



FACULDADE DE FILOLOXÍA
Departamento de Filoloxía Inglesa e Alemá

THE SYNTAX-SEMANTICS INTERFACE IN THE PRODUCTION OF NUMBER AGREEMENT: A CROSSLINGUISTIC PERSPECTIVE

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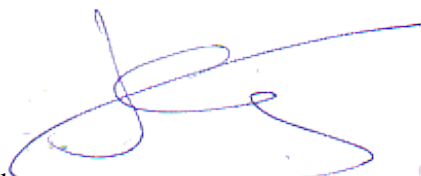




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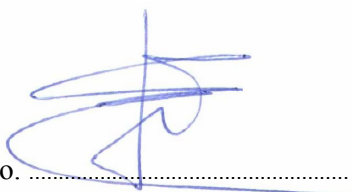
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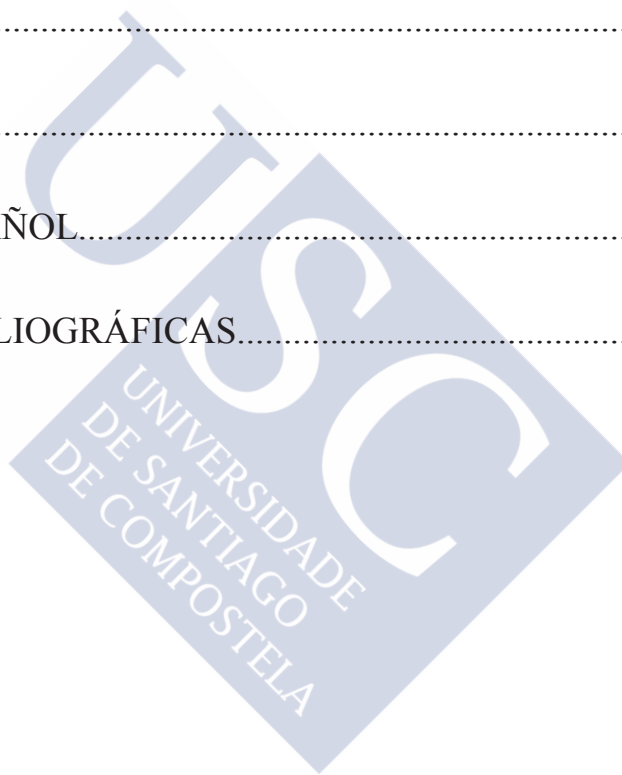
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INTRODUCTION

Talking is an apparently effortless activity, one which at times we are even able to perform unconsciously. However, little is known about how this mental process occurs and what the mechanisms are which allow us to develop this ability. This topic has been dealt with from many different perspectives over many years, but no consensus as to what the exact nature of language is has ever been reached. Perhaps the easiest way of finding out what the mechanisms intrinsic to the production and comprehension of language are will be by trying to answer questions related to lower-level language processes. This is the starting point for many researchers in the field and for this reason we have chosen the study of the linguistic phenomenon of *agreement* as a way to delve into a particular process that can help us understand how more complex linguistic processes take place. In our opinion, agreement can offer many clues as to how the mapping from thought to language works. This phenomenon is a recurring tool in about 70% of the world's languages, and might therefore shed some light on general language processes. Agreement is, however, also a very complex phenomenon whose functioning is very difficult to describe, which accounts for the fact that no definition of the term has ever been accepted. This complexity about the nature of agreement was noticed by Anderson (1992: 103), whose words perfectly summarise the problem:

Agreement is a quite intuitive notion which is nonetheless surprisingly difficult to delimit with precision.

The problem with agreement is basically about dealing with its main sources of information. Whether it is simply a syntactic phenomenon or one that extensively depends on meaning constitutes the main point of controversy. Starting by how grammars have dealt with this problem, Quirk, Greenbaum, Leech & Svartvik (1985: 755) affirmed that agreement is:

[...] the relationship between two grammatical units such that one of them displays a particular feature (e.g. plurality) that accords with a displayed (or semantically implicit) feature in the other.

Implicit in this definition is the fact that there are two types of agreement. The first one is agreement based on syntactic concord and the second one is based on semantic parameters (as the “or semantically implicit” parenthesis indicate in Quirk et al.’s quotation). As pointed out, it is precisely this dichotomy between form and meaning as the primary sources of agreement that makes it a quite difficult concept to define. This problem was tackled by many other authors in the literature. Steele (1978: 610), for instance, wrote:

The term agreement commonly refers to some systematic covariance between a semantic or formal property of one element and a formal property of another.

Corbett (2006: 3), and also Eberhard, Cutting & Bock (2005), pointed to a similar problem when they tried to provide a suitable definition for agreement. For the former, agreement is mainly in between morphology and syntax:

Agreement is arguably the major interface problem between morphology and syntax, and hence appears particularly difficult when viewed from the heartland of either component.

Since agreement is apparently a complex issue (as it seems to depend on syntax, morphology and semantics), different approaches to the topic had to be taken. It is mainly through the analysis of errors that numerous models that describe agreement processing have been created, especially in recent years. Errors normally reflect broader mental operations, and thus general processes can be disentangled by paying attention to failures in agreement operations.

The disciplines of linguistics and psycholinguistics have tried to tackle the topic of agreement from different perspectives. Each and every model (either from a linguistic or a psycholinguistic perspective) reflects the intricacy of this linguistic process. To our knowledge, the first explicit model of agreement was proposed by generative grammarians. They regard agreement as a copy-percolation operation which runs exclusively along syntactic lines (Chomsky, 1981; Gazdar, Klein, Pullum & Sag, 1985). The autonomy of syntax postulated by generativists was therefore also applied to operations such as agreement. The rival view maintains that all features (gender, number, person, etc.) actually originate where they are spelled out in the surface structure of the sentence and later become merged in a process known as *unification* (De Smedt, 1990; Shieber, 1986). Thus, agreement is not a matter of copying in unification accounts, but of checking features and putting them in place whenever they coincide. Latterly, psycholinguistic theories based exclusively on the supremacy of semantic information have been developed. They are based on various studies that paid precise attention to errors founded on semantic causes. This is the case in Eberhard's (1999) study on distributivity, for example, which is based on a model which relies primarily on semantic information. Also, hybrid models which contemplated the possibility of both formal and semantic operations taking place at different moments in processing were published in the literature. We are referring to models like *Marking and Morphing* (Bock, Eberhard, Cutting, Meyers & Schriefers, 2001), for instance. According to this theory, agreement passes from a marking stage in which the conceptual representation of the sentence is established, to a marking phase, which is eminently syntactic and consists of providing the sentence components with their corresponding agreement features in order to give them their right morphological shape. Thus, the Marking and Morphing (M&M) account still bears a certain degree of encapsulation in its approach to the topic, although conceptual interference is also contemplated. However, the theory of *Maximal Input* (Vigliocco & Franck, 2001; Vigliocco & Hartsuiker, 2002) as well as the *Constraint Satisfaction* models (MacDonald, Pearlmutter & Seidenberg, 1994) and the *Competition* model of Bates & McWhinney, 1989, seem to suggest that non-

syntactic factors are able to influence agreement processes at all levels, so grammatical encoding can easily be affected by conceptual representations (and even by phonological information) if that causes a processing advantage for the processor. That is, they believe in a type of processor that takes into account all the available information from both conceptual structures and other sources such as phonology, and that is able to incorporate them during all phases of processing. Thus, no traces of encapsulation are found in these models. Alternative views have completed the set of theoretical models on agreement. One such case is Solomon & Pearlmuter's (2004) theory of *Semantic Integration* (later on extended through Gillespie & Pearlmuter's *Scope of Planning* account), that posits that the more semantically integrated two nouns are in a complex subject, the more likely it will be to process them under the same scope of planning and therefore to let their two numbers interfere in processing. According to these two accounts, the retrieval cues of nouns can be easily misled if those two nouns are under the same scope of planning (that is, if they are processed in the same time unit) and the semantic integration of two nouns within a sentence increases this possibility. In a similar vein are models based on memory, such as Badecker & Kuminiak's (2007) *Working Memory Retrieval* model, for instance. It states that subjects bear feature indices that allow them to be quickly identified as subjects (being in the nominative case, occurring pre-verbally, etc.). Therefore, whenever a noun sharing any of these subject features occurs in a position close to the verb, these retrieval cues are likely to misguide the parser, therefore causing failures in the system. Thus, if in a complex subject phrase we encounter a head noun close to a local noun and those two nouns have different number marks, the processor would be prone to experience a certain level of confusion, since both nouns would retrieve the same subject characteristics and they do not share the same number specification.

It is worth noticing the fact that some of the above described models (that will be thoroughly explained in chapter 3) have been designed via the observation of experimental data acquired through experiments of various kinds. Experimental evidence has allowed researchers to observe the data and establish conclusions about the functioning of the

language processor in light of the results obtained. Many are the methodologies employed in the literature; from completion tests in which the responses provided by the participants are analysed on the part of the researcher, to more complex ways of gathering data with the help of technological support. In the field of psycholinguistics, Evoked-Response Potentials (ERPs) and eye tracking techniques, for instance, have been widely used in recent decades and have gained experimental reliability (see for instance: Friederici, 2002; Kutas & Federmeier, 2009, and Schmitt, Lamers & Münte, 2002 for ERPs, and Clifton, Staub & Rayner, 2007 for eye-tracking techniques). Also databases are of special help when designing experiments. In databases we can find, for instance, important data about the levels of concreteness, animacy, emotionality, number of syllables, and other semantic/phonological variables that could be of special value for research. Comparative studies can also shed light on the topic of agreement. Languages have evolved in different manners throughout time and for this reason they have developed different defining characteristics. For instance, Romance languages are characterised by rich morphological systems and a quite flexible syntactic order (subjects can appear post-verbally, etc). On the other hand, a language such as English, for instance, is particularly rigid as regards syntactic flexibility and possesses a scarce amount of morphology. Comparing such different languages can lead us to important conclusions. For instance, semantic penetrability during agreement can be dependent on the degree of morphological richness shown by a language. This issue will be dealt with in this thesis at several points, since, as has been noted, we find contrastive analyses of special relevance for the study of language processing.

As an outline of this thesis, firstly we will start with the basis of this phenomenon, so we will deal with the grammar of agreement by making a revision of some of the most important information about it contained in grammars (chapter 1) while giving a theoretical perspective on the topic by explaining the main theoretical trends which are proposed in the linguistics literature. In chapter 2, we will present a study in which certain structures (that according to grammars are quite controversial) will be tested. The crosslinguistic perspective that we intend to maintain throughout this work will

also be present in the study found in chapter 2. Chapter 3 will have a more theoretical character. The main theoretical trends about agreement processing in psycholinguistics will be explained and, in some cases, refuted. The aim of chapter 4 will be that of offering experimental evidence as regards the syntax-semantics interface problem in agreement computation. In particular, we will try to provide experimental evidence for whether or not the “emotionality variable” is able to influence an a priori purely syntactic process like agreement. Again, we will try to offer a comparative perspective in our research for reasons previously mentioned. Therefore, our investigation will be developed in two structurally different languages, namely Spanish and English. Finally, chapter 5 will be devoted to finding out if any influence of the semantic variable “concreteness” (or “palpability”) can exist in the resolution of number agreement operations. We will take as a starting point Bock & Miller’s (1991) paper, in which they discarded any possibility of concreteness having an effect on agreement. This hypothesis will be refuted by providing new data concerning the aforementioned semantic variable. Finally, this dissertation has a section containing general discussion and some suggestions for further research. This section will include all the additional research questions which emerged after conducting and analysing all the experimental work which is presented in this thesis.

Chapter 1.

AGREEMENT IN LINGUISTICS

1. INTRODUCTION

The aim of this chapter will be to provide a general idea of agreement from both a theoretical and a grammatical perspective. We are going to focus on those views given by both Generative Grammar and opposing lexicalist approaches, while observing in what sense traditional grammars (as that of Huddleston & Pullum, 2002; Quirk et al., 1985, etc.) contributed to the topic. The linguistic forces that are responsible for the final agreement resolution in particular structures will be delimited and discussed in later sections of this chapter.

2. THE POINT OF VIEW OF GENERATIVE GRAMMAR

As pointed out in the introduction, one of the first theories put forward with regard to the phenomenon of agreement was that postulated in Chomsky's Generative Grammar. According to generative grammarians (Chomsky, 1995, and the more recent Minimalism (Chomsky, 1998, 1999 and 2001)) agreement is an automatic, syntactic and encapsulated operation that starts in an element of the sentence named the "controller", which copies its features onto a recipient called the "target". This operation takes place within a certain domain or "syntactic scenario", and it obeys a marked directionality. We provide below a more thoroughgoing explanation of such theories as well as a description of previously mentioned elements found in some linguistic systems of the world.

2.1. Elements of agreement

As said, some of the most traditional literature on agreement has pointed to the fact that there exist four main elements which are present in every agreement operation. These are: *controllers*, *targets*, *features* and *domains* (Corbett, 2006: 4). Agreement was considered as a copy-percolation process which always goes in the same direction: from controllers to targets. As evidenced, this is a purely syntactocentric and unidirectional view which posits that the number/gender/person information contained in a sentence's head percolates through the structure and is finally copied in the target, all of this regardless of other types of information to which the agreement system seems not to be sensitive (namely semantics, contextual information, phonology, etc).

2.1.1. Controllers

Controllers represent the starting point for agreement according to the above mentioned view. In *Mary plays the piano*, *Mary* is the controller, as it imposes its features (third person and singular) on the verb. We normally match this function with nouns, but it is true that many other types of words can develop the role of controllers. According to Corbett's (2006: 35ff.) classification, in the world's languages there exist the types of controllers which we describe in the sections which follow.


2.1.1.1. Nominal controllers

These are the commonest type since according to formalist premises, within the phrase domain it is usually the noun which acts as a controller, as in:

(1)	<u>This</u>	<u>boy</u>
	Target	Controller
	Dtve.	Noun
	(SG)	(SG)
	↑	

Feature: number
Domain: noun phrase


The most frequent controller beyond the phrase domain is the noun phrase (which may be constructed around a noun, pronoun, or other element):

- (2) This boy is my sister's boyfriend
- | | |
|------------------------|------------------------|
| Controller | Target |
| NP | Verb |
| 3 rd p. Sg. | 3 rd p. Sg. |
- 

Features: number and person
Domain: clause


2.1.1.2. Defective controllers

Within this category we have for example clauses and infinitive phrases:

- (3) [That he came so early] was very surprising
- | | |
|------------------------|------------------------|
| Controller | Target |
| Clause | Verb |
| 3 rd p. Sg. | 3 rd p. Sg. |
- 

Features: number and person
Domain: clause

In the previous example, it is the whole clause which imposes its person and number features on the verb, so the entire clause plays the role of the controller. In the following clause, an infinitive phrase establishes an agreement relation with the verb based on the same features:

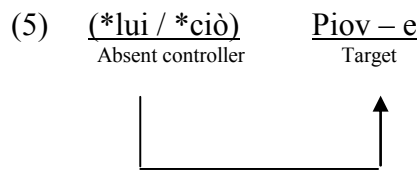
- (4) [To err] is human
- | | |
|------------------------|------------------------|
| Controller | Target |
| Inf. Phr. | Verb |
| 3 rd p. Sg. | 3 rd p. Sg. |
- 

Features: number and person
Domain: clause

2.1.1.3 Absent controllers

Sometimes, there is no explicit controller. This is the case of the so-called “weather” verbs (*to rain, to snow...*), for instance. In languages like Italian or Spanish, these verbs show morphological marks that indicate that there is agreement. However, there is not an overt controller, that is, the controller is absent:

[Italian]

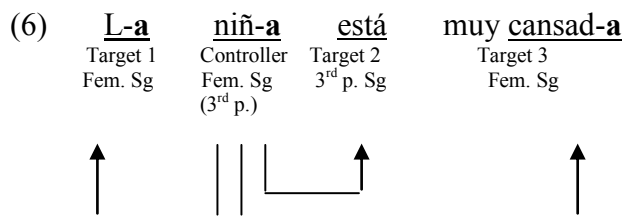


[(It / that) Rain-3SG]

Although these are the most frequent kinds of controllers, they are not the only possible ones. In some languages words like numerals, possessive adjectives or even qualitative adjectives may function as controllers. It all happens in accordance with the particular characteristics of each language and depends on how a certain language prefers to establish cohesive connections between different parts of the sentence.

Finally, it is worth mentioning the fact that the same controller may have more than one target. When this is the case, each target may share different features with the controller. This is illustrated in example (6):

[Spanish]



[The-FEM SG girl-FEM SG is-3rd p. SG very tired-FEM SG]

2.1.2.3. Articles and demonstratives

Articles are possible targets within the noun phrase. In Spanish, for instance, the article must agree with the head noun (in the noun phrase). Thus, Spanish has eight forms of the article; four definite (*el*: masculine singular; *la*: feminine singular; *los*: masculine plural; *las*: feminine plural) and another four indefinite (*un*: masculine singular; *una*: feminine singular; *unos*: masculine plural and *unas*: feminine plural). All of them must show number and gender agreement within the phrase. Other Romance languages such as French or Italian have analogous systems.

Demonstratives show a similar behaviour to that of articles. In Spanish, for example, there are three types of demonstratives, each class denoting different levels of proximity between the speaker and the referent. All these demonstratives change their morphological form according to number and gender (*este, estos, esta, estas // ese, esos, esa, esas // aquel, aquellos, aquella, aquellas*). Conversely, the English system for demonstratives only reflects changes in number and only shows two levels of proximity (*this, these // that, those*). Thus, crosslinguistic differences are quite noticeable in the system of demonstratives.

2.1.2.4. Other possible targets

By analysing different languages, we can identify other types of targets. Pronouns may be targets in a language such as Russian (Zemskaja and Kapanadze, 1978: 245). Also adverbs, complementisers or coordinating conjunctions may behave as such in some of the world's languages. Even nouns may agree with other nouns. In Bagwalal, a language of the Andi group, we may find a possessor agreeing with the possessed thing, that is, a noun agreeing with another noun (Kibrik, Kazenin, Ljutikova & Tatevosov, 2001: 139f). Quite remarkable is the case of Celtic languages, where even prepositions can be marked for agreement (Corbett, 2006: 43).

As can be seen, different word classes may be either controllers or targets in different languages of the world. This variation is subject to the particularities of each language.

2.1.3. Features

Features indicate in what respect there is agreement. Gender, number and person are the features which are most frequently present in the world's languages. These have been named "phi-features" by Chomsky in Government and Binding (GB) and Minimalism (Chomsky, 1981: 330). Nevertheless, there are other features of agreement such as case, tense, aspect, mood, etc., which are part of the system in a smaller number of languages. We are going to start by explaining some characteristics of gender, number and person and then move progressively into less frequent or even more controversial types of features.

2.1.3.1. Gender

Gender is mainly reflected in the adjectives that acquire the noun's gender marks. Normally, a native speaker of a language has to learn the gender of every noun in order to be able to make the appropriate agreement ties. Gender is hence a lexical feature for the majority of languages, since its value has to be available in the lexicon.

A gender assignment system refers to the parameters used to assign nouns to a particular gender class (Corbett, 2006: 126). There are two ways of assigning nouns to gender: using either semantic or formal information. Consequently, there exist semantic and formal systems of agreement.

Semantic systems: These are systems in which nouns are assigned to a gender class following a purely semantic criteria. There are two subclasses:

"Strict semantic systems" or "natural gender systems": one can know the gender of a noun by knowing its sex. In these systems, male humans belong to the masculine gender, female humans are of the feminine gender, while all other words belong to the neuter category. Therefore, by knowing the sex of the referent, a speaker can assign it to one of these three gender classes. English has a gender system based on semantic criteria, but

it is a pronominal gender system, since it is reflected only in personal, possessive and reflexive pronouns.

“Predominantly semantic systems”: in languages that follow this system, each sex does not have an independent gender class. Corbett (1991: 13) uses the example of Kolami, a language spoken in some states of India, in order to explain the functioning of languages possessing such systems. In the Dravidian language Kolami, for example, there is a semantic assignment rule stating that nouns denoting male humans belong to the masculine gender. The remaining nouns, the semantic residue, make up the other gender. This second rule is analogous to an “elsewhere condition”. Thus, nouns denoting feminine entities are not of feminine gender since they belong to the “elsewhere condition”, that is, to the class of that which is not masculine.

Formal systems: the noun’s form is responsible for gender. Semantic criteria are not sufficient to classify all words. Consequently, the majority of them fall into a phonological or a morphological classification. Spanish has a formal system of this kind. Words ending in *-a* tend to be feminine and words ending in *-o* are usually masculine. There are however, a number of exceptions to this rule: for instance, *mano* ends in *-o* but is feminine and *mapa* ends in *-a* but is masculine (“hand” and “map” respectively). This inconsistency of the rule coexists with opaque endings such as *páis* (“country”), where there is no gender cue at all. It is worth pointing to the fact that in this language there is hardly any inconsistency in the determiner system, though, and this is important because all referential NPs carry determiners in this language (Franck, Vigliocco, Antón Méndez, Collina & Frauenfelder, 2008). However, these exceptions are few, and there are indeed clear rules for other affixes, for example; suffixes such as *-ción* are feminine, so when a new word ending in *-ción* is introduced into the vocabulary (for instance a borrowing), it will acquire feminine gender (e.g. *civilización*-FEM). Thus, most of the time, a speaker of Spanish may deduce a word’s gender by looking at its form. Nonetheless, the semantic

criteria also function for animate beings, that is, more often than not, male animates are assigned a masculine gender and female animates a feminine gender (with the exception of some animals' names). Thus, as Corbett (1999: 307) notes:

[...] even in the systems nearest to the formal end of the spectrum there is a considerable overlap with semantic criteria and, when the two are in conflict, it is typically the semantic criterion which dominates. Hence formal assignment systems are really semantic plus formal systems.

In conclusion, words may be assigned to a particular gender class by following either semantic criteria or a combination of formal and semantic criteria.

2.1.3.2. Number

Number is a feature strongly based on meaning. The singular usually denotes one entity whereas the plural denotes more than one. However, number is not just an opposition of singular versus plural in all the languages of the world. Some languages have another value, the "dual" (see Humboldt, 1830 and Plank, 1989 for examples and references), which stands for two real world entities. Some others have a "trial" for three, or a "paucal" for a small number of entities (usually more than two and less than seven, although the number expressed by the paucal varies according to context). Languages may range from having these five values within their number systems, to no number marking at all. In the case of English, it has just the singular and the plural. The other values (dual, trial and paucal) are not present in any word of this language. Hence English expresses the meanings of "two entities", "three entities" or "a few entities" by ways different from number marking, for instance with the quantifier "a few" instead of the paucal. Another interesting fact that shows how variable language systems are, is that in languages with more than one number value, not all words must necessarily show number marking. This is the case in English, for instance. Although English nouns regularly have a singular and a plural form, words like *honesty*, for example, cannot show plural marking. Nouns

similar to that are called “singulare tantum” as they just have a singular form. “Plurale tantum”, that is, words that have only plural marking (e.g. *scissors*) are also present in English (as in the vocabulary of many other languages, Corbett, 2000: 173). So as a general rule, in English the plural is signalled (on nouns) by adding an ending (normally *-s* or *-es*) while the singular is signalled by the absence of such a marker (Corbett, 2000: 4). However, as noted, this rule is not applicable to all words.

As in the case of English, the usual way of marking number in many languages is via the addition of a morphological ending. However, Corbett (2000: 146ff.) explains that there are other ways of marking the plural too:

Prosodic differences: even alternations in the prosody of words may be the only markers of number. Whether the stress is placed on the root or on the inflection indicates different number in some languages such as Russian.

Alternations: Macedonian is an example of a language that marks number with alternations within the stem. In this language, the plural is formed by the addition of *-i* to the stem. E.g. *koren* (root), plural *koreni* (roots). However, nouns ending in *-k*, *-g* or *-x* change to */c/ /z/* or */s/* respectively. Thus for example, singular *učenik* (pupil) has *učenici* (pupils) as plural. (Friedman, 1993: 258). So number marking depends in these cases on the morphological environment.

Augments: there may be augments in the singular, the plural or both. For example, a word such as *bolgar-in* (Bulgarian) in Russian has the ending *-in* for the singular, while the plural is marked by adding a different suffix *-y* (*bolgar-y*: Bulgarians). Thus, both forms have augments, not only the plural as in English (see Kibrik, 1991).

Reduplication: it consists in repeating some part of the lexical item, normally the stem or part of it. Corbett (2000: 149 -table 5.8-) provides some examples of reduplication in Ilocano, a language spoken in some parts of the Philippines:

Singular	Plural	Gloss
Kaldín	kal- kaldín	goat(s)
Púsa	pus-púsa	cat(s)
Kláse	klas-kláse	class(es)
Jyánitor	jyan-jyánitor	janitor(s)
Yóyo	yoy-yóyo	yoyo(s)
Trák	tra:-trák	truck(s)

As can be observed in these examples, the plural is formed by adding to the singular some material from the stem.

Internal modifications: some “umlaut forms” function as plurals in languages like English or German. In English, we find that a word like *goose* does not form its plural with the addition of the *-s* suffix as would be expected, but by a vowel change within the word stem. Thus, <oo> in *goose* turns into <ee> in the plural form *geese*. This vocalic alternation has been present throughout the history of English. For example, in Proto-Germanic the word *mūs* (mouse) had the plural *mūsiz* (mice). The <i> vowel in *mūsiz* was assimilated by the previous vowel <u>, and when the ending *-iz* disappeared in Old English, the plural form which remained was *mȳs*, which was the final result of umlaut. Thus, in Old English, singular *mūs* had plural *mȳs*. This difference in the stem vowel has been kept until Present-day English, where we have the same alternation of the stem vowel in *mouse* (sg) – *mice* (pl).

Subtractive morphology: plural number can also be indicated by removing material. In Hessian German, for instance, we find examples like *hond* (dog)- plural *hon-*, where the plural is a reduction of the singular form.

Therefore, marking plural forms is not a mere question of adding phonemes to the stem, but it can become a more complex issue in many languages.

2.1.3.2.1. The Number Hierarchy

We have already seen that singular and plural are not the only existent number values. Many languages have the dual, the trial or the paucal integrated in their systems. So a question may arise; can these values be present in a language randomly? That is, can a language have dual but not plural or trial but not dual? In order to give an answer to these questions, a Number Hierarchy has been proposed:

singular > plural > dual > trial

What this hierarchy shows is that the elements to the left of the scale must be present in a language in order for the ones in the right to exist. This hierarchy is derived from Greenberg's universal 34 (1963: 94), cited in Corbett (2000: 38):

No language has a trial number unless it has a dual. No language has a dual unless it has a plural.

But this hierarchy does not include the paucal. Thus, Foley (1986: 133) and Croft (1990: 96f.) suggested the following modified hierarchy:

singular > plural > dual > paucal/trial

The paucal and the trial, then, can only be present in a language if that language already has a dual, a plural and a singular, and consequently they (the paucal and the trial), appear less frequently.

2.1.3.2.2. Semantic effects

As explained previously, number is frequently seen as a way to express the difference between one, two, three, a few or various entities. This is the common meaning associated with number. However, it is worth mentioning that sometimes the expression of number has different semantic effects. For example, the difference in meaning between *cat* and its plural *cats* is not the same as that of *wine* and *wines* (Corbett, 2000: 83). Whereas the difference in meaning in the former pair is just a matter of the number of cats, in the latter there is an opposition between *wine* as a substance (*wine*) and different varieties of wine, as for example “sherry” or “chignon”, expressed by the plural *wines*.

Another interesting semantic variable provided by number marking is that found in the opposition between *I* and *we*. The personal pronoun *we* is said to be the plural form of *I*, however, the meaning of *I* does not actually allow a plural, since *I* denotes a unique entity. Moreover, *we* does not just have the meaning, “more than one entities named ‘I’”. So number is not simply a matter of “counting things” since it can also express other kinds of meaning too.

In brief, number systems vary substantially across languages. Evidence from other languages does not allow us to reduce these systems to a mere opposition of singular versus plural. In addition, it can be asserted that within the same language, there are different strategies to mark number and that it can express different kinds of meaning. Having established a comparison between number and gender we may conclude that there are significant differences between these two features. Number seems to be much more conceptually grounded than gender. As a consequence, gender allows any type of construal and these construals may even be arbitrary, whereas number allows almost no arbitrariness at all (see Acuña Fariña, 2009).

2.1.3.3. Person

Person makes reference to participants in the speech act. This is a feature which is present in two kinds of words: pronouns and verbs. For pronouns, the first person is in relation to the speaker, the second person refers to the addressee/s, and the third person to people different from the speaker and the listener who are somehow involved in the speech act.

Person is an inherent feature of pronouns but a contextual feature of verbs (Corbett, 2006: 131f). That is, verbs acquire person by agreement, whereas it is an inherent part of the pronoun's meaning. Languages tend to have three persons for the singular and another three for the plural. But some languages can show subdivisions in any of its persons. In some Algonquian languages, for example, they split the third person into more and less central participants in the situation. Consequently, they have one extra person as compared to the majority of systems.

2.1.3.4. Other agreement features

2.1.3.4.1. Case

Corbett (2006: 133) asserts that if case is considered a feature of agreement, it is not a canonical one (at least if compared to number and gender). This difference lies in the fact that case does not reflect an asymmetric relation similar to that of gender or number. Agreement is taken to be asymmetrical (according to directional conceptions) in the sense that first, there are the controllers and their features, and then these features are expressed on targets. So features on controllers are primary and features on targets are secondary or derived. If we believe that this asymmetry is criterial for agreement, it will become more difficult to consider case as a feature, since case is not an inherent feature of the controller as it depends on the syntactic environment. Corbett (2006: 133) illustrates this with the following example in Russian:

[Russian]

- (8) v nov-om avtomobil-e
 in new-M.SG.LOC car (M)-SG.LOC
 “in a new car”

In this example, case is not an inner feature of the noun *car*. The locative is imposed in both the noun and the adjective by the preposition *in* which denotes place. So a syntactic element different from the controller and the target is the one which causes agreement. However, there are many linguists who continue to consider case as a common agreement feature even for sentences like (8), since both noun and adjective share the same values, irrespective of what element in the sentence is responsible for agreement. In fact, these cases might argue against agreement being something necessarily directional (see sections 2.2., 3. and 4. of the present chapter).

2.1.3.4.2. Tense, aspect, mood and polarity

Tense, aspect, mood and polarity are features of the verb in the same way as case is a feature of the noun. Case can be present in other elements of the noun phrase (adjectives, articles, etc.), as explained before. The same stands for tense, aspect, mood and polarity in the verb phrase. These are usually features of the verb, although in some languages other elements within the phrase may be marked for them as well, thus establishing a symmetric relation between elements. Hence, for these features the same problem as to whether there is (canonical) agreement or not remains, since this symmetry goes against the nature of agreement as posited by formalist accounts.

2.1.3.5. The Feature Hierarchy Hypothesis

As happened for number with respect to the “number hierarchy”, a hierarchical relation has also been established in the literature between the three “phi-features” (person, number and gender) along the following lines:

Person > Number > Gender

Greenberg (1963) explains that the motivation for this hierarchy is the frequency of occurrence of these features across the world's languages. Likewise, Carminati (2005: 263) explains the relation between these three features in the following terms:

If a language possesses a feature, then it must have all the ones above it in the hierarchy. Thus, if it possesses the feature of gender, it must also have number and person. If it has number, it must have person but not necessarily gender. The implication of this is that, in some sense, person is more important/basic to language than number and gender, because it is universal, i.e. it occurs across languages independently of the other two. Next in "importance" comes number and last gender.

If we go back to the number hierarchy explained in section 2.1.3.2.1., for which a hierarchical relation of the kind: *singular* > *plural* > *dual* > *paucal/trial* was established, we may reason that there also exist sub-hierarchies within each feature. For person, Silverstein (1985) proposes a hierarchy in which first and second person dominate third: 1st/2nd > 3rd. These hierarchies are for many linguists a way of measuring the feature's "cognitive significance" (Carminati, 2005: 263). On this view, features higher in the hierarchy are more prevalent in our conceptualization of the world, and are consequently systematically encoded in language. Conversely, features lower down in these hierarchies are less cognitively salient and therefore less frequently found across languages.

As a summary for this section, Ferguson & Barlow's (1988: 10) words perfectly explain the issue of features, their importance and the problem of their classification:

One of the key questions for any kind of general definition of agreement is the identification of those grammatical properties that can match in agreement. The ideal answer would presumably be a principle or set of principles –syntactic, semantic, or other– which would neatly define a list of possible agreement properties. At the present time the best that can be done is a listing of agreement features that have been noted in descriptions of the world’s languages, perhaps grouped together into some general types.

2.1.4. Domains

Domains in agreement make reference to the syntactic environment in which agreement occurs. Some theories point to the fact that the degree of penetrability of non-syntactic variables such as semantics strongly depends on the domain of agreement. This perspective would clash with a syntax-first conception of agreement. However, formalist theories have to account for such a fact.

Corbett (2006: 54) points to four broad domains. These are:

- within the noun phrase (e.g. *these books*)
- beyond the noun phrase but within the clause (e.g. *Mary sings*)
- beyond the clause but within the sentence (e.g. *the committee, who have decided...*)
- beyond the sentence (e.g. *Mary sings because she is happy*)

Corbett emphasizes the fact that the smaller the domain, the more canonical agreement is (in the sense of automatic feature copying). That is to say, as the distance between controller and target increases, agreement becomes more exposed to semantic interference. One cannot say **these committee...*, as in this example semantic agreement within the noun phrase is not possible, whereas it is perfectly acceptable to say *the committee have decided...*, since semantic agreement within the clause domain is a valid option. And of

course, with pronouns the possibility of semantic interference increases (*the committee have decided ... They...*).

2.1.4.1. *The Agreement Hierarchy (Corbett, 1979)*

As just seen, agreement in English does not depend only on controllers and targets, but also on the domain in which it occurs. This same situation holds true for many other languages as well. Consequently, an agreement hierarchy has been proposed:

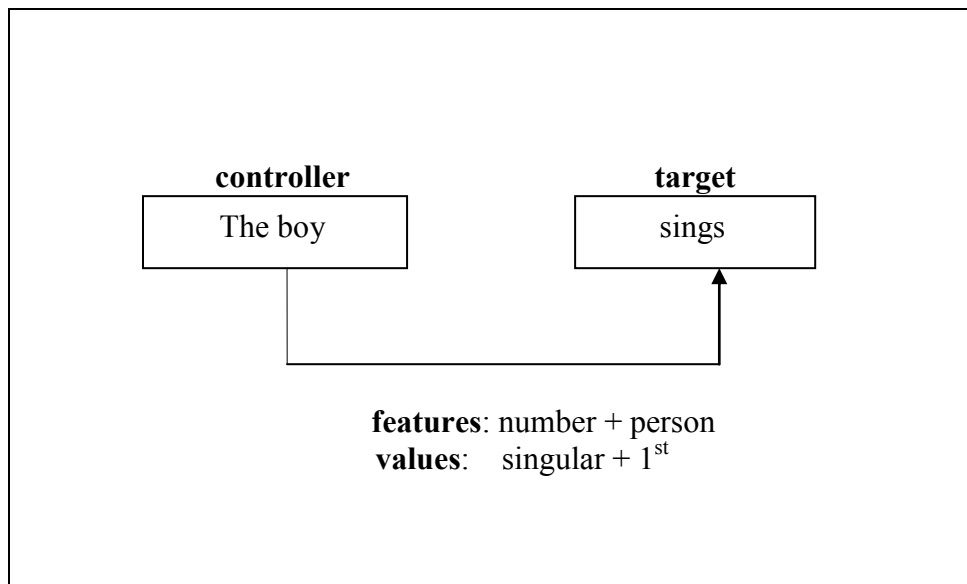
attributive > predicate > relative pronoun > personal pronoun

About this hierarchy, Corbett (2006: 207) explains:

For any controller that permits alternative agreements, as we move rightwards along the Agreement Hierarchy, the likelihood of agreement with greater semantic justification will increase monotonically (that is, with no intervening decrease).

Hence, the elements towards the right of the hierarchy are more prone to semantic interference when compared to the elements on their left. So personal pronouns are the elements which are most frequently exposed to semantic influence. This hierarchy is closely related to actual distance between controller and target. Thus, we might conclude that, normally, the longer the distance between controller and target, the more semantically influenced agreement might be.

To conclude, the following diagram summarises the roles of the general elements that every agreement operation must have according to serial conceptions of processing:



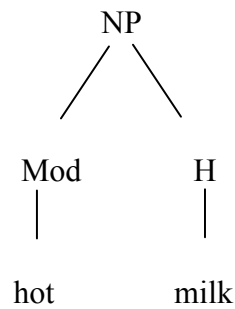
As alluded to before, the idea that agreement is processed in a serial way, meaning that it starts in a controller, ends in a target and follows a process in which the features of the former are copied onto the latter, is not shared by all theoretical views on this topic. Streams such as HPSG or unification (Barlow, 1992) do not agree with this idea of directionality. There exist cases in which the sources of agreement are not fully specified (as for instance in the French construction: *Je suis heureuse*, where the pronoun “*Je*” is not responsible for the feminine features in the adjective *heureu-se*, Ferguson & Barlow, 1988: 13). Structures such as these may be an argument against directional theories of agreement. Thus, in unification, for instance, the idea that structures bear feature indices that have to coincide in order to be given their morphological shape is expressed. Therefore, directional trends and their opposing views (such as those in unification) obviously clash. As a consequence, experimental evidence has to be found in order to offer support to one of the two. But first of all, let’s provide a more comprehensive account of the main axioms of the syntax-based conception offered by Generative Grammar. This information will be summarised in the next section.

2.2. Directionality and movement in Generative Grammar

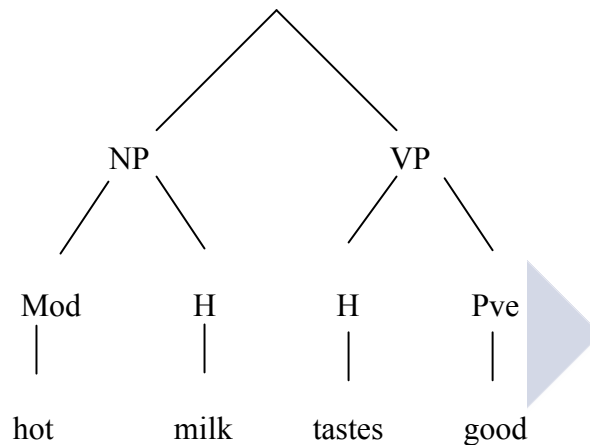
Once the elements present (according to Generative Grammar and the view of some traditional grammars) in agreement operations have been enumerated and described, we are going to see how these elements “act” when inserted within a sentence. But, in order to produce a more comprehensive account of all this, and in order to understand how Generative Grammar conceives agreement as a whole process, it is necessary to first provide a general view of Chomsky’s linguistic theories. To start with the basis of these theories, Generative Grammar points to the existence of two levels in language. A distinction is made between what has been called *deep structure* (D-structure) and *surface structure* (S-structure). By *deep structure*, Chomsky refers to the set of concepts that are present at the very first stage of message formulation. The so-called *surface structure* emerges from the syntactic organization of all these concepts. The transition from the *D-structure* to the *S-structure* is carried out by means of three main syntactic operations, which in the current (minimalist) version of the model, Chomsky (1995) calls *merge*, *move* and *agree*. Of particular interest for us is the third of these, as it coincides with the topic of this dissertation.

Merge:

Merge consists in linking concepts that belong together in order to create phrases, sentences or clauses. These are then labelled according to their syntactic properties. Thus, two words may merge in order to create a noun phrase which is formed by a head (normally a noun) and its modifier, which may be, for instance, an adjective. In this way, we obtain a noun phrase (NP) such as *hot milk*:



But in this system, a binary branch can be added to (or complemented by) another binary structure, since *merge* also operates between structures. Thus, one structure (a phrase, for instance) can be merged with another structure (another phrase) to finally obtain a larger structure, namely a sentence or a clause.



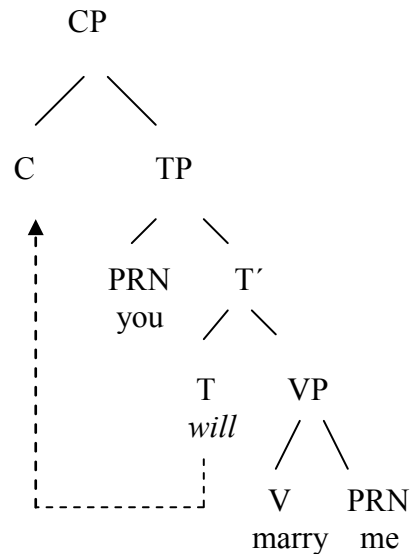
Move:

The operation of *move* involves, as its name indicates, movement from one position within the sentence to another. These movements are a consequence of the fact that the *D-structure* has to be organised in order to create a new *S-structure*. The three most important operations that according to Generative Grammar take place in the transition from the *D-structure* to the *S-structure* are the following:

Head movement: this movement is related to the formation of questions. For generative grammarians, both declaratives and interrogative sentences share the same *D-structure*.

Interrogative sentences then acquire their S-structure by moving certain constituents to the front position. Auxiliaries are the elements that are moved out of their normal post-subject position into a pre-subject position in English. An example of this movement is shown in the following tree diagram, included in Radford (2004: 152):

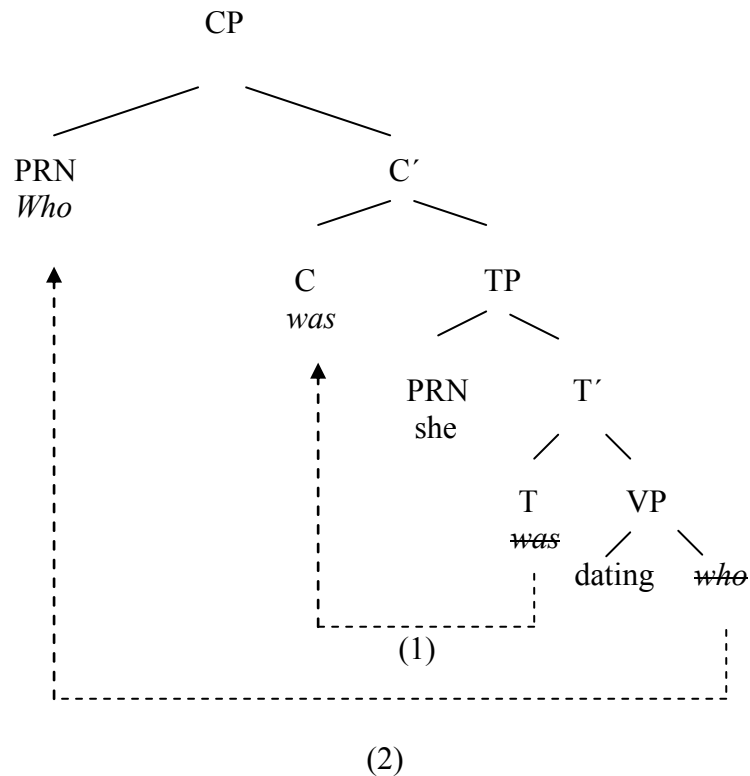
[Will you marry me?]



The interrogative sentence *will you marry me?* is supposed to have the form *you will marry me* in the *D-structure*. The auxiliary *will* is moved (or copied) to the left in order to occupy position C (complementiser) in the diagram. That is how the *S-structure* of this question arises. The most salient case of auxiliary inversion in English is that of *do-support*. The auxiliary *do* is normally moved to the C position in English questions that lack other types of auxiliaries. According to Radford (2004: 156f.), a reliable source of evidence in favour of this type of movement comes from the field of language acquisition. He points out that children tend to produce sentences such as *Did the kitchen light did flash?* or *Was that was Anna?*. The fact that children at a particular age produce such sentences means that they still place the auxiliary in post-subject position (its position in the *D-structure*). They are also able to carry out head movement and thus place the auxiliary in subject position as well, but they still cannot delete the original occurrence of the auxiliary and so it persists in both positions in the sentence.

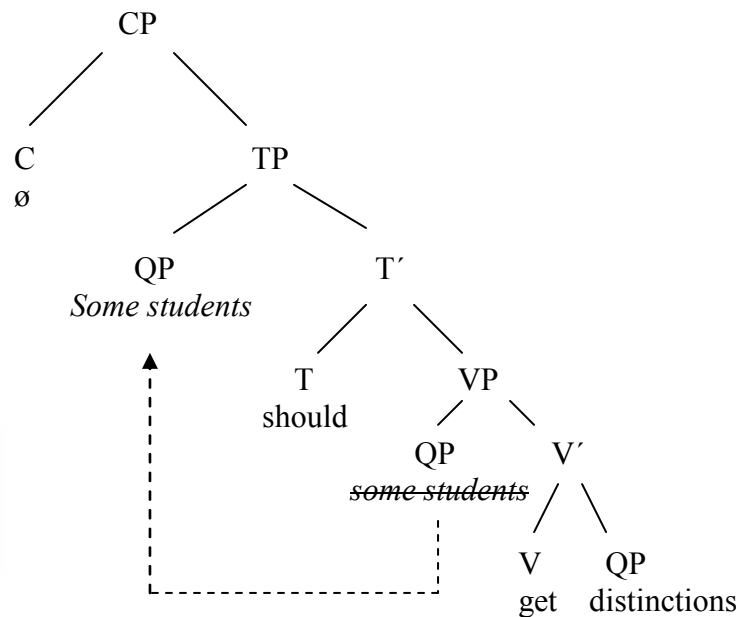
- **Wh- movement:** this is the type of movement responsible for the formation of *wh*-questions. The following tree diagram shows an example of both head movement and *wh*- movement (also from Radford, 2004: 189):

[Who was she dating?]



(1) represents head movement. As was explained before, the auxiliary *was* is moved in order to occupy the C position. Then, the former position occupied by *was* is left empty, that is to say, there is deletion of the auxiliary. On the other hand, the movement represented in (2) is an example of *wh*-movement. *Who* is raised to front position in order to occupy the place of the interrogative pronoun. This is the explanation that Chomsky gives for the generation of interrogative sentences containing an interrogative pronoun. An important point in the analysis of these movements is the fact that displaced constituents are said to leave behind a *trace* in the positions out of which they move (Radford, 2004: 190). Hence, in the above diagram ~~was~~ and ~~who~~ represent the traces that are left behind after the movement of these two elements.

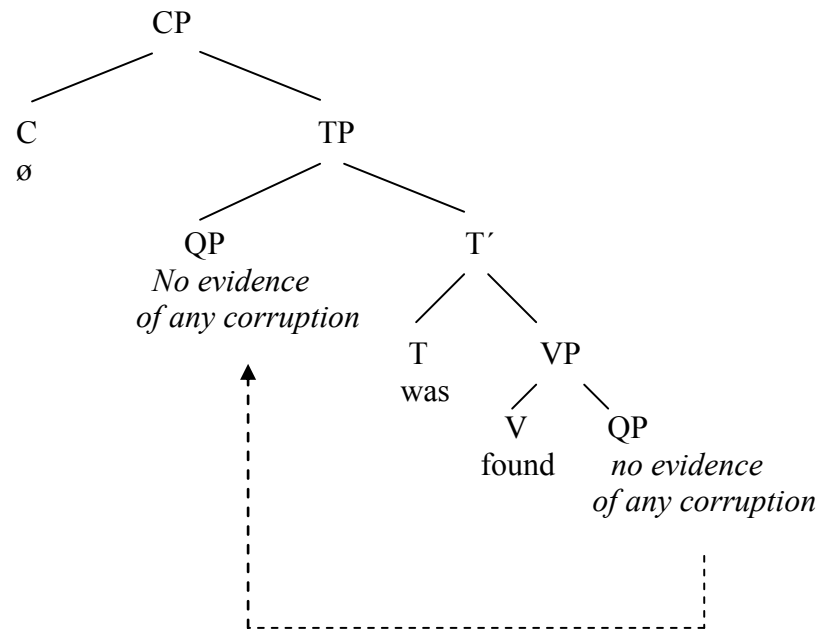
A-movement: the VP–Internal Subject Hypothesis (VPISH; see Kitagawa, 1986, Rosen, 1990 or Huang, 1993, among others) maintains that non-expletive subjects in English originate within the verb phrase and then move left into the position habitually occupied by this argument of the clause. After this element is copied to subject position, it is deleted from its former position, thus leaving a trace behind:



The operation illustrated by the dotted arrow represents A-movement. The expression *some students*, which is originally placed close to the verb, is moved to a position that can only be occupied by an argument expression.

A-movement is a syntactic operation that is present, according to generative theories, in the generation of passives and other similar structures. Let's see an example of A-movement in passives (Radford, 2004: 262):

[No evidence of any corruption was found]



In this example, the subject of the passive appears initially in a post-verbal position. In the transition from the D-structure to its corresponding S-structure, the subject changes to an initial position within the sentence.

Agree:

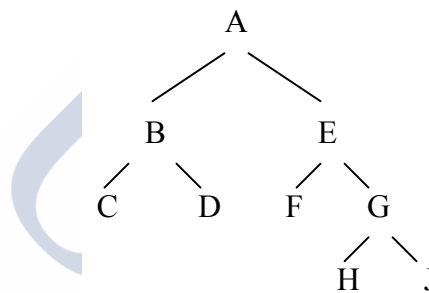
The third movement of this model is *agree*, which is the focus of study of this thesis and consequently the one which is deserving of most attention and explanation. In his grammatical theories of the late 80's and 90's, Chomsky explains that the operation of *agree* involves the copying of features from the controller to the target (as we have mentioned from the beginning of this chapter). According to this theory, the main features that intervene in agreement are those he named "phi-features", mainly person, number, gender and case (Chomsky, 1981: 330). So features (and their correspondent values) which are present in the controller are repeated (or copied) in the target in order to establish an agreement relation between both elements. According to Chomsky, the agreement relation can only operate under conditions of *c-command* (an abbreviation

for constituent-command). An informal definition of c-command provided by Radford (2004: 91) is presented below (where X, Y and Z are three different nodes):

C-command

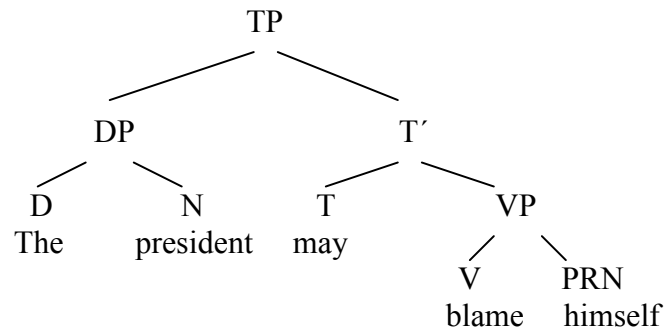
A constituent X c-commands its sister constituent Y and any constituent Z which is contained within Y.

Radford (2004: 91) provides a better visualization of this phenomenon by means of the following tree diagram:

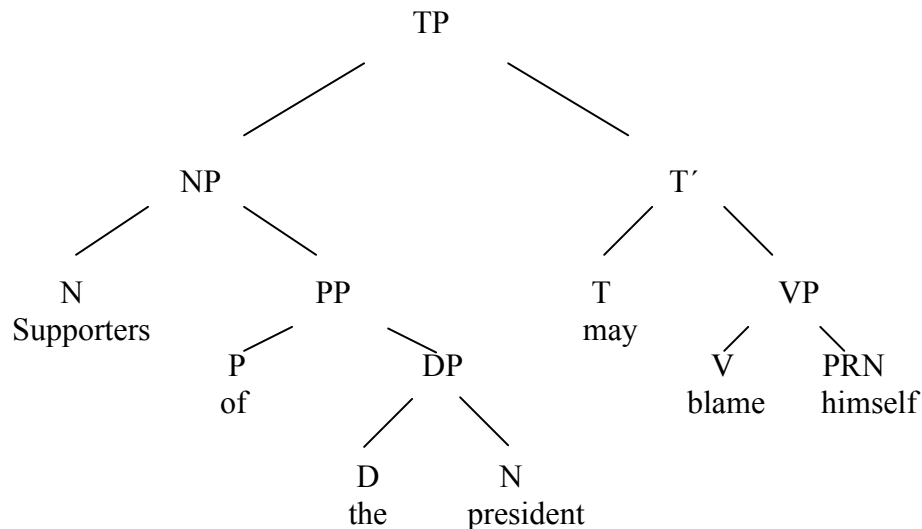


A is not in a c-command relation with any of the other nodes since it has no sister node. B c-commands its sister E and all its descendants, namely F, G, H and J. C c-commands only D since D is its sister and it does not contain any other constituent. This relationship is reciprocal, and thus D c-commands only C. E c-commands B, C and D because B is the sister of E and B contains both C and D. Following the same logic, F c-commands G, H and J; G c-commands only F, and H and J c-command only each other because they are sisters which have no daughters on their own (Radford, 2004: 91f.).

The importance of c-command in syntax is evidenced in expressions such as anaphors. Anaphors can only occur between elements that are in a c-command relation. Radford (2004: 93) gives an example of this with the sentence “*the president may blame himself*”, which has the following syntactic structure:



In this sentence, the reflexive anaphor *himself* is c-commanded by its antecedent *the president*. DP¹ (the node that contains the antecedent) has T-bar as its sister, and the reflexive pronoun *himself* is a grandchild of T-bar, so there is a c-command relation and the *binding* condition is consequently satisfied. When there is no such binding condition between the anaphoric pronoun and its antecedent, the result is an ungrammatical sentence as is shown in the following example (also Radford's 2004: 93):



This sentence is ungrammatical because the node containing *the president* (the DP node) does not c-command the node that contains the anaphoric pronoun *himself* since the only sister of DP is P and the pronoun *himself* is not contained within it. Consequently, the binding condition between the antecedent and the anaphoric pronoun is not satisfied. Examples such as the former are presented as evidence of the important role that c-command plays in syntax. Moreover, these examples also show that, as conceived

¹ In Radford's terminology, TP stands for "tense phrase" and DP stands for "determiner phrase" (the latter abbreviation implies that the determiner is the head of the nominal phrase).

by such a formalist theory, c-command is an essential requisite for the occurrence of agreement. In the second example **supporters of the president may blame himself*, it is evidenced that if two terms are not in a c-command relation, they cannot share the same features, that is to say, agreement is not possible. Thus, *the president* positively cannot impose its features on the reflexive pronoun, and this being so, the result is a completely ungrammatical sentence.

Checking:

In Minimalism, Chomsky (1995) revises his previous theories. It is here that he introduces some new notions which relate to the operation of *agree*. The most important contribution to his new syntactic model is the concept of *checking*. He explains that features are copied from the controller to the target, but they must be “checked”, that is to say, “uninterpretable features” must be eliminated. By “uninterpretable features” he refers to those which do not contribute to meaning (for example case). Here is Chomsky’s (2000: 123) explanation of the phenomenon of *checking*:

Checking reduces to deletion under matching with an active local goal and ancillary deletion of the uninterpretable feature that rendered the goal active.

To summarise, it might be said that Generative Grammar somehow compares language systems to mathematical systems. Language is composed of fixed elements and fixed rules that could (in theory) be applied to every sentence. However, there is much evidence to suggest that language cannot be explained in such a straightforward way. The main source of evidence comes from lexicalist theories such as HPSG (Head-Driven Phrase Structure Grammar- Pollard & Sag, 1994) which postulate that semantics is responsible for agreement in some structures. Such theories, which oppose derivational ideas will be developed in the next section.

3. LEXICALIST THEORIES (POLLARD & SAG, 1994 AND WECHSLER & ZLATIC, 2003)

According to Pollard & Sag (1994: 60) and Wechsler & Zlatić (2003: 7) agreement is not an automatic copy of features from a controller to a target, as generative theories believed, but rather two elements specifying partial information about a single linguistic object. Such information is, in addition, compatible most of the time:

[...] the (competence) grammar of agreement is nothing more than a system of constraints requiring certain token identities, and hence inducing compatibility of certain lexically specified information.

(Pollard & Sag, 1994: 61)

According to these theories, agreement has two main components, namely *index* and *concord* (Wechsler & Zlatić, 2003 (following Pollard & Sag's 1994 and Kathol's 1999 nomenclature)). Index refers to the semantic component of words, while concord alludes to their morphosyntactic features. Therefore, *person*, *number* and *gender* involve index features and *case*, *number*² and *gender* involve concord features (notice that *case* is a purely syntactic feature dependent on local syntactic relations while *person* is a semantic feature which entirely depends on meaning). There are also in-between categories, as is the case of relative pronouns: on the one hand relative pronouns link the relative clause to their head nominal, so they show some concord properties, but on the other hand, they show index agreement with the antecedents they refer to.

The basis of these theories coincides with Corbett's Agreement Hierarchy (Corbett, 1979, 1991), explained in section 2.1.4.1. Corbett provides evidence of how a

² Number cannot be reduced to a strictly semantic feature of nouns. Although it is normally associated with the semantics of aggregation, there exist nouns such as *pluralia tantum* (e.g. *scissors*) that are conceptually singular but take plural determiners and verbs. In this sense, nouns like *scissors* are said to be grammaticized and therefore do not depend entirely on either the semantics or the morphology of the noun. The same occurs with gender, which sometimes is semantically motivated while others it is not.

given agreement type is more likely to show syntactic agreement (agreement ad formam) or semantic agreement (agreement ad sensum) in some languages of the world:

Attributive < Predicate < Relative pronoun < Personal pronoun
← Syntactic agreement Semantic agreement →

Therefore, the index component of words is more likely to appear as we move towards the right of the hierarchy, while concord features tend to be more visible as we move toward the left.

This form-meaning dichotomy is easily exemplified in structures involving collective nouns, for instance. As an example, Wechsler & Zlatić (2003) mention the so-called *deca*-type (children) collectives in Serbian/Croatian, which provide evidence for separating concord from index agreement features, since they trigger different features on different agreement targets (they have the concord values feminine and singular but the index values neuter and plural; Wechsler & Zlatić, 2003: 60). However, they also comment on another type of Serbian/Croatian noun (the *rak*-type (crab-type)). Nouns of this kind do not have a gender classification based on the sex of their real-world referent (crabs may be male or female, but their gender classification is based only on grammatical parameters). Therefore, for these nouns their index values do not coincide with those of their semantics. So occasionally, index and semantics (as well as concord and syntax) may diverge.

In general, what their theory postulates is that words have both index and concord features and that those features tend to coincide due to redundancy rules. However, sometimes those features do not coincide and thus the general rule is that semantic agreement appears when grammatical agreement fails. This conception of what the agreement mechanisms are, conflicts with those proposed by derivational approaches such as those of Generative Grammar, where the system is directional and completely dependent on the syntax of the trigger. This syntactocentric system postulated by Chomsky

cannot account for sentences like *the police are here to protect us*, in which subject-verb agreement does not depend on syntax (it is not a copy-percolation operation beginning in a controller and ending in a target) but on the meaning of the sentence (or the index features of a collective such as *police*). Several cases like the one just mentioned, in which semantics is responsible for the implementation of particular agreement marks, are going to be looked at in the next section, and evidence will be provided to show that agreement is not only a matter of syntax, since semantics plays a very important role in some structures that are present in every-day language and in grammar books.

4. CONTRADICTING GENERATIVISM: EVIDENCE FOR SEMANTICALLY-BASED AGREEMENT IN TRADITIONAL GRAMMARS

Contrary to what generative rules predict, there exist many cases in which syntactic agreement is violated in favour of a meaning-based type of agreement, since certain structures are clearly more prone to set agreement on notional parameters. If syntax is the first and most important phase, then semantic effects should have no weight, and consequently, no structure could be solely dependent on semantic parameters. However, the existence of constructions where meaning seems to have a more important role than syntax would represent serious counter evidence to formalist theories since it would call into question the very basic feature-copying operation. Moreover, these semantic structures seem to be present in many languages of the world (and as a consequence most of them have been compiled in their grammars), which adds support to the idea that although agreement may be to a large extent based on formal and syntactic grounds, it is not exempt from semantic influence.

Examples of many such structures in English are provided below. They all show a *mismatch effect* (see Acuña Fariña, 2012), since the subject's number and the verb's number do not agree due to a plural conception of a morphologically singular subject.

4.1. Collective nouns

Collective nouns are those which in spite of having a singular morphology, conceptually denote a set of things. Collectives tend to be formed of several entities of the same kind which in a particular piece of discourse are not important by themselves but gain importance when they are presented together, that is to say, when they are a collectivity. Common collective nouns in English are *committee*, *group* or *band*, for example. The following two examples illustrate the problems that such types of nouns may cause in subject-verb agreement:

(9) *The committee has* not yet come to a decision [simple agreement]

(10) *The committee have* not yet come to a decision [plural override]

If we analyse these two examples, we may see that with collectives the override is optional (except for cases in which an aggregate-entity interpretation is nonsensical, as in: **a new committee have been constituted* (Pollard & Sag, 1994: 71)). In fact, there is a subtle difference in meaning between the two versions. The singular reading might be based on a view of the collection as a whole, whereas the plural reading might be focusing on the different members of the committee, rather than on the committee as a unit. This is why both forms are grammatically accepted. In addition, there exist dialectal differences, since the plural version is more common in British English than in American English (see Bock, Eberhard & Cutting, 2004: 253). This distinction may also be due to register issues; the plural is more commonly used in informal style than in formal written style.

As regards antecedent-pronoun agreement involving the use of collectives, there are also two options (Huddleston & Pullum, 2002: 495):

(11) *The committee hasn't* yet made up *its* mind

(12) *The committee haven't* yet made up *their* mind/minds

It is even possible to switch from singular verb to plural pronoun, but not from plural verb to singular pronoun in close proximity:

(13) *The committee hasn't yet made up their mind*

(14) **The committee haven't yet made up its mind*

In this respect, it is worth mentioning the fact that plural agreement with collectives is facilitated when distance intervenes. Thus, distance between the controller and the target provokes a weakness of the morphological form of the controller and an enhancement of its meaning (Gili Gaya, 1943: 31f., and see section 5 of this chapter on proximity concord).

As we may notice in the following examples, a plural pronoun is also particularly likely where there is an overt plural oblique (Huddleston & Pullum, 2002: 495):

(15) *A group of bystanders were having their names and addresses taken down*

(16) *A group of bystanders was having their names and addresses taken down*

(17) #*A group of bystanders was having its names and addresses taken down*

The first version (example (15)) presents no apparent problem. Sentence (16) is possible though the singular verb *was* has no evident semantic motivation. As Huddleston & Pullum (2002: 495) notice: “[...] it is likely to be due just to the application of what we call the simple (subject-verb) agreement rule”. The third version has no apparent reason for having a singular pronoun because in terms of semantics (or even pragmatics), the names and addresses belong to the members of the group as individuals, not to the group as a unit (see section 4.10. on distributivity).

Another interesting case is that of reflexive pronouns. Here, we can observe that the semantic/pragmatic restriction is even stronger:

(18) *A group of bystanders were behaving themselves rather badly*

(19) *A group of bystanders was behaving itself/*themselves rather badly*

The lack of grammaticality of the plural form of the reflexive in (19) can be accounted for by the so-called binding theory (Pollard & Sag, 1994: 74ff.; Chomsky, 1981). This theory requires that those lexical items which refer to the same entity in the real world must have the same *index*. Thus, if we take the group of bystanders as a collectivity and link it to a plural verb with a plural *index*, any other entity referring to the same referent (as for example the reflexive pronoun) must share this plural *index* (as in (18)). Conversely, if the *index* of this expression is singular, the reflexive must yield its singular status. Otherwise, the sentence would clash as regards its grammaticality, as is reflected in (19). However, Pollard & Sag's binding theory did not work for previous examples like "*a group of bystanders was having their names and addresses taken down*". In fact, it is quite likely that the grammaticality of this structure would be questioned by many native speakers. This one is indeed a borderline example showing to what extent different words within the same sentence designating the same referent can bear different number features.

In semantic terms, we might say that the choice between singular or plural in collectives (both in subject-verb and pronoun-antecedent choices) on some occasions depends on whether the group is considered as a single undivided body, or as a collection of individuals. Additionally, sometimes the election depends on whether the action expressed by the verb relates to something that is normally carried out by separate individuals or by whole groups of people, that is to say, whether the action may accept a plural referent as the performer or only a set of individuals.

4.2. Reference transfer

According to Nunberg (1977), metaphorical reference is a common phenomenon across languages, as seen in the following English examples (from Pollard & Sag, 1994):

(20) *The ham sandwich at table six is getting restless* (said by one waitress to another)

(21) *Queen-six bets*

(22) *The dean's office approved the proposal*

Obviously, the referent of the subject NP in (20) is not a ham sandwich, but a restaurant customer who ordered such a meal. Similarly, in (21) we are not referring to two cards, but to the player who holds them. Finally, it is not the office itself which approves the proposal, but a certain individual working there who made the approval public. Thus, as posited by Pollard & Sag (1994: 69):

In each case, the referent of the relevant phrase is some individual in a contextually appropriate relation to an object of the sort normally picked out by nonmetaphorical utterances of that phrase.

Obviously, whenever we exclude this metaphorical meaning from the sentence and the referent becomes a direct one, a simple singular interpretation is possible:

(23) *The hash browns at table nine are getting cold*

So, the same plural referent can elicit a different number on the verb depending on the interpretation given to such a subject. Formalist views of agreement processing would definitely have problems explaining effects such as this.

4.3. Coordinated subjects

Subjects can be formed by two elements that may be presented conceptually as a unit when linked by the preposition *and*. The opposite case occurs when the preposition linking two (or more) elements in the subject is of a disjunctive type, as in coordination with the preposition *or*. Let's look at both cases separately.

4.3.1. Coordination with “and”

Quirk et al. (1985: 759) distinguish between coordination and coordinative apposition. Both types of coordinative constructions may lead to different agreement problems.

4.3.1.1. Simple coordination

In simple coordination with *and*, a plural verb is used even when each conjoin is singular because the addition of both elements creates a new plural referent:

(24) Tom and Alice *are* now ready

(25) What I say and what I think *are* my own affair

The same occurs in asyndetic coordination (without a coordinator):

(26) His camera, his radio, his money *were* confiscated by the customs officials

The same effect is present in sentences which express a mutual relationship:

(27) Your problem and mine *are* similar [“Your problem is similar to mine and mine is similar to yours”]

Only the principle of notional concord can explain the sentences above. More surprising are the following examples in which despite the coordination, the subject names a single flag, a single meal, and a single pub:

(28) The hammer and sickle *was* flying from the flagpole

(29) Danish bacon *and* eggs makes a good solid English breakfast

(30) The Bat *and* Ball sells good beer

A borderline case between singular and plural choice in coordinated structures is that represented by arithmetical sums, as in:

(31) Two and two *is/are* four

A similar case occurs in sentences such as:

(32) American and Dutch beer *is/are* much lighter than British beer

Here, although the preferred option is agreement with a plural verb, the singular form *is* is commonly accepted in this context. Noticeably, when the phrases are postmodifying, the singular verb is required:

(33) Beer from America and Holland *is* much lighter than British beer

Finally, when the subject is a nominal relative clause, coordination reduction allows some variation in number interpretation:

(34) What I say and do *are* my own affair [What I say *is*...and what I do *is*...]

(35) What I say and do *is* my own affair [That which I say and do *is*...]

It is clear when examining cases like these, that an account of copying based on the formal features themselves cannot account for sentences like the ones above.

4.3.1.2. Coordinative apposition

In coordinative apposition, both parts of the coordinated sentence have the same referent, so plural agreement is not expected (Quirk et al., 1985: 760):

(36) This temple of ugliness and memorial to Victorian bad taste *was* erected in the main street of the city

However, ambiguity within the sentence might be a cause for which we may have two possibilities in verb number:

(37) His aged servant and the subsequent editor of his collected papers *was/were* with him at his deathbed

Singular or plural agreement is dependent on whether we consider the servant and the editor to be the same person or not. Again agreement is resolved beyond the form especially if the form is underspecified.

Abstract nouns also leave the way open to interpretation:

(38) Your fairness and impartiality *has/have* been much appreciated

(39) Her calmness and confidence *is/are* astonishing

(40) Law and order *has/have* been established

It may be the case that the presence of a repeated determiner biases the choice to plural:

(41) Your fairness and your impartiality *have* been much appreciated

4.3.1.3. Quasi-coordination

According to Quirk et al. (1985: 761ff.), subject noun phrases may be linked by quasi-coordinators or prepositions that are semantically similar to coordinators (e.g. *along with*, *rather than*, *as well as*, etc). Normally, there is singular agreement with the verb if the first noun is singular:

(42) The captain, as well as the other players, *was* tired

However, on some occasions, notional concord is at play and prompts plural agreement:

(43) The President, together with his advisors, *are* preparing a statement on the crisis

If there is a negative parenthetical construction, like in (44), the verb must agree in number with the first noun phrase for reasons of both grammatical and notional concord. The same occurs when an adverbial is attached to the second noun phrase, as in (45):

(44) The Prime Minister, (and) not the monarch, *decides* government policy

(45) A writer, and sometimes an artist, *is* invited to address the society

4.3.2. Coordination with “or”

Coordination with *or* indicates exclusion or separation of two elements. As a consequence, the union of these elements does not normally yield a plural verb.

The main problem with *or* coordination arises when the two noun phrases do not share the same number, that is, when one of the noun phrases is singular and the other plural. So we can compare (from Huddleston & Pullum, 2002: 508):

(46) (Either) Mary or John *is/*are* sure to go [sg *or* sg = sg]

(47) (Either) the twins or Mary *?is/ ?are* sure to go [sg *or* pl = ?sg/?pl]

As Quirk et al. (1985: 762) points out for such cases:

Since the dilemma is not clearly resolvable by the principles of grammatical concord or notional concord, recourse is generally had to the principle of proximity: whichever phrase comes last determines the number of the verb.

Sometimes, the disjunctive force of *or* is weak and thus approaches the meaning of *and*. It is in such cases that the plural verb form is possible (although not always the preferred option) when having two singular noun phrases functioning as subject:

(48) Jogging or swimming *is/?are* supposed to be good for the heart

When *or* appears as a coordinator of *supplements*, we have to resort to notional agreement in order to solve the problem (Huddleston & Pullum, 2002: 509):

(49) His proposal, or rather the ramifications of it, *are/*is* going to have a serious effect on our plans

Here, the second noun phrase is a correction of the previous one. It therefore supersedes the first noun phrase and determines the number of the verb. But:

(50) Arhythmia, or irregular contractions of the ventricles, *is/*are* a serious heart condition

In the previous example, the supplement is merely an explanatory and parenthetical reformulation of the first noun phrase, and it is therefore the latter that determines the number of the verb.

4.4. Indefinite expressions as subject

The indefinite determiners (and pronouns) *no*, *none*, *all*, *some*, *any* and even *half* sometimes lead to ambivalence for subject-verb number agreement, as for instance in (Quirk et al., 1985: 764):

(51) None (of the books) *has/have* been placed on the shelves

The singular choice is more in accordance with what prescriptive grammars posit. A plural verb, on the contrary, is promoted by notional concord. The latter is more frequently used and is generally accepted even in formal usage (Quirk et al., 1985: 764). A similar thing happens with *either* and *neither*. In informal usage, when *either* or *neither* (particularly *neither*) is followed by a prepositional phrase with a plural complement, the plural verb may occur:

(52) Either/neither of them *are* welcome. [“Both are (not) welcome”] (informal)

The plural is favoured even more in constructions with *none*:

(53) None of them *have* been placed on the shelves

So in brief, in indefinite constructions, the battle between morphosyntax and semantics is most of the time won by meaning.

4.5. *Measure phrases*

Measure phrases are an interesting case of agreement in which a referent composed by several entities (all sharing similar characteristics) acquire a singular meaning corresponding to the conceptualisation of this referent as a single unit. This represents the opposite case to that of the previously mentioned collectives:

(54) Ten dollars *is* all I have left [“That amount is...”]

(55) Fifteen years *represents* a long period of his life [“That period is...”]

(56) Two miles *is* as far as they can walk [“That distance is...”]

4.6. Proportional constructions

According to Huddleston & Pullum (2002: 504), there are a wide variety of constructions expressing proportion:

(57) [One student in a hundred] takes/*take drugs [simple agreement]

(58) In a hundred students, [only one] takes/*take drugs

(59) [One in a hundred students] takes/take drugs [optional singular override]

In (59) the possibility of having a singular verb is motivated by the presence of *one* and by the similarity in meaning with (57) and (58) together with the fact that these elements coexist with a plural local noun located closely to the verb.

A particularly interesting case is that of proportional constructions with *per cent* (BrE) and *percent* (AmE):

(60) One percent of students *takes/take drugs

(61) One percent of the electorate takes/take drugs

(62) One percent of the cheese was/*were contaminated

As is evidenced in these examples, the singular form is not allowed with non-collective plural nouns (*students*), but it is perfectly possible if the *local noun* (the one which does not occupy head position) is a singular collective noun. Again notional agreement can be the responsible for this choice. Interestingly, with singular mass nouns (such as *cheese* in (62)), the singular is the only grammatically accepted option since mass nouns cannot be conceptually divided into several individual components as is the case with collectives. These particular facts demonstrate that in these cases it is the local noun which is the proper nucleus of the sentence and not the head noun, so this contradicts any idea of directionality and seriality.

4.7. Interrogatives

The interrogative pronouns *who* and *what* normally take the default value of singular. The following examples illustrate this fact:

(63) Who *wants* some more ice-cream?

(64) What *remains* to be done?

The default singular allows for either singular or plural answers, but the singular can be overridden when the speaker presupposes that the answer will be in the plural:

(65) What *are* going to be the deciding factors?

(66) Who *haven't* yet handed in their assignments?

In (65) the plural verb is obligatory since *the deciding factors* forces a plural construal of *what*. In (66) a singular verb form (*hasn't*) would be possible, but we should indicate that there is no expectation of a plural answer and, in addition, the singular form *assignment* favours the interpretation that there is only one assignment per person.

4.8. Existential constructions

The choice between singular and plural in existential constructions depends on more than one constraint. First of all, style is responsible for agreement in sentences such as *there's only two problems remaining*. Many speakers use the third person singular form in informal style because they do not take into account the number of the post-verbal noun phrase, but only that of *there*, which is treated as a third person singular pronoun like *it*. In fact, the dummy pronoun *there* does not have inherent person-number properties but inherits them from the noun phrase that it displaces as subject.

Sometimes, the post-verbal NP is treated as subject, and so if it is plural, a plural form of the verb is possible. Compare (from Huddleston & Pullum, 2002: 242):

(67) There *tends* to be a single pre-eminent factor in the breakup of a marriage

(68) There *tend* to be several contributing factors in the breakup of a marriage

In the second sentence, agreement is established with the plural local noun phrase *contributing factors* (plural) instead of with *there* (singular). And this happens in spite of the fact that that noun phrase cannot be the subject of *tend*, for it is not located in the *tend* clause, but in the *be* clause. So it is evidenced that existential constructions are a clear example of how the meaning of a sentence can change the morphological expression of the agreement marks. However, from a structural perspective, it can be argued that it is the location of the subject which allows only singular agreement or both singular and plural agreement. The idea would be that whenever the subject is located after the verb, agreement seems to be weaker (Franck, Lassi, Frauenfelder & Rizzi, 2006). If we have a look at languages such as Italian, English, French and even Arabic we can encounter structures which illustrate this idea:

-Italian (only in some dialects): *Viene le ragazze* (“Comes the girls”). Although **Le ragazze viene* is not possible.

-English: *There’s some boys at the door*. Although **Some boys is at the door* is ungrammatical.

-In French, *C’est les filles* (It is the girls) is as valid as *Ce sont les filles* (They are the girls) and similarly, Standard Arabic requires agreement in person and number only in SV sentences, not in VS structures (see Guasti & Rizzi, 2002 and Acuña Fariña, 2012 for similar examples).

4.9. Singular plurals

If we consider examples such as (69) and (70) (Pollard & Sag, 1994: 70):

(69) *Eggs is my favourite breakfast*

(70) *Unleashed dogs on city sidewalks threatens the health and welfare of law-abiding citizens*

Apparently, a conflict exists between those agreement features on the subject and those on the verb. In other words, their morphological marks for number are not congruent according to formal criteria. However, they are coherent in a semantic sense, and this is enough of a reason to consider the sentences as being grammatical.

4.10. Distributivity

As Quirk et al. (1985: 768) point out; “The distributive plural is used in a plural noun phrase to refer to a set of entities matched individually with individual entities in another set”, for example:

(71) *Have you all brought your cameras?* [“Each has a camera”]

(72) *Hand in your papers next Monday* [“Each has to hand in one paper”]

Huddleston & Pullum (2002: 513) provide a similar definition for this concept:

Distributive predicatives combine with plural predicands and the property they express is ascribed to the individual members of the set referred to by the predicand (or to various subsets of that set).

The same authors establish a classification of distributive sentences depending on the nature of the predicand (whether it is non-collective, neutral or collective). So they establish the distinctions shown in the following subsections.

4.10.1. Non-collective properties

(73) My daughter *is* a doctor [non-distributive]

(74) My daughters *are* doctors [distributive]

In (74), the pluralized form indicates that the property of being a doctor is ascribed distributively to each of the daughters. “*Doctor*” is a non-collective predicand, and so it might be ascribed to a singular referent (as in (73)) as well as to a plural distributive referent (as in (74), where each of the daughters are said to be a doctor).

4.10.2. Neutral properties

(75) Our neighbour *is* a nuisance

(76) Our neighbours *are* a nuisance [non-distributive]

(77) Our neighbours *are* nuisances [distributive]

(Huddleston & Pullum, 2002: 514)

(75) has no possible distributive referent since both the subject and the predicand are singular. In (76) the predicative ascribes the property of being a nuisance to the collectivity (they are collectively a nuisance). In (77) however, the property of being a nuisance refers to each of the individuals. Thus, (77) has a distributive reading which is not possible for the previous two examples. Huddleston & Pullum also point to a number of other nouns which denote neutral properties, such as: *delight*, *disgrace*, *embarrassment*, *godsend*, *mess*, *obstacle*, *pest*, *pigsty*, *problem* and *tip*.

4.10.3. *Collective properties*

Collective properties are ascribed to sets, even when used in the plural with a distributive interpretation (Huddleston & Pullum, 2002: 514).

(78) #This stamp *is* a superb collection of rare issues

(79) Bill's stamps *are* a superb collection of rare issues [non-distributive]

(80) Bill's stamps *are* superb collections of rare issues [distributive]

In (79) *a superb collection of rare issues* is the set of Bill's stamps as a whole. On the other hand, (80) has a distributive interpretation which assigns the collective property not to the individual stamps but to subsets of them.

In addition to all these cases in which sentences might have a distributive interpretation, it is worth mentioning the fact that sometimes, the distributive singular might also be used to avoid ambiguity, as Quirk et al.'s (1985: 768) example illustrates:

(81) Students were asked to name *their favourite sport* (The singular makes it clear that only one sport was to be named)

Moreover, the singular is preferable (and sometimes even obligatory) with idioms and metaphors:

(82) We are *keeping an open mind* [?open minds]

(83) They *vented their spleen on him* [*their spleens]

(84) They can't *put their finger on what's wrong* [*their fingers]

4.11. Third person override in cleft relatives

Semantics may also be responsible for agreement involving person, as these examples illustrate:

(85) It is I [*who am at fault*]

(86) It is me [*who is at fault*]

(Huddleston & Pullum, 2002: 507)

In the first example, the verb agrees in person with its corresponding anaphoric pronoun *I*. However, in the less formal version with the accusative pronoun *me*, third person singular agreement is accepted for the verb. Therefore, in informal style, a lack of match between the relative pronoun and the antecedent is possible. Thus, not only number agreement but also agreement in person may be modelled by the overall semantics of the sentence.

Formalist theories treat such examples as “deviations” or even “viruses” (according to Sobin’s (1997) terminology). For Sobin (1997: 319), “A grammatical virus is a device that can read grammatical structure and affect it, though it is grammar-external”. Although Sobin explains that viruses are reduced to a certain set of formal problems within certain structures (as those of the third person override in cleft relatives, among others), other theories regard them as a terminology used to explain those phenomena that do not fit into the rigid parameters of the generative view.

In brief, these eleven structures (1. collectives, 2. reference transfer, 3. coordinated subjects, 4. indefinite expressions as subject, 5. measure phrases, 6. proportional constructions, 7. interrogatives, 8. existentials, 9. singular plurals, 10. distributives, and 11. clefts, among many others) confirm that notional agreement is a recurrent tool in agreement operations. So agreement is not simply a syntactic phenomenon, as some definitions of it try to posit, but it is also sometimes dependent on the semantics of either the Noun Phrase or the whole sentence. This leads us to think that full encapsulation of either syntax or semantics is not an option. The previously mentioned examples cannot be just

a question of linguistic idiosyncrasy, nor can they merely be the peculiarities of particular language; there must be something else, a system in which different types of information coexist and interact in order to provide a final result based on different parameters. The election of which parameter (syntax, semantics, phonology, etc.) regulates the final result might depend on things such as frequency of use of a particular structure (notice that collectives agreeing with a plural verb are much more frequent in British English than in American English (Bock et al., 2004)), the weight of the semantic representation of the referent which denotes the whole sentence, or the structure and characteristics of the language under analysis, among other things. With respect to the last statement, it is worth mentioning that a morphologically rich language such as German, for instance, has been shown to be more dependent on morphology, with semantics taking a back seat (Berg, 1998), whereas a language such as English, which has little morphology, could depend more on the semantic particularities of each and every sentence, or as Acuña Fariña (submitted) points out:

Conceptual structure is ready to interfere in the establishment of agreement ties, but that interference is neatly modulated by morphological strength, in the sense that morphology acts as a barrier to it.

So it seems that everything counts in agreement and that we must not disregard any source of information. This fact indicates that many regions of our brain (related to different linguistic areas) must be active during the computation of agreement and during the election of agreement marks. Agreement might be partially formally regulated, but this does not imply that it is reduced to an encapsulated phase.

5. THE ROLE OF MORPHOLOGY IN AGREEMENT: THE PHENOMENON OF “ATTRACTION” OR “PROXIMITY CONCORD”

5.1. “Attraction” or “proximity concord”

A third constraint (different from syntax and semantics) might be introduced in the study of the nature of agreement. On some occasions, agreement occurs only due to proximity and does not respond to any syntactic or semantic rule. Therefore, it seems that agreement is, at certain points, an issue of pure morphological copying. The result of this type of “attraction”, as it came to be called in the literature, may be an ungrammatical sentence, or at least a type of sentence which speakers would have some difficulty in determining whether it was grammatical or not. Quirk et al. (1985: 757) defines “attraction” or “proximity concord” as follows:

The principle of proximity, also termed “attraction”, denotes agreement of the verb with a closely preceding noun phrase in preference to agreement with the head of the noun phrase that functions as subject.

The following sentence exemplifies this definition:

(87) ?*No one* except his own *supporters* *agree* with him

The plural local noun *supporters*, which is located in the vicinity of the verb, has in this example influenced the choice of the plural verb *agree*, although the head (and the subject) of the sentence is *no one*, which is grammatically singular. In this particular example, proximity concord is also reinforced by notional agreement (“only his own supporters agree with him”), which supports the plurality of the verb. Additionally, as

Quirk et al. (1985: 757) indicate, the distance between the head and the verb favours this type of incorrect (but at the same time quite frequent) agreement:

Conflict between grammatical concord and attraction through proximity tends to increase with the distance between the noun phrase head of the subject and the verb, for example when the postmodifier is lengthy or when an adverbial or a parenthesis intervenes between the subject and the verb.

It is worth noting the fact that proximity concord or attraction occurs mainly in unplanned (and mostly oral) discourse. In writing, it is normally corrected to grammatical concord if it is noticed. So when the proximity principle is followed, the result is likely to be considered as an error. The following examples taken from Quirk et al. (1985: 764) show the effect of proximity:

(88) Nobody, not even the teachers, *was/?were* listening

(89) Every member of the vast crowd of 50.000 people *was/?were* pleased

So the verb can be attracted towards the plural even in the presence of indefinites such as *nobody* and *every*, which impose some restrictions on the number of the referent. These sentences might well be uttered in oral unplanned speech, but from a prescriptivist point of view, they could be considered as ungrammatical since they violate the principle of grammatical concord.

More acceptable are those sentences whose meanings involve type and number in spite of the fact that they make use of proximity concord. Notice that many of them belong to informal style:

(90) These sort/kind/type of parties *are* dangerous (informal)

(91) A (large) number of people *have* applied for the job

(92) The majority *are* Muslims

(93) Lots of the stuff *is* going to waste (informal)

In (90) rephrasing can even be useful in order to avoid number conflicts (those sorts/kinds/types of parties *are* dangerous). Sentences (91) and (92) do not accept a singular form, in part influenced by notional agreement. Attraction to the singular is observed in (93), since the singular *stuff* attracts singular agreement on the verb (*is*). This contrasts with “*lots of people are coming to our party*”, where plural *people* reinforces the plurality of the referent and triggers plural agreement on the verb.

Although there are cases in which the singular is the number that causes attraction, these sentences are rare. Normally, it is the plural that provokes proximity concord. This fact is according to some authors related to a question of *markedness* (see Bock & Eberhard, 1993; Eberhard et al., 2005 or Haskell, Thornton & MacDonald, 2010 in the psycholinguistics literature). The singular form has been considered the “unmarked” or “default” number, that is, that to be used in neutral circumstances, where no positive indication of plurality is present (Quirk et al., 1985: 756-note). This would explain why the existential *there* or the interrogatives *who* and *what* are considered as singular when they are subjects in existential constructions and interrogatives.

In summary, attraction is a type of linguistic phenomenon that may lead us to think that a purely syntactic account of agreement is not a valid explanation for such an intricate and complicated mental operation like agreement. It seems that morphology also has a role to play when speakers create ties within sentences. The same is true for semantics, which, as explained in section 2., seems to play a very clear role in agreement processes. We may therefore think that generativist theories could be refuted.

6. CONCLUSIONS

This first chapter has tried to provide an analysis of agreement (or concord) from the perspective of Generative Grammar, which sees agreement as an independent and encapsulated process which depends solely on syntax. The main syntactic rules leading to the understanding of such a point of view have been explained, while many of the flaws in the premises which this theory postulates have been presented in other sections in this chapter. The alternative viewpoint provided by lexicalist theories (such as those of Pollard & Sag (1994) or Wechsler & Zlatić (2003), where nouns are said to possess index features which match those of the word's semantics) has also been presented. Our view is more in line with this last conception of agreement, rather than with syntactocentric postulates of the topic. In fact, the presence of semantic information is quite visible on certain structures. Eleven of such structures (collected in grammars) have been analysed and discussed (we referred to collective nouns, reference transfer, coordinated subjects, indefinite expressions, measure phrases, proportional constructions, interrogatives, existential constructions, singular plurals, distributive constructions and the third person override in clefts), finally reaching the conclusion that semantics (and not only syntax) is to a large extent responsible for their agreement resolution.

A third constraint has been presented in the last section of this chapter, namely morphology. The influence of pure morphology on agreement computation has been revealed through the analysis of attraction errors. Our conclusion was once again that agreement must not be solely syntactic but a combination of various linguistic forces (syntax, semantics, morphology and even pragmatics).

In the next chapter, we are going to present a study in which the influence of meaning (semantics) on the final resolution of agreement marks will be demonstrated with the use of extensive data. Moreover, we are going to try to demonstrate that other constraints can also influence agreement operations, as is the case with morphology. So two different languages with two different morphological systems (one with a very robust morphology and another with a very poor one), will be compared with regard to

agreement, and our results will reveal whether strong morphological systems are able to influence agreement to a greater extent than weak systems or viceversa.



Chapter 2.

SOME EXPERIMENTAL EVIDENCE OF SEMANTIC INTERFERENCE IN GRAMMATICAL CONSTRUCTIONS: A COMPARATIVE STUDY BETWEEN ENGLISH AND SPANISH

1. INTRODUCTION

The main aim of this chapter is to investigate number conflicts in subject-verb agreement. It is worth noting the fact that the structures that will be analysed are considered as grammatical and correct, and even collected in grammars. Thus, the set of studies that will be presented can only reflect agreement mechanisms whenever grammaticality is not put at risk.

As previously noted, one of the most characteristic properties of agreement is precisely its sensitivity to various influences (syntactic, semantic, morphological, pragmatic, etc). Moreover, on some occasions, the competition between these different forces leads the speaker towards uncertainty in use. A German linguist, Thomas Berg (1998), analysed some crosslinguistic differences between English and German agreement in eight particular structures where semantic issues were involved. He showed that the structure of a particular language also has an important role to play when dealing with some particular forms of agreement. In his paper, he suggested that agreement could be based either on notional or syntactic grounds depending on the strength of the morphological system of each particular language. Berg maintained that English was more prone to showing notional agreement when the morphological and notional features of the subject mismatch (this being a consequence of the limited morphology of the English language).

Thus, with collective nouns such as “committee”, for instance, English often establishes a form of agreement based on notional grounds, resulting in sentences such as “*the committee have...*”. However, since English is a deeply left-oriented language (subjects in English are almost invariably located to the left of the verb), recourse to notional agreement is not sought when this puts the left location of the subject at risk. Thus, in a sentence such as “*the cause of the accident was bad brakes*”, English speakers show a tendency to place the subject in an initial (or left) position (therefore they are likely to take “the cause” as subject and not “bad brakes”), thus sticking to an SVO syntactic order. This happens even in spite of the fact that from a semantic point of view, both the preverbal and the post verbal noun phrases are plausible subjects. On the other hand, the agreement systems of other languages work in different directions. Subject-verb agreement involving collective nouns in German is usually resolved morphosyntactically. Thus, agreement with “committee” nouns in this language usually results in a singular match with the verb. However, when there are two possible subjects within the sentence, the parser in German can look to both sides of the verb, and agreement with the postverbal element is possible (and sometimes even more frequent - “bad brakes” would be a normal subject for the previously mentioned sentence-). This is a consequence of the higher syntactic flexibility of German, and the complexity of its morphological system.

Section 2. will provide a comprehensive account of Berg’s (1998) findings.

2. NUMBER CONFLICTS IN ENGLISH AND GERMAN (BERG, 1998).

In order to prove the aforementioned facts, Berg came up with a completion study which tested the following eight structures in both languages:

Table 2- 1: Number conflicts in English and German (Berg, 1998).

PROPERTIES	ENGLISH EXAMPLE	GERMAN EXAMPLE
1. Morphosyntactically singular but semantically plural words	<i>the couple</i>	<i>das Ehepaar</i>
2. Morphosyntactically plural but semantically singular words	<i>Pancakes</i>	<i>Pfannkuchen</i>
3. Postmodified NPs of the kind: “ART (+ADJ) + N(sg) + of (+ADJ) + N(pl)”	<i>a gang of thugs</i>	<i>eine Bande von Rowdys</i>
4. Coordinate structures conjoined by <i>and</i> , <i>or</i> or <i>neither...nor</i>	<i>both he and she</i>	<i>sowohl er als auch sie</i>
5. Comparative NPs of the kind	<i>more than one X and fewer than two Xs</i>	<i>mehr als ein X, weniger als zwei Xs</i>
6. Expressions such as:	<i>many an X</i>	<i>manch ein X</i>
7. NP-copula-NP structures with nominal predicates	<i>the cause (of the accident) + copula (to be) + bad brakes</i>	<i>die Ursache (für den Unfall) + copula (sein) + kaputte Bremsen.</i>
8. Clefts and pseudoclefts	<i>it (to be) the politicians who... -cleft sentence- what interests me + (to be) + N(pl) -pseudocleft-</i>	<i>es (sein) die Politiker, die.. -cleft sentence- was mich interessiert, + (sein) + NP(pl) -pseudocleft-</i>

2.1. Berg's materials and procedure

As mentioned, items from these eight categories figured in two similar completion tests (one in English and the other in German). The tests were distributed to 46 native speakers of German and 57 native speakers of American English. There were a series of blanks which the participants had to fill in (on a written form) with a correctly conjugated verb. They were encouraged to react spontaneously in order to obtain natural and almost unconscious responses in an attempt to replicate their normal way of speaking (although the task was not an oral production task). In order to divert the participants' attention away from the real purpose of the task, the critical items were interspersed with filler items, blank spaces for verbs where agreement was not an issue (Berg, 1998: 48).

2.2. Berg's results

The results that Berg obtained from this completion experiment pointed primarily to a tendency for the English speakers to react "semantically" when the controller is a subject NP denoting notional plurality (e.g. *the committee were*; *a gang of thugs were*). He thought this to be a consequence of the English language's poor morphology, which forces the processor to rely on conceptual structure directly in order to project reference to the top of the NP node. Conversely, for categories 7 and 8, in which there were two possible subjects (on both sides of the copula) the participants preferred as the subject the NP that is placed in preverbal position. Berg (1998: 60) explains the situation in English in the following terms:

As is well known, the inflectional morphology of English is highly impoverished. Case and gender inflectional morphology have completely disappeared and number morphology is restricted to the third person in the present tenses. Thus, there is hardly any opportunity for (syntactically based) agreement processes to operate in English. It is a general cognitive principle that frequency impacts upon

the strength of a phenomenon. The less frequently it occurs, the weaker it is. As a consequence, the limited opportunity that the language provides for expressing syntactically based agreement relationships involves a weakening of the syntactic force. In view of the complementary relationship between the syntactic and the semantic influence, this weakening of the syntactic force implies a strengthening of the semantic force. Hence, the agreement pattern in English is for the larger part semantically based.

The German results were almost the complete opposite of the results obtained from English. As is well-known, German is a language that has a rich morphological component with marks for number, gender and case. This fact allows word order to be much more flexible than in English. As a consequence, German speakers provided more diversified results when they dealt with items in categories 7 and 8, but seemed to cling to morphology blindly when coping with items of categories 1 to 6. Berg (1998: 61) provides the following explanation of how agreement processes work in German:

[...] The situation is quite different in German. Unlike English, it has preserved much of its inflectional morphology, which codes case, gender and number distinctions across the major and (some) minor word classes. Case, gender and number agreement processes are rife in German. In particular, the number agreement between the subject and the verb applies throughout the tense system. This high frequency of syntactically based agreement processes accords a great deal of strength to the syntactic principle, which is therefore in a position to outweigh the semantic influence. As a result, the agreement pattern in German is for the largest part syntactically based.

In summary, English syntactic and morphological attrition causes speakers to: A) always stick to the stipulated word order when there are two potential subjects (a left-orientation

strategy), and B) resort to semantics instead of morphology when, once the subject NP is located, this presents internal layering that launches referential competition. German, however, is quite the opposite, there being variability in locating subjects either to the left or the right of the verb, and blind obedience to morphology to project the subject's head features upwards.

3. ACUÑA FARIÑA'S (2009) REPLICATION FOR ENGLISH AND SPANISH

In the same vein, Acuña Fariña (2009) carried out a similar study for the comparison of English and Spanish. Spanish and German are similar languages in the sense that they both have a complex morphological system that allows word order flexibility. If we establish a comparison between Spanish and English, for instance, we see that in a Spanish sentence such as "*l-o-s pequeñ-o-s candelabr-o-s blanc-o-s y l-a-s cómod-a-s sill-a-s roj-a-s estaba-n allí*" up to 17 different morphological marks conveying agreement (either for gender or number) are used, whereas in the equivalent English translation ("*the little white candlestick-s and the comfortable red chair-s were there*") there are only two. The evident richness of the Spanish (or German) morphological component allows a higher degree of word order flexibility. Thus in most cases, adjectives can be located either before or after the noun (both "*candelabros blancos*" or "*blancos candelabros*" are possible), and subjects are easily placed after the verb in certain types of constructions ("*la causa del accidente fueron los frenos*" or "*los frenos fueron la causa del accidente*"), literally "the cause of the accident were the brakes" and "the brakes were the cause of the accident". As has been said, Acuña Fariña (2009), created a pilot study in which he used some of Berg's structures but this time for a comparison of English and Spanish. Since the results were quite similar to those found in Berg's original study, this pilot study was replicated with a more thorough control of the materials employed. A description of this replication is provided in the next section.

4. A COMPLETION STUDY BY RIVEIRO OUTEIRAL & ACUÑA FARIÑA (2012)

The theoretical implications of the work of Berg and Acuña Fariña were potentially very important, and therefore more data needed to be found in order to either confirm their findings or indicate that the findings ought to be viewed with more caution. This aim was pursued in Riveiro Outeiral & Acuña Fariña's (2012) work. For this new English-Spanish production task, some categories from Berg (1998) were used whereas others were discarded. The omitted categories are the following:

Category 1: morphosyntactically singular but semantically plural words. E.g. *the couple*

Category 2: morphosyntactically plural but semantically singular words. E.g. *pancakes*

Category 4: coordinate structures conjoined by *and*, *or* or *neither...nor* as in *both he and she*

Category 5: comparative NPs of the kind *more than one X* and *fewer than two Xs*

Category 6: *many an X*

Category 8a: Cleft sentences (*it (to be) the politicians who...*)

There are various reasons for the omission of the listed categories (which are present in Berg's study). Categories 2, 6 and 8a were discarded either because these expressions do not have a Spanish counterpart or because their most accurate translations entail a change of structure. To give an example, a word like *pancakes* (category 2) used in its plural form to refer to a type of dish has a close Spanish translation like *tortitas* but it will always show plural agreement, that is, a Spanish speaker would never say **las tortitas es-SG mi comida favorita* ("pancakes is my favourite food") since this sentence is ungrammatical. So although this type of agreement works in English it does not work in Spanish and consequently no agreement conflict exists. Category 6 (*many an X*) can only be translated into Spanish by an impersonal structure of the kind: *los hay que...*, so it had to be dismissed due to the fact that the English and Spanish structures were not at all similar. Finally, cleft sentences (category 8a) were excluded because they have no feasible translation into Spanish or at least not one containing a neuter pronoun like

it. In brief, these three structures are not subject to any number conflict in their Spanish version and so had to be overlooked. Categories 1, 4 and 5 were discarded simply because they produced the same effect as category 3. All these constructions pointed to a plural referent expressed by a word (or a group of words) in the singular. So instead of adding four different categories, it was preferable to include a higher number of examples from the same category. Furthermore, categories 2 and 3 were split into two subcategories. NP-copula-NP structures and clefts have two potential subjects; a formal and a logical one. In order to avoid a possible tendency for subjects to be the most logical (or concrete) or the most grammatical independently of their location within the clause, the sentences were reversed. That is to say, structures such as *the cause of the accident* BE *bad brakes* and the structurally reversed *two broken pistons* BE *the cause of the sinking* were included in the questionnaire. With regard to category 1, the items were manipulated by adding modifiers which emphasized one of the two elements of the complex NP. Thus, there were sentences such as *a very small but quite significant number of children*, in which the first singular noun was modified, and others like *a number of famous actors*, in which the emphasis was put on the last plural element of the NP.

The following table shows the categories finally used in the completion task (also contained in Riveiro Outeiral & Acuña Fariña (2012)):

Table 2-2: *Number conflicts in English and Spanish (Riveiro Outeiral & Acuña Fariña, 2012).*

PROPERTIES	ENGLISH EXAMPLE	SPANISH EXAMPLE
<p>1. Postmodified NPs of the kind: “ART (+ADJ) + N(sg) + of (+ADJ) + N(pl)”</p>	<p><i>a gang of thugs</i> or <i>a number of children</i> + copula (<i>to be</i>)</p>	<p><i>una banda de matones</i> o <i>un número de niños</i> + copula (<i>estar</i>)</p>

2. a) NPsg -copula- NPpl structures with nominal predicates	<i>the cause of the accident + copula (to be) + bad brakes</i>	<i>la causa del accidente + copula (ser) + los frenos</i>
b) NPpl –copula- NPsg structures with nominal predicates	<i>bad brakes + copula (to be) + the cause of the accident</i>	<i>los frenos + copula (ser) + la causa del accidente</i>
3. a) Pseudoclefts	<i>what I actually adore + copula (to be) + N(pl)</i> <i>all you can see there + copula (to be) + N(pl)</i>	<i>lo que a mí realmente me gusta + copula (ser) + N(pl)</i> <i>todo lo que puedes ver allí + copula (ser) + N(pl)</i>
b) Pseudoclefts	N(pl) + copula (to be) <i>what I actually adore</i> N(pl) + copula (to be) + <i>all you can see there</i>	N(pl) + copula (ser) + <i>lo que a mí realmente me gusta</i> N(pl) + copula (ser) + <i>todo lo que puedes ver allí</i>

4.1. Materials and procedure

A series of participants were asked to complete a test which consisted of 51 short paragraphs. In each small text there were a series of blanks which they had to fill in with a correctly conjugated verb. To facilitate this, the participants were given the infinitive form of the verb they had to conjugate (all the items in the completion test can be seen on pages 87 to 92). The questionnaire was distributed to a total of 85 participants who were necessarily native speakers of English (English questionnaire) or Spanish (Spanish questionnaire).

The critical items were interspersed among the 51 paragraphs. The ratio of critical items to fillers (sentences where agreement was not an issue) was 24:96, that is to say, there were four times more fillers than there were critical items in the questionnaire. Only very rarely were two critical items presented without a minimum of 2 or 3 fillers separating them. The Spanish and the English questionnaires were almost identical versions of each other so that there would be a fair comparison between the responses in both languages. The questionnaires were delivered either on paper or electronically (via e-mail). Once the participants had their questionnaires, they were encouraged to provide spontaneous, unpremeditated responses. The participants were told that the aim of the task was to measure the time that native speakers took to complete simple tasks involving verb conjugation in order to compare these times to those of second-language speakers. In this way, the participants' attention was diverted away from the real purpose of the task.

A total of 43 native speakers of English and 42 native speakers of Spanish were recruited for this experiment. The English speakers were either from the United Kingdom or the United States, while the Spanish speakers were predominantly from Spain. No separate analysis based on the participants' origin was made, since dialectal variants were not thought to influence this type of agreement. The ages of the participants ranged from 20 to 62, however, the results were analysed without any focus being put on a subject's age. This is due to the fact that Berg's study showed no effects related to age and so this variable was also overlooked in the present research.

4.2. Results

Overall, the participants understood the task correctly and only one English participant had to be discarded because he did not follow the instructions for the task provided at the top of the questionnaire. In addition, 0.40% of the English data and 0.10% of the Spanish data were classified as inappropriate and thus did not contribute to the final score.

The general results for the critical items are presented below. Table 2-3 shows the number of singular and plural responses for each sentence and the total percentages for both singular and plural responses in the English test. Table 2-4 shows the results obtained for Spanish:

Table 2-3: Results obtained for the critical items of the English test.

Category 1: “ART + (ADJ) + N(sg) + of (+ADJ)+ N(pl)”

A number of + pl

12. A number of famous actors (TO BE) on the red carpet when Brad Pitt and Angelina appeared.

SG	PL	NULL	%SG	%PL
0	40	2	0%	100%

23. A number of children (TO BE) in the playground when this happened.

SG	PL	NULL	%SG	%PL
1	40	1	2.45%	97.55%

38. A very small but quite significant number of children in England (TO BE) hyperactive.

SG	PL	NULL	%SG	%PL
1	41	0	2.38%	97.62%

42. ...a great number of Americans (TO BE) sure that Barack Obama will be...

SG	PL	NULL	%SG	%PL
2	40	0	4.76%	95.24%

A bunch/gang of + pl

16. ...the bunch of grapes (TO BE) on the kitchen table.

SG	PL	NULL	%SG	%PL
9	33	0	21.43%	78.57%

26. That bunch of beautiful big red roses (TO BE) the best thing I could have bought her.

SG	PL	NULL	%SG	%PL
27	15	0	64.28%	35.72%

20. ...the gang of thieves (TO BE) still planning the robbery.

SG	PL	NULL	%SG	%PL
8	34	0	19.05%	80.95%

50. A small but extremely dangerous gang of thugs (TO BE) caught yesterday by the police.

SG	PL	NULL	%SG	%PL
11	31	0	26.20%	73.80%

Category 2: NP-copula-NP

2a) NP(sg)-copula-NP(pl)

3. The cause of the accident (TO BE) bad brakes.

<u>SG</u>	<u>PL</u>	NULL	<u>%SG</u>	<u>%PL</u>
42	0	0	100%	0%

5. The main reason for the conflict (TO BE) their bad relations.

SG	PL	NULL	%SG	%PL
42	0	0	100%	0%

9. The cause of this strike (TO BE) their dreadful work conditions.

SG	PL	NULL	%SG	%PL
42	0	0	100%	0%

18. The consequence of the president's words (TO BE) a lot of bad critiques in some national newspapers.

SG	PL	NULL	%SG	%PL
24	17	1	58.54%	41.46%

2b) NP(pl)-copula-NP(sg)

29. Two broken pistons (TO BE) the cause of the sinking.

SG	PL	NULL	%SG	%PL
3	39	0	7.14%	92.86%

33. Two thousand dollars (TO BE) the reason for the argument.

SG	PL	NULL	%SG	%PL
18	24	0	42.86%	57.14%

40. Amendments 22 and 23 (TO BE) the main cause of the protests.

SG	PL	NULL	%SG	%PL
0	42	0	0%	100%

48. ...his infidelities (TO BE) the cause of the divorce.

SG	PL	NULL	%SG	%PL
2	39	1	4.88%	95.12%

Category 3: Pseudoclefts

3a) What/All.... + copula + N(pl)

6. ...what I actually adore (TO BE) horror films.

SG	PL	NULL	%SG	%PL
19	22	1	46.34%	53.66%

18. ...what worries him most (TO BE) tomorrow's reports in the most well-known international papers.

SG	PL	NULL	%SG	%PL
26	16	0	61.90%	38.10%

14. ...all you can see there (TO BE) trees, flowers and birds.

SG	PL	NULL	%SG	%PL
10	32	0	23.81%	76.19%

21. ...all that he needs to fix it (TO BE) some nuts and a spanner.

SG	PL	NULL	%SG	%PL
17	25	0	40.48%	59.52%

3b) N(pl) + copula + what/all...

30. ...ballet performances (TO BE) what I actually love.

SG	PL	NULL	%SG	%PL
1	41	0	2.38%	97.62%

46. ...all the defensive mistakes they made (TO BE) what worries him.

SG	PL	NULL	%SG	%PL
6	36	0	14.29%	85.71%

35. ...my heart beats (TO BE) all I could hear.

SG	PL	NULL	%SG	%PL
0	42	0	0%	100%

44. \$1,600 (TO BE) all that I need.

SG	PL	NULL	%SG	%PL
37	3	2	92.50%	7.50%

Table 2-4: Results obtained for the critical items of the Spanish test.

Category 1: “ART (+ADJ) + N(sg) + of (+ADJ) +N(pl)”

Un número de + pl

12. Un número de actores famosos (ESTAR) ya sobre la alfombra roja cuando Brad Pitt y Angelina aparecieron.

SG	PL	NULL	%SG	%PL
13	29	0	30.95%	69.05%

23. Un número de niños (ESTAR) en el patio del colegio cuando los hechos ocurrieron.

SG	PL	NULL	%SG	%PL
22	20	0	52.38%	47.62%

38. Un pequeño pero significativo número de niños (MOSTRAR) algún signo de hiperactividad.

SG	PL	NULL	%SG	%PL
9	33	0	21.43%	78.57%

43. Un elevadísimo número de americanos (TENER) la certeza de que Barack Obama...

SG	PL	NULL	%SG	%PL
24	18	0	57.14%	42.86%

Un racimo/ramo/banda de + pl

16. ...el racimo de uvas (ESTAR) sobre la mesa de la cocina.

SG	PL	NULL	%SG	%PL
27	15	0	64.29%	35.71%

26. Aquel ramo de enormes y preciosas rosas rojas (SER) lo mejor que le pude haber comprado.

SG	PL	NULL	%SG	%PL
33	9	0	78.57%	21.43%

20. ...la banda de atracadores (ESTAR) todavía planeando el robo.

SG	PL	NULL	%SG	%PL
32	9	1	78.05%	21.95%

50. Una banda de peligrosos y violentos atracadores (IR) ayer a juicio.

SG	PL	NULL	%SG	%PL
14	28	0	33.33%	66.67%

Category 2: NP-copula-NP

2a) NP(sg)-copula-NP(pl)

3. La causa del accidente (SER) los frenos.

SG	PL	NULL	%SG	%PL
2	40	0	4.76%	95.24%

5. El principal motivo del conflicto (SER) sus malas relaciones.

SG	PL	NULL	%SG	%PL
3	39	0	7.14%	92.86%

10. La causa de esta huelga (SER) sus pésimas condiciones laborales.

SG	PL	NULL	%SG	%PL
13	28	1	31.71%	68.29%

18. La consecuencia de las palabras del presidente (SER) un montón de desfavorables críticas en algunos periódicos nacionales.

SG	PL	NULL	%SG	%PL
11	31	0	26.19%	73.81%

2b) NP(pl)-copula-NP(sg)

29. Dos pistones rotos (SER) la causa del hundimiento.

SG	PL	NULL	%SG	%PL
6	36	0	14.29%	85.71%

33. Dos mil euros (SER) el motivo de la disputa.

SG	PL	NULL	%SG	%PL
9	33	0	21.43%	78.57%

40. Las enmiendas 22 y 23 (SER) la principal causa de las protestas.

SG	PL	NULL	%SG	%PL
1	41	0	2.38%	97.62%

48. ...las infidelidades de Javier (SER) el motivo del divorcio.

SG	PL	NULL	%SG	%PL
2	40	0	4.76%	95.24%

Category 3: Pseudoclefts

3a) Lo que/todo lo que/todo cuanto.... + copula + N(pl)

6. ...lo que a mí realmente me gusta (SER) las películas de terror.

SG	PL	NULL	%SG	%PL
0	42	0	0%	100%

18. ...lo que seguro más le preocupa (SER) los titulares de mañana de los principales periódicos internacionales.

SG	PL	NULL	%SG	%PL
0	42	0	0%	100%

14. ...todo lo que puedes ver allí (SER) árboles, flores y pájaros.

SG	PL	NULL	%SG	%PL
2	40	0	4.76%	95.24%

21. ...todo cuanto necesita para arreglarlo (SER) unas cuantas tuercas y una llave inglesa.

SG	PL	NULL	%SG	%PL
4	38	0	9.52%	90.48%

3b) N(pl) + copula + lo que /todo lo que/lo único que...

30. ...las representaciones de ballet (SER) lo que en realidad me gusta.

SG	PL	NULL	%SG	%PL
8	34	0	19.05%	80.95%

46. ...todos los errores defensivos que cometieron (SER) lo que más le preocupa.

SG	PL	NULL	%SG	%PL
21	21	0	50%	50%

35. ...los latidos de mi corazón (SER) lo único que podía oír.

SG	PL	NULL	%SG	%PL
12	29	1	29.27%	70.73%

44. 1.600 euros (SER) todo lo que necesito.

SG	PL	NULL	%SG	%PL
29	13	0	69.05%	30.95%

As has been pointed out, tables 2-3 and 2-4 above provide a breakdown of the results obtained in each critical sentence contained in the Spanish and the English questionnaires respectively.

The following diagrams provide a detailed comparison between the English and the Spanish results obtained in each category:

4.2.1. Category 1: “ART + (ADJ) + N(sg) + of (+ADJ)+ N(pl)”

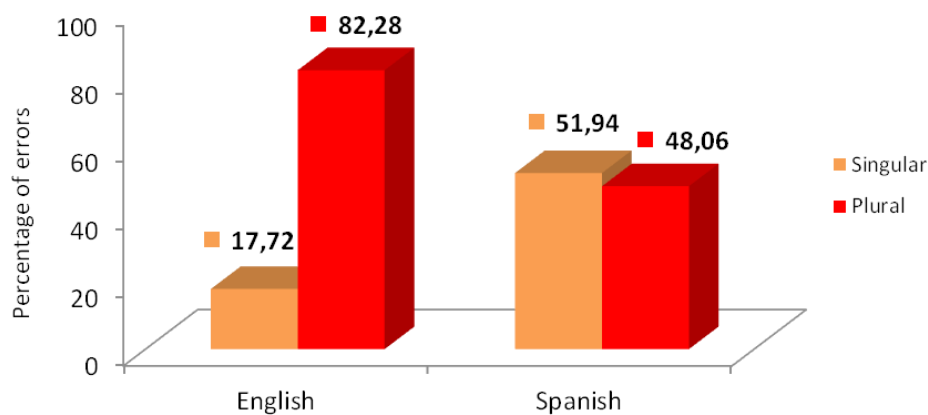


Figure 2-1: *A (+ADJ) number/bunch/gang of + pl. // Un (+ADJ) número/racimo/ramo/banda de + pl.*

4.2.1.1. English

The results obtained for category one (figure 2-1) point to the following facts: there is a clear tendency towards plural agreement in English (82.28% pl. vs. 17.12% sg). English participants base agreement choice on the notional plurality of these expressions rather than on their grammatical singularity. Notice that, as opposed to what happens in **attraction**, these choices *are* grammatical. It is worth bearing in mind that the sg-pl make-up of the phrases which typically induces **attraction** effects in the psycholinguistic literature accounts for up to 13% of incorrect responses at the most (Eberhard et al. 2005), so **attraction** alone cannot explain this clear pattern of behaviour. Direct appeal to conceptually plural referentiality of expressions such as “*a gang of thugs*” is then

responsible for the choice of a plural verb. These expressions denoting multiple referents behave in a similar way to collective nouns.

Sentence (16), *the bunch of grapes (TO BE) on the kitchen table*, presents additional constraints influencing agreement choice. It shows a robust preference for plural and may well represent a tendency towards the grammaticalization of all of the pre-N2 sequence as a sort of complex determiner or quantifier in the way suggested by, for instance, Brems (2003), Verveckken & Cornillie (2012) and Langacker (1991a: 89) (see below on *un número de* in Spanish and Verveckken & Cornillie (2012)). The interesting thing is that, as Keizer (2007: 151) notes (see also Brems, 2003), these complex NPs have three possible analyses and varying strengths of activation: a) as right-headed structures; b) as referential, left-headed structures and c) as hybrids:

First of all, one and the same construction can be interpreted in more than one way, depending on the way in which the entity in question is conceptualized by the discourse participant. Thus a construction like *a cup of coffee* can be conceptualized either as a concrete object containing some fluid or as a certain amount of coffee (the volume of an average coffee cup). But, [...], this evidence is not always unequivocal; instead it seems as though the two conceptual domains (of containment and quantification) overlap, or blend, in the mind of the language user, resulting in a construction which exhibits features of both. In those cases, the construction in question can be regarded as conceptually situated on the border of two categories [...]

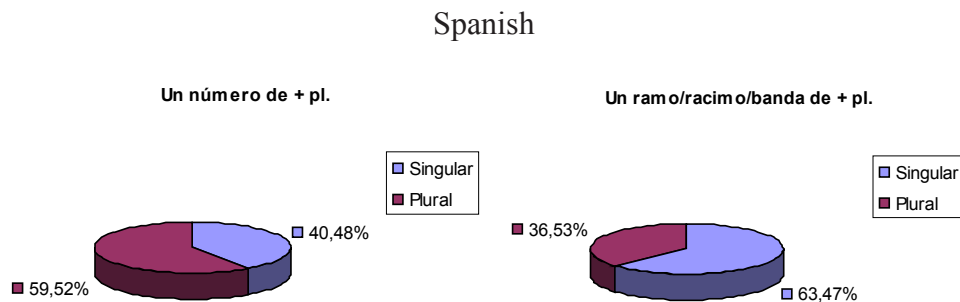
4.2.1.2. Spanish

The Spanish results showed much more variability, although generally speaking, participants seemed to prefer the singular, causing the verb to agree with the grammatical features of their nominal expressions (rather than with the notional ones). However, a high number of plural responses were also given by the participants in this experiment. Closer

inspection shows that these plural answers were mainly found in one construction only, namely *un número de...* (“a number of”). The reason for this disparate behaviour might be that *number*, unlike *gang* or *bunch*, does not easily evoke a referent unless it is associated with another noun that provides more *imaginable* referentiality (Eberhard, 1999). This is at least partial evidence for a syntactic analysis of such desemanticized strings as complex determiners, along the lines of recent work by Keizer (2007: VI), cited above, where such “pseudo-partitive” constructions are seen as “right-headed”. By contrast, the duality of *a gang of thugs* or *a bunch of flowers* is evident in that one can easily **profile** the entire set –as opposed to the containing units in the set– making them potentially “left-headed” (while still also potentially right-headed, hence their duality). In this respect, the work by Verveckken & Cornillie (2012), which is based on a corpus analysis, sheds light on this construction in Spanish. According to these authors, the traditional idea that agreement in *N-de-N* constructions is based only on syntactic parameters (like the distance between N1 and the verb or its position with respect to it) needs being reconsidered since, according to the data they have analysed, conceptual criteria seem to play an important role in them (coinciding with our results as well). As said, Verveckken & Cornillie point to some interesting facts concerning the semantics of the elements involved in the sentence: for instance they claim that the type of verb used has a lot to do with the number resolution on the verb. In this respect, they take into account if the verb contains any contextual indices suggesting plurality (Fält, 1972) or if it has a distributive reading (Brucart, 1997). Another important semantic parameter is the use of N2, that is, whether the speaker wants to emphasize the idea of plurality of the constituents mentioned in N2 or if it tries to highlight the idea of unity conveyed by N1. Therefore, these authors propose that syntactic criteria are not sufficient on their own in order to establish agreement in such constructions. Semantic criteria seem to have a weight in number agreement processing, although, as they point out, they denote tendencies, not absolute rules. In summary, Verveckken & Cornillie conclude that instead of supposing that each and every lexeme is predetermined towards agreement with N1 or N2, we should take into account that

every lexeme shows a certain tendency to develop quantitative uses and therefore to be interpreted as singular or plural.

Figures 2-2 and 2-3 show the difference in the percentages obtained for singular and plural in *un número de + pl.* and *un racimo/ramo/banda de + pl.*:



Figures 2-2 and 2-3: Different results obtained for *un numero de + pl.* and *un racimo/banda de + pl.*

4.2.1.3. Special cases

Sentence (26), *That bunch of beautiful big red roses (TO BE) the best thing I could have bought her*, is also interesting in that it provided the majority of the (anti-trend) singular responses. In fact, sentence (26) is the only sentence within this category which shows a higher number of singular than of plural responses in English (27:15). It is noteworthy that this sentence was manipulated by adding dependents to the second noun of the complex NP, a fact that was intended to increase its topicality. This also separated the head noun and the verb more than in standard cases of attraction. Yet the processor preferred agreement with the head, against the general tendency of the construction, and that of the language at large. This suggests a strong level of entrenchment of the *a bunch of FLOWERS* construction as a left-headed structure and is precisely in line with Brems' idea (2003: 294ff.) that the original meaning of *bunch*, which used to be applied to only a restricted set of nouns such as *flowers*, *grapes* and so on, retains its strong lexicality with such modifiers (therefore not promoting its own grammaticalization as a quantifier, see Verveckken & Cornillie, 2012). Since in general no effects of the topicalization provided by increased adjectivization were obtained, no further reference will be made to this.

4.2.2. Category 2: NP-copula-NP

4.2.2.1. Sub-category 2a

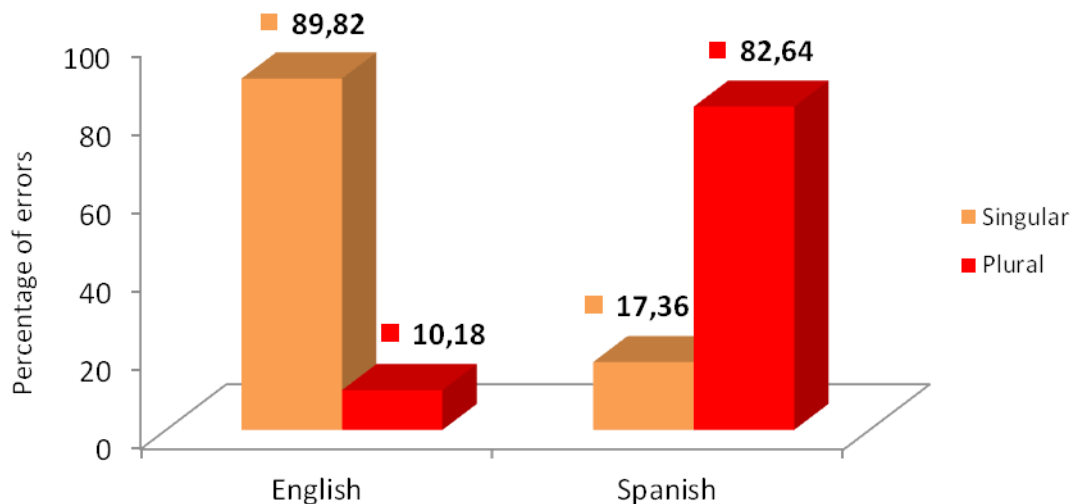


Figure 2-4: NP (sg) - copula - NP (pl)- Eg: *the cause of the accident (TO BE) bad brakes // la causa del accidente (SER) los frenos.*

4.2.2.1.1. English

The results for category 2a (Figure 2-4) show an inclination in the English speakers to choose the NP which is located to the left of the verb (in this case the one in the singular) as the subject of the sentence. This is a consequence of the fact that English speakers tend to find the subject in a preverbal position, due to the strong SVO bias of this language. As maintained by Berg (1998: 41), this left-orientation is most probably caused by its morphological attrition, since English cannot use morphological marks in order to match distant elements within a clause. Thus, subjects are almost always located to the left of the verb, since word order is the only way to assure that there will be a relational link between subject and predicate.

4.2.2.1.2. Spanish

A comparison with Spanish reveals almost the completely opposite pattern, as this language prefers agreement with the most “informative” NP, that is, with the NP that is

semantically and/or pragmatically richer, irrespective of its position within the structure of the sentence. The general tendency of the language no doubt contributes to this trend, for as is well known, in Spanish information structure is usually accommodated via word order arrangements, which results in the frequent postposition of focal subjects (Lambrecht, 1994).

4.2.2.1.3. Special cases

In the English completion test, the only sentence which did not follow the same parameters as the rest of the elements in category (2a) was sentence (18) *the consequence of the President's words (TO BE) a lot of bad critiques in some national newspapers*. This sentence induced participants to produce more plural responses than in the rest of the sentences belonging to this category (41.46% pl). Two possible explanations for this were found: first of all, there might be an attraction effect since there is a plural local noun (*words*) that may be attracting the verb towards plural agreement, consequently preventing verb agreement with the singular feature of the head noun. Secondly, there might be a semantic constraint in the expression *a lot of* which in view of its plural connotations, might cause the agreeing verb to be plural.

4.2.2.2. Sub-category 2b

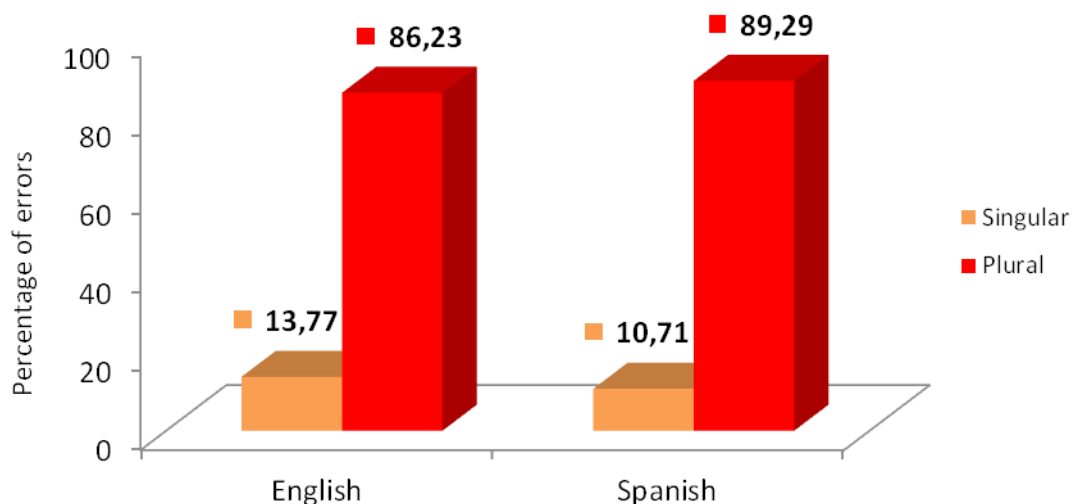


Figure 2-5: NP (pl)- copula- NP (sg)- Eg: two broken pistons (TO BE) the cause of the sinking // dos pistones rotos (SER) la causa del hundimiento.

4.2.2.2.1. English

As illustrated in figure 2-5, here both languages show a strong tendency towards plural agreement. In the case of English, this can be predicted due to the syntactic constraints which cause the verb to agree with the element on its left, which in this case is plural.

4.2.2.2.2. Spanish

As for Spanish, the syntactic flexibility of this language allows agreement with either of the two NPs. Here, the Spanish participants seem to prefer (as in 2a) the NP which is more contentful (*dos pistones rotos, dos mil euros...*) instead of the cohesive, low-information-value NP after the copula (*la causa, la consecuencia, el motivo...*)³.

4.2.2.2.3. Special cases

Only one English sentence provided more singular responses than expected. Sentence (33) *two thousand dollars (TO BE) the reason for the argument* obtained 42.86% of singular responses and 57.14% of plural ones. Although the statistics point to a preference towards the plural, the number of singular answers is much higher than that of the other sentences of this category (see table 2-3). A suitable explanation for this is that amounts of money show a predisposition to make the verb choice singular as money quantities tend to be regarded as unities instead of as a collection of different entities in English. However, since the NP *two thousand dollars* shows marks of morphological plurality (the *-s* morpheme in *dollars*), the tendency points to plural agreement. Plural is considered the *marked* value of number whereas singular is considered the *unmarked* value (Croft, 1991: 54), since it lacks morphological/phonological marks. Thus, plural is more prone to attract the verb, as it has an activated number feature that singular lacks (singular is considered the “default” value). So the plural morpheme in *dollars* may attract the verb towards plural agreement. Another fact that causes the agreeing verb to be plural in this sentence is that the numeral *two* immediately activates plural agreement. Numerals are the linguistic expressions which are most closely related to grammatical number. Thus, *one* normally activates a singular feature whereas numerals higher than *one* cause activation

3 See section 7.5. of chapter 5 in relation to “semantic richness”.

of the plural feature and provoke plural agreement. This type of constraint is semantically based since we normally associate the numeral *one* with single referents and numerals such as *two* with plural ones.

In brief, several constraints which influence the agreement choice were found in this category, with these constraints being mainly syntactic, semantic and morphological ones.

4.2.3. Category 3: Pseudoclefts

4.2.3.1. Sub-category 3a

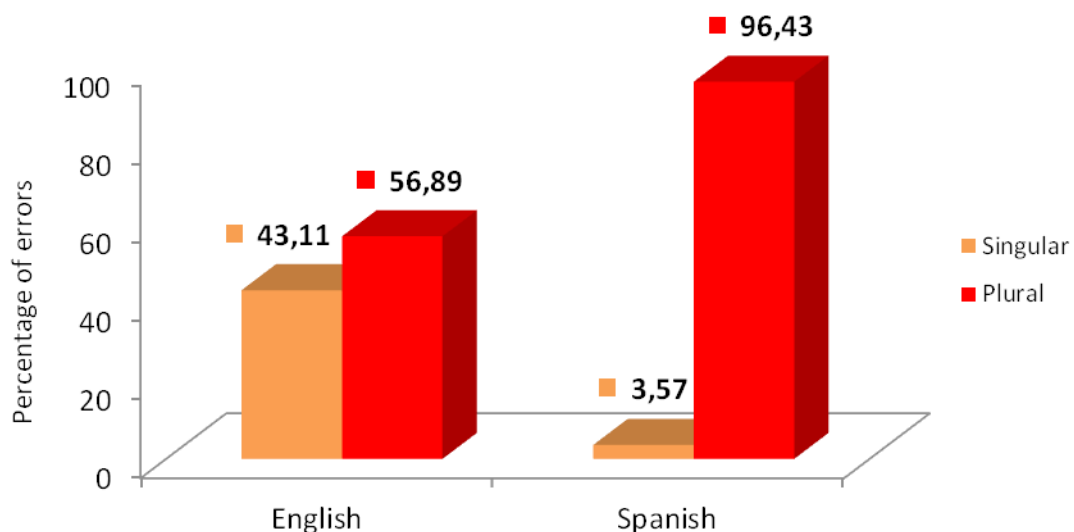


Figure 2-6: *What/all that// lo que/todo lo que/todo cuanto...-copula-N(pl)- Eg: what I actually adore (TO BE) horror films // lo que a mí realmente me gusta (SER) las películas de terror.*

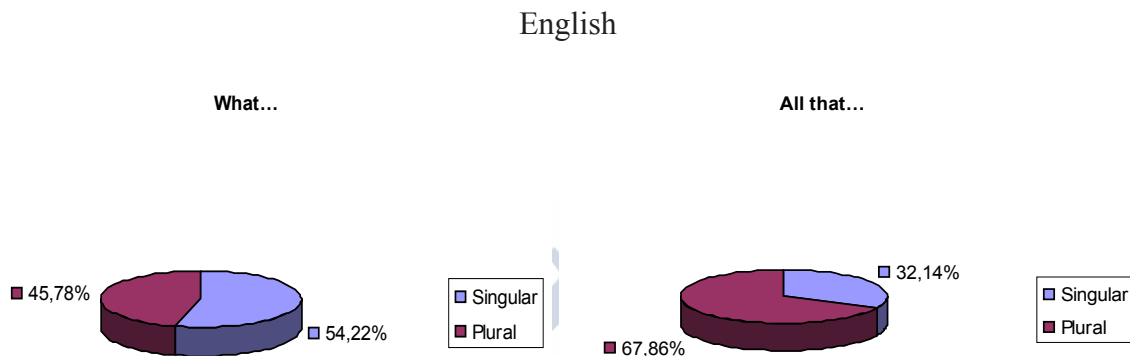
4.2.3.1.1. English

Overall, the pattern does show that even English can overcome its solid SVO bias under certain circumstances. It is interesting that Berg (1998: 57) also attested to this reversal of the left-orientation reflex of English in his study. He suggested that *all* and *what*:

[...] are relatively neutral in terms of number. The pronoun *all* for example can modify a singular noun (*all the time*) or a plural noun (*all the students*). This

relative neutrality does not interfere with the semantic principle, which may consequently deploy its full vigor. (Berg, 1998: 57)

However, a distinction must be made in English between pseudoclefts beginning with *what* and those beginning with *all*. Figures 2-7 and 2-8 show that the results for these two types of pseudoclefts are not similar:



Figures 2-7 and 2-8: Pseudoclefts beginning with *what* vs. pseudoclefts beginning with *all*.

In fact, pseudoclefts beginning with *what* in English promote verb agreement with the constituent to the left of the verb (the *what*- clause), while pseudoclefts beginning with *all* show a stronger inclination toward plural verb agreement. So the majority of the English anti-trend results for this category pertain to the specific case of the latter construction. A possible explanation for this is that the word *all* has such strong inherent plurality in its conceptualization that the competition between semantics and syntax is clearly won by the former. Berg (1998) did not make any distinction between these two types of expressions and thus did not obtain clear results for pseudoclefts.

4.2.3.1.2. Spanish

In category 3a (figure 2-6), Spanish again shows a tendency for the more contentful NP to be the controller of agreement regardless of its syntactic position within the sentence. As in the previous category, Spanish speakers seem to disregard quasi-empty, anaphorically-

cohesive nominals as agreement controllers and opt for rich, focal referents to connect with the predicational core. For instance, they normally prefer to establish verb agreement with a noun phrase such as *horror films* rather than with a sentence beginning with either *what* or *all* (e.g. *what I actually adore*) which is more semantically inert and much less easily imaginable and topicalizable. This trend is extremely strong.

4.2.3.2. Sub-category 3b

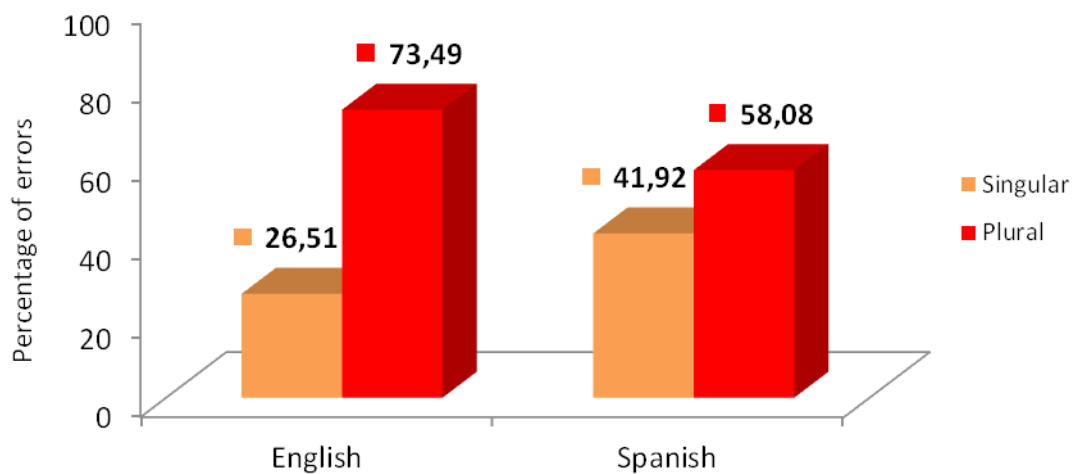


Figure 2-9: *N (pl)- copula- What/all that// lo que/ todo lo que /lo único que...- Eg: ballet performances (TO BE) what I actually love // las representaciones de ballet (SER) lo que en realidad me gusta.*

4.2.3.2.1. English

In category 3b (figure 2-9), both languages show a preference for plural agreement. The combination of English habitual left-orientation and the NP1's inherent topicality explains this effect.

4.2.3.2.2. Spanish

As predicted, the lack of left-orientation leaves content/topicality as the main instigator of Spanish responses and as a consequence, a more flexible effect has emerged in this language.

4.2.3.2.3. Special cases

There are two sentences which deserve special attention, namely; sentence (46) of the Spanish questionnaire and sentence (44) in both the English and the Spanish completion tests.

Sentence (46) *todos los errores defensivos que cometieron (SER) lo que más le preocupa* is the only item that obtained exactly the same number of singular and plural responses. This sentence was expected to show plural agreement since the constituent which is more “semantically full” is *todos los errores defensivos*, and Spanish had demonstrated in previous categories to prefer agreement with the most contentful constituent than with the most grammatical one. However, the presence of the expression *lo que más* in the second element biases the verb towards singular agreement because it adds a nuance of singularity which influences the interpretation of the sentence.

Sentence (44) in both versions of the test: *\$1.600 (TO BE) all that I need // 1.600 euros (SER) todo lo que necesito*, might be placed in relation to sentence (33) as both involve the expression of quantities of money. As seen in (33), *two thousand dollars (TO BE) the reason for the argument*, amounts of money tend to be seen as unities and thus normally cause the verb to agree with the singular. It was also mentioned that if any plural morphological mark exists, the tendency towards singular agreement partially decreases. Example (44) in the English test is especially interesting because it involves the expression of a quantity of money with no visible morphological marks (\$1.600). Furthermore, this quantity contains the number 1, which is the prototypical expression of singularity. So the processor might be constrained by:

- The notional number of the expression in a twofold sense: the referent might be either conceptually plural (\$1.600 understood as the sum of many dollars) or singular (it is a single entity composed of many elements).
- A psychological bias. “\$1.600” contains the number 1, which may activate a singular schema for the sentence.

- A lack of morphological marks. The absence of plural morphological marks may cast a shadow over the notional plurality of this expression, thus favouring a singular interpretation of it.

In general, these constraints, which are supposed to compete during processing, seem to favour singular verb agreement and the results obtained for this sentence point to the same conclusion (37sg. vs. 3pl). It might therefore be concluded that the number ambiguity of the element which is to the left of the verb makes the parser resort to other types of linguistic information (semantic and morphological) to resolve the agreement operation.

Additionally, there is an unexpected result obtained in the Spanish version of this sentence: *1.600 euros (SER) todo lo que necesito*, which might be related to morphological constraints. The English-Spanish translation of the sentence is not identical since a morphological mark was added in the Spanish test. The *-s* morpheme denoting plural number influenced the percentage of singular and plural responses. In the Spanish questionnaire, even though the tendency continues to be singular, the number of plural responses increases in relation to the English translation of the same sentence (29sg. vs. 13pl). So even a relatively weak factor such as morphology might have considerable influence when other factors are not decisive. In brief, English tends to choose as the controller of agreement the element which is located at the left of the verb. However, when the grammatical and the semantic features of this element do not match, there is a competition between different linguistic constraints until finally the stronger value prevails.

5. CONCLUSIONS

The conclusion we can draw from the set of studies described in this chapter (Berg, 1998; Acuña Fariña, 2009 and Riveiro Outeiral & Acuña Fariña, 2012) is that agreement is not an on-off switch which, when pressed, works in the same predetermined ways for all the languages of the world. Similar results to those in Berg (1998) and to the pilot study of Acuña Fariña (2009) were obtained in the last work presented, which indicates that English behaves differently from German and Spanish, whereas the latter two languages display a similar pattern of behaviour. The crosslinguistic comparisons that the three languages afford are limited both quantitatively and qualitatively, and besides this, the three do not represent drastically different linguistic genealogies. In spite of this, the fact that they behave in the expected way (given Berg's ideas about the repercussions of morphology in setting grammatical and processing biases) is surely relevant.

However, it is not a question of emphasizing the poor morphology of English compared to the rich morphology of Spanish and German, as this is already well-known. Similarly, it is also commonly understood that as English gradually lost its once rich morphology, it veered towards and finally settled for a rather rigid word order (Sonderegger, 1998), whereas Spanish and German did not (due to retention of their rich morphology). The theoretical significance of what Berg (1998) suggested, which the present work tries to reinforce is that far from displaying a frozen picture of either a formal or a semantic nature, agreement uses more semantic or more syntactic regulation depending on the morphological *status quo* of each language. This architectural opportunism is, however, perfectly synchronized with the way languages align themselves in terms of the interaction between word order and information structure, affording a series of neat, formal predictions. Firstly, all things being equal (such as the domain of agreement), the stronger the morphological component of each language is, then the less likely it is that semantics will penetrate into feature percolation operations inside the noun phrase. This was evident from the results for category 1 in Spanish (the “*a NOUN of NOUN*” construction). Conversely, the less morphology is employed, the stronger the

need to resort to semantics in order to project referential phrases, and subject phrases in particular – as shown by the English results for the same category. Furthermore, with less morphology, there will be more need for subjects to be located in stable locations, resulting in word order fixity in the sense suggested by Hawkins (1994: 372; 2004: 160; see also Siewierska, 1998). As the results of category 2b show, this tendency is noticeably not subject to ceiling effects, since the results are even more robust when left-orientation and content are aligned. The results also suggest that formal and semantic regulation of agreement operations cannot be set *a priori* as a fixed Chomskyan cycle of encapsulated computation, as in current phase-based forms of generative grammar (Chomsky, 2001: 46; 2005: 13). Instead they depend on the particulars of each language, as these have varying degrees of morphological strength. Finally, and this was evident in both our results and in Berg's, intracategorical variability was observable for every category in the three languages studied (e.g. “*a bunch of*” construction in English and the “*un número de*” construction in Spanish). This means that in production, semantics can readily tamper with cyclic domains of agreement, in cases where semantic construals are inescapably useful, even in richly-inflected languages like Spanish or German. In English, complex NPs may show a continuum ranging from right-headedness (with first nouns reanalyzed as parts of complex determiners) to left-headedness (and “standard” nominal syntax), with intermediate cases as suggested by Brems (2003), Verveckken & Cornillie (2012) and Keizer (2007). The data from the identifying structures are particularly interesting in that they show the fluid nature of the choices: 1. In English the NP subject is expected to occur left of the VP through its position in an underlying SVO template, and meaning is not needed, and thus, not consulted; 2. However, after another cycle of computation, meaning has an additive effect when it aligns with left-oriented choices, as well as a competing effect when it does not, as is the case with the pseudo-cleft construction involving the conceptually plural *all*; 3. the Spanish NP- be- NP sequences also show how a language that punctiliously observes morphological information when constructing phrasal constituents disregards that information during the functional assembling of the sentence structure. Indeed, one of

the study's most conspicuous findings was that a central component of sentence structure – the identification of the subject phrase of which something is predicated – is resolved differently within the two languages examined.





Chapter 3.

AGREEMENT IN PSYCHOLINGUISTICS

1. INTRODUCTION

In this chapter we are going to analyse agreement from the perspective of processing, which has been the focus of much of the psycholinguistic research on agreement carried out in the last two decades. We will try to shed light on the question of what the mental mechanisms are which intervene during the computation of agreement marks by providing a review of the main theories proposed in the psycholinguistics literature.

2. THEORIES OF AGREEMENT AND THE NOTION OF “ATTRACTION” IN PSYCHOLINGUISTICS

We have previously seen that many grammars have described some structures in which semantics is responsible for agreement resolution (see chapter 1). This fact has been verified through the set of experiments presented in chapter 2, in which some grammatical structures with clear semantic traces have been examined in three different languages (English, German and Spanish). A priori, the structures used in chapter 2 seemed to cause no special trouble, since the results obtained in the completion tests were always grammatical sentences. However, they seemed to cause the processor to work in different ways, as it had to decide whether to base agreement on syntax or semantics in each particular case. On the other hand, on some occasions, the meddling of semantics (or any other information source) can cause ungrammatical sentences to arise. In this respect, the notion of “attraction” (see section 5. of chapter 1) has been introduced into the psycholinguistics literature on this topic. By “attraction” we mean the phenomenon which causes the features present in the local noun (instead of those of the head) to

interfere with the verb, leading to an incorrect selection of number in the verb. Sometimes this meddling may be due to purely morphological causes, as was explained in chapter 1, and sometimes it may be due to semantic causes. Psycholinguistic research on the causes of attraction errors during the processing of agreement started in the 90's with the works of Kathryn Bock and collaborators (Bock & Miller, 1991, for instance). The questions raised by these authors with regard to the nature of agreement are still unanswered, with the topic being debated to this day. In the next section, we are going to provide a review of some of the most relevant trends in the study of the processing of agreement (especially in production).

2.1. The beginnings: Theories of syntactic encapsulation

Whether the modular theories posited by the Generativism of the 80's had psychological validity or not was the focus of extensive research over many years, and research in this area has continued up to the present day. According to modular and syntactocentric theories, agreement processes take place during grammatical encoding, and non-syntactic information (semantics, pragmatics, morphology, etc.) is thought to be unable to affect this process (at least during its very first phases (Chomsky, 1999, 2001)). Therefore, processing is for such a theoretical conception divided into separate stages. The first stage is that of message formulation. The second stage consists of the retrieval of the corresponding lexical items and the subsequent planning of the syntactic structure. Finally, the phonological form of the sentence is created. Thus, syntax would be the most salient stage of language processing, as illustrated in figure 3-1, proposed by Bock & Levelt (1994):

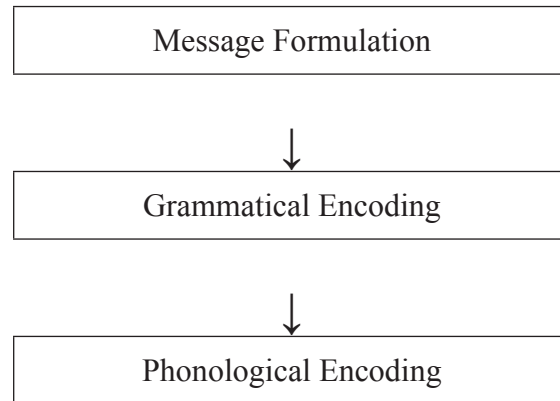


Figure 3-1: *The Bock & Levelt (1994) model of speech production.*

Serial models assume that these stages occur one at a time and that after one stage is terminated there is no possible return to it, that is to say, overlapping between stages is not possible.

Despite what these theories affirm, mental access to semantics is quite likely to be at play in some structures in the very early stages of processing. There exist various commonly used structures that reflect the influence of semantics (see chapter 1). We refer for example to those structures containing collectives (e.g. *the team was angry because of the defeat. **They** had lost the world cup or *?the team are about to win the competition*), among many others. So, contrarily to what Generative Grammar claims, agreement is definitely an interface problem, as the so-called interactive models of processing have suggested. Interactive models believe in parallel processing instead of serial processing. That is, syntax, semantics, pragmatics and even phonetics work at the same time. Thus, these models neither believe in the autonomy of syntax nor in modularity in general. Syntax is not an independent module which can be separated from other facets of language or even from other aspects of human cognition but is part of a system in which the interaction between different levels of language is necessary.

In the 1990s, Kathryn Bock attempted to prove the validity (or invalidity) of the previously mentioned generative theories through experimental work which made use of certain structures which, according to her, could prove the processing mechanisms employed in the resolution of agreement cues. Thus, in Bock & Miller (1991), they

developed a series of experiments in which they presented a set of sentence subjects with the form NP-*prep.*-NP (that is, a complex noun phrase of the kind: *the key to the cabinets...*) to a series of participants. What these participants had to do was to complete such unfinished sentences with the first words that came to their minds as long as they were able to create meaningful sentences. Participants had to complete the sentences as quickly as they could, as the ultimate purpose of the experiment was to see how agreement failures came to happen in simulated spontaneous speech. Bock & Miller divided their investigation into three different experiments: in the first experiment they manipulated the distance separating the head noun and the verb by inserting linguistic material between them. In this way, they tried to work out whether the length of the postmodifier (and consequently the increment in the distance between the head noun and the verb) could be responsible for an increase in the rate of agreement errors. What they found was that the occurrence of agreement errors was unaffected by the length of the postmodifier, errors being equally likely with short as well as with long postmodifiers (Bock & Miller, 1991: 62f). They also examined if distributivity was able to exert an influence on the resolution of verb agreement (as in: *the letter from the lawyers*-where there is only one letter and therefore a single referent- versus *the picture on the postcards* -where every postcard has a picture on it and as a consequence the mental referent is multiple-), but negative results were also obtained concerning this semantic variable. The only recurrent pattern that they did find in the participants' responses was that errors were much more likely when the head was singular and the local noun plural (responding to a "markedness effect" (Bock & Eberhard, 1993; Eberhard et al., 2005; Thornton & MacDonald, 2010). In their second experiment, they introduced two more semantic variables to the preambles, namely "concreteness" and "animacy", in order to see whether semantics had any role to play in processing or if agreement processes are only syntactic, as generative grammarians had always asserted. What the analysis of the errors indicated was that concrete local nouns were scarcely more likely than abstract local nouns to provoke attraction effects ($p < .06$). As a consequence, they disregarded the variable "concreteness" as a potential source for

attraction errors, thus discarding any effect of semantics during syntactic processing. The same conclusions were reached for “animacy”, which was regarded as non-influential, again pointing to a non-interactive way of processing. In their third experiment the same results were obtained, allowing them to conclude that subject-verb agreement in number was to all intents and purposes encapsulated and automatic (it could neither be influenced by linear distance nor by any semantic constraint). So according to this research, whenever the features of the local noun were present on the verb, this failure could only be due to their incorrect percolation. Processing was then thought to be linear in the sense that those features in the controller were thought to be inherent and features in the target were thought to be copied from the source.

Later on, Bock & Eberhard (1993) delved a little more deeply into the issue of morphological/phonological control in agreement marking. To this end, they came up with a series of completion tests which followed the same methodology of their 1991 study. In their first two experiments, they explored the likelihood of attraction errors happening after singular local nouns which phonologically resembled plural nouns. So they compared sentences such as: *the player on the course* with *the player on the courts* (notice the phonetic resemblance between *course* and *courts*). They compared these sentences with the singular base: *the player on the court*. The premise these authors pursued was the following (Bock & Eberhard, 1993: 66):

If there is a phonologically based mechanism that contributes to normal agreement, we would expect to see more agreement errors after singulars that phonologically resemble plurals than after phonologically unambiguous singulars.

Contrary to their hypothesis, the results showed that local nouns resembling plurals in their phonological form (*course*) did not produce higher agreement error rates. It was thus demonstrated that attraction errors only occurred after preambles with true plural local nouns (*courts*). This pattern of results was confirmed in the first two experiments. The third

experiment dealt with irregular plurals, as *feet* or *children*. This time, they tried to see whether the irregular plurality of nouns (or the absence of the habitual *-s* mark) could exert an influence on the number resolution on the verb. The hypothesis was that *kids* should elicit the same number of errors as an irregular such as *children*, since both nouns convey plurality, and what the results revealed was precisely this, that regularity in terms of plural marking on the noun did not attract agreement more. That is to say, regular (*kids*) and irregular (*children*) local nouns were equally likely to attract the verb towards the plural number, thereby producing similar numbers of agreement errors. Moreover, both regular and irregular plurals were more likely to produce agreement failures on the verb than the singular nouns they were compared to (*boy*, for instance). These results suggest that it is not the surface plural morphology which controls agreement but rather an abstract specification of plurality (Bock & Eberhard, 1993: 80). However, as the authors attest (Bock & Eberhard, 1993: 81):

[...] the results do not illuminate the nature of that specification, in particular whether it is grounded in number meaning or in a lexical stipulation of singularity or plurality.

In order to clarify this point, they introduced collective nouns in their last experiment. If the notional number of the local noun was able to attract the verb, singular collectives such as *army*, for instance, should attract the verb to themselves more often than non-collectives like *soldier*. The results obtained point to the following: English speakers tend to treat morphologically singular collectives as singular for the purposes of verb agreement (Bock & Eberhard, 1993: 87). So, both singular collectives and singular individuals provoked almost the same number of errors in the error elicitation task, and again, errors occurred more often after plural local nouns, independently of their collective or non-collective status. However, it is worth mentioning the fact that more errors occurred after plural collectives than after plural individual referents. This line of enquiry may lead us to think that the notional plurality conveyed in the collective, in combination with the plurality denoted by

the plural mark, increased the tendency to create attraction errors. Nevertheless, notional plurality of local nouns on its own was definitely not influential enough to create attraction.

Research on this topic continued in the following years. In a later work by Bock, Nicol & Cutting (1999), they continued to test different structures (involving potential semantic interference) that could misguide the parser. On this occasion, they tested the effect of collective nouns once again, but in two different types of targets; verbs and pronouns. As is known, singular subjects normally take singular verbs, and plural subjects take plural verbs. However, in the case of collectives, plural verbs are allowed with morphologically singular subjects as long as the collective in it clearly depicts a group of things or persons. For this reason, Bock and her collaborators tested whether the presence of a collective in the local noun position could cause an increment in the probabilities of making attraction errors. According to the *Agreement Hierarchy*, the likelihood of semantic agreement increases as we move towards the right of the hierarchy: *attributive > predicate > relative pronoun > personal pronoun*. Thus, personal pronouns (which are the furthest right in the hierarchy) should allow more semantic interference than verbs. In order to prove this, they asked a number of participants to create completions for sentence fragments. They had to complete those preambles in three different ways: with a verb, with a tag pronoun and finally with a reflexive pronoun. All the sentence fragments showed the same number conditions:

Verb-eliciting fragments:

The actor(s) in the soap opera(s)/ The cast in the soap opera(s)

Tag pronoun-eliciting fragments:

The actor(s) in the soap opera(s) rehearsed/ The cast in the soap opera(s) rehearsed

Reflexive pronoun-eliciting fragments:

The actor(s) in the soap opera(s) watched/ The cast in the soap opera(s) watched

The preambles had a subject noun that was singular, plural or collective and a local noun that was either singular or plural. All the possible combinations were included. Participants were divided into three groups. Each group was assigned a list containing one of the three types of preambles (verb-eliciting, tag pronoun-eliciting or reflexive pronoun-eliciting). The preambles were presented auditorily. All participants had to repeat the fragments and immediately complete them with a full sentence of the designated kind (Bock et al., 1999: 335). So when participants in the first group heard a sentence fragment such as: *the actor in the soap operas...* they first repeated it and then immediately complete the sentence with a verb, thus forming a full sentence such as: *the actor in the soap operas was/*were popular*. The number of attraction errors, that is, those showing attraction with the features of the local noun, instead of with those of the head noun, as for example in: **the actor in the soap operas were popular*, were counted. Participants in the second group had to complete the fragments with a tag pronoun. Thus, after hearing a preamble such as: *the actor in the soap operas rehearsed...*, they had to complete it with a tag of the kind: *the actor in the soap operas rehearsed, didn't he/*they?* Again, attraction errors (those using the tag pronoun *they*) were counted. Finally, participants belonging to the third group had to complete the preambles with a reflexive, thus forming full sentences such as: *the actor in the soap operas watched himself/ *themselves*. Exactly the same procedure was followed for the preambles containing a collective noun (*the cast in the soap opera(s)...rehearsed/watched*). What the analysis of the results obtained for collectives revealed was that, when they are agreement targets for collectives, verbs reflect the grammatical number whereas pronouns tend to reflect the notional number of the controller. To illustrate this with an example, the results show that: *?the cast in the soap opera rehearsed, didn't they?* and *?the cast in the soap opera watched themselves* are more likely options than *?the cast in the soap opera were popular*⁴.

In brief, it was concluded that there exist some noticeable effects of collective notional number on subject-pronoun agreement, although the same cannot be said of subject-verb agreement. These results were not contradicted until Haskell & MacDonald

4 These two types of pronouns (tags and reflexives), which were said to behave differently since Chomsky's 1981 Binding Theory, were demonstrated to show a quite similar behavior, thus contradicting Chomsky's premises.

(2003) found that there exist visible traces of notional agreement in subject-verb agreement in English as well. So up to this 1999 study, agreement was basically thought of as a copy-percolation issue, where pure semantic interference was only present in certain marginal domains, such as that of pronoun-antecedent agreement (in consonance with Corbett's *Agreement Hierarchy*), but not in agreement computation in general.

2.2. Vigliocco, Butterworth & Semenza (1995), Vigliocco, Butterworth & Garrett (1996a), Vigliocco, Hartsuiker, Jarema & Kolk (1996b) and Unification theories

Attraction issues continued to be the focus of much research after the debate started by Bock & Miller (1991). This meant that the force exerted by semantics during agreement processes continued to be tested. Interestingly, in 1995-1996a and b, and in opposition to previous research by Bock et al. (1999) for English, Vigliocco and colleagues did find robust effects for the variable distributivity when they tested it in Romance languages. In their 1995 paper, the influence of distributivity was clearly evidenced in Italian as well as in Dutch and French. Thus, they found more errors in a multiple-token item such as *l'etichetta sulle bottiglie* ("the label on the bottles" -notice that every bottle has its own label) than in a single-token referent preamble like *il viaggio verso le isole* ("the journey to the islands"). It was noticed that these results were in opposition to those achieved for English in Bock & Miller's 1991 study, so Vigliocco et al. (1996a) found it necessary to replicate the experiment in English, as well as in another Romance language such as Spanish. What they found in their 1996a work was that Spanish was also susceptible to distributivity. Thus, similar languages (in terms of their morphological and lexical systems), such as Italian, French and Spanish, were shown to be equally sensitive to semantic interference. However, the effect of distributivity was not observed in English after applying the same test in this language. These findings agreed with those published by Bock & Miller, 1991. So it seemed that the inner structural characteristics of different languages could vary the degree of semantic penetrability in the computation of agreement.

The results achieved for English were interpreted in the light of Unification theories (Shieber, 1986; Copestake, 2002; Pollard & Sag, 1988; Wechsler & Zlatić, 2003; Wechsler, 2008). In the words of Vigliocco et al. (1996a: 267) Unification maintains that:

[...] the two elements which participate in the agreement relation specify partial information about a single linguistic object. Unification involves the merging of information located in two compatible structures.

According to them, agreement is not an issue of copying features from one sentence element to another. Unification, which shares the linguistic philosophy that every form of language has an associated meaning (Langacker, 1991b), assumes that words contain information about the structures they can be combined with, agreement being simply a matter of making features match. Agreement is not then directional in essence, since features are just checked in various words and only those features that match in all of them became unified. This conception of agreement as a “long component” or “discontinuous morpheme” (Ferguson & Barlow, 1988: 13) has been shared by lexicalist theories such as that of Wechsler & Zlatić (2003), described in chapter 1. According to them, agreement usually works along syntactic lines, but whenever it encounters any semantic constraint, the *index* features of words (instead of their *concord* ones) lead the process.

The results obtained by Vigliocco et al. (1995-1996a and b) also suggest that agreement seemed to work differently in different languages. According to them, there are three different parameters that may explain the likelihood of semantic interference interrupting agreement processes in different languages (Vigliocco et al., 1996a: 288):

- A rich verbal inflectional system versus a poor verbal morphology
- The presence of post-verbal as well as pre-verbal subjects versus a fixed word order
- The possibility of dropping subject pronouns versus mandatory pronouns (pro-drop)

Especially relevant is the first assumption that languages with a poor verbal morphology are more susceptible to semantic agreement than richly inflected languages. This fact could explain the results achieved in their experiments as regards the language differences observed. Vigliocco et al. base this theory on the fact that, in the history of languages, agreement markers in the verb phrