is variation between the definite and the indefinite determiner. *Cardinality* was shown to have a statistically significant correlation with the percentage of the indefinite article usage. *Visual saliency* was shown statistically significant in most cases, although its impact was comparable to that of cardinality only for the Spanish examples. Some of the data is shown in the combined graph in Figure 3.

The combination of various factors governing the choice of the article results in *gradual changes* between preferring the definite article and preferring the indefinite one. This supports the view that the conditions for article use are not absolute. The choice of the article is affected by the *distinguishability* of the body part, affected by its cardinality and visual saliency (see Section 3.4). The higher the distinguishability, the less probable the choice of the indefinite article.

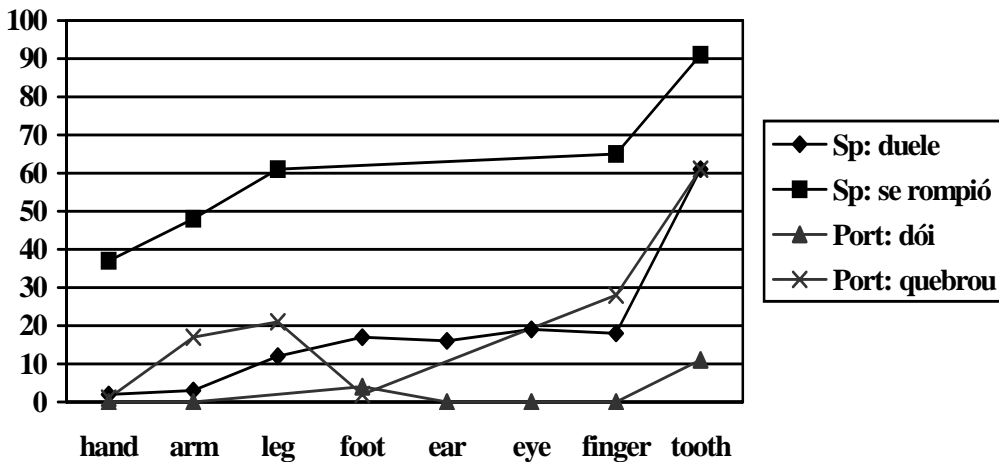


Figure 3: Percentage of indefinite article usage in different languages

5.3 Asymmetry between the articles

Another interesting result is the asymmetry between the uniqueness effect of the definite and the indefinite article. Unique body parts can only be used with the definite article; the indefinite article is not allowed. Non-unique body parts can usually be used with either of the articles. A possible explanation is that the indefinite article has the implication of choice, of the necessity of choosing the intended referent from the set of candidates. It is therefore not acceptable with the unique body part

terms. The higher indefinite usage with the higher cardinality body parts can be explained by the more prominent necessity of the choice in these cases.

It seems in the cases discussed here that the definite article is the unmarked choice, and the indefinite article is the marked one. In a similar case, Du Bois (1980:232) claims that in (17) using the indefinite article would be “unnecessary precision,” that is, giving more information than necessary.

(17) The boy scribbled on the/a living-room wall.

Indeed, when used with a body part term, the indefinite article conveys more information about the body part cardinality, since the definite article can be used with all the body part terms, and the indefinite one only with the non-unique ones. In definite-only constructions the marked choice is not possible at all, and the additional information is not given in any case.

5.4 Relevance to uniqueness theories

The results described above show that theories requiring every definite noun phrase to be unique (Kadmon 1990, Russell 1905) cannot properly account for the data. This, however, was already shown by the counterexamples given in the previous literature. The main difference between the results in this paper and the other counterexamples is in showing that the uniqueness effect does exist, but the transition from the definite to indefinite usage is gradual.

The results also constitute evidence against the explanations of Ojeda (1993) and Epstein (1999). Those analyses claim that the body part noun phrase does not refer to a particular body part token, but rather to the uniquely identifiable body part *group* (Ojeda 1993), or *role* (Epstein 1999). Therefore, the use of the definite article is sanctioned in any reference to a body part. The difference between the usages with different body parts is not predicted by these theories.

The results can be better accounted for within the familiarity-based theories in which uniqueness is a by-product explained by Gricean principles (Heim 1982, Roberts 2003, Szabó 2000). The usage of the indefinite for non-unique reference is explained by *non-arbitrariness*, the need to avoid the mistake in the choice of the appropriate referent required when the definite description is used. If this is taken as a gradual measure, the indefinite article should be used more frequently in the cases in which the probability of misidentification is higher. These are indeed the results I obtained: the indefinite article is more frequent with less *distinguishable* body parts, which would more likely lead to misidentification if used with the definite article.³

The results also raise a methodological issue: theories about article use should be concerned with both the definite and the indefinite article, if they are present in the language. Papers about uniqueness (Kadmon 1990, Roberts 2003) typically discuss only the definite article. Some papers (Gundel et al. 1993) seem to assume the indefinite article can always be used, if syntactically possible. In our case, such an approach would miss the difference between the unique body part terms, for which the definite article is the only option, and the dual body part terms, allowing the indefinite one. In order to fully account for the facts, conditions governing the use of both articles should be examined.

6. Web as a corpus

A standard corpus usually allows the user to know the number of the words a corpus contains. This is not the case with using a Web search engine. Kilgarriff and Grefenstette (2003:section 3) describe a technique introduced and tested by Grefenstette and Nioche (2000) to find the total size (in words) of text in a particular language accessible via a search engine. A small corpus whose size is known is required. The technique is as follows:

³ See Chen (2004:note 5) for another demonstration of gradual changes of *distinguishability*.

Let C_1, C_2 be two corpora, and w_i a frequent word. If the corpora are similar, we assume, that

$$\frac{\textit{tokens}(w_i, C_1)}{\textit{size}(C_1)} \approx \frac{\textit{tokens}(w_i, C_2)}{\textit{size}(C_2)}$$

$\textit{tokens}(w_i, C_j)$ is the number of occurrences of the word w_i in corpus C_j .

If $\textit{size}(C_2)$ is unknown, it can be estimated as

$$\textit{size}(C_2) \approx \frac{\textit{tokens}(w_i, C_2) \cdot \textit{size}(C_1)}{\textit{tokens}(w_i, C_1)}$$

As noticed in (Kilgarriff & Grefenstette 2003:note 7), currently the search engines do not give the *number of occurrences* of a word, but rather the *number of documents* containing the word. Using this number, while using the number of occurrences for the calibrating corpus C_1 , leads to an underestimation of the size of C_2 .

Kilgarriff and Grefenstette' (2003) estimation of the size of the web in March 2001 for the 10 languages with the highest estimated web size is given in Table 7. Kilgarriff and Grefenstette checked a total of 30 Latin-script languages. Languages with a non-Latin script were not examined.

Language	Web Size (millions of words)
English	76,600
German	7,040
French	3,840
Spanish	2,660
Italian	1,850
Portuguese	1,330
Dutch	1,063
Swedish	1,000
Norwegian	610
Czech	520

Table 7: Kilgarriff and Grefenstette's (2003) Web size estimate, March 2001

Using the method described above, I estimated the size of the Spanish web to be about 10 billion words, and the approximation for Portuguese is about the same. Assuming a similar web growth, the numbers in Table 7 should be multiplied by 4 to obtain a current picture. In 2001, when the size of Spanish and Portuguese corpus was approximately 2.5 billion words, results discussed in this paper could not have been obtained for these languages. The size of the web corpus limits the languages for which significant results can be obtained at a given time. As the web grows, the number of such languages will grow as well.

7. Further research

The data on article usage with body part terms give rise to the following question: to what extent are the results due to the actual properties of the body part, and to what extent do they reflect the conventional image of it? This could be checked by an experiment in which speakers are shown pictures with creatures having a non-conventional number of body parts, such as multiple heads and arms. The speakers then would have to write, or to complete, sentences involving the relevant body

part. It would be interesting to see if the actual number of body parts in the picture will affect article usage frequencies.

Apart from cardinality, another factor that might potentially influence the identifiability is the similarity between the possible candidates. For example, if all the candidates look similar, the intended one is harder to identify than if it looks different. One way to check the influence of the similarity between candidates could be to make a production experiment in a number of settings that would differ in the level of saliency of the intended referent and to see if gradual changes in the frequency of article use will be obtained.

For Spanish I collected judgments of a small number of native speakers on some examples taken from the corpora. In order to check whether speakers indeed do not see any difference between the sentences with the definite and the indefinite article, a full completion study can be run, in which the subjects are shown sentences with the article taken out and then asked to fill in the appropriate article.

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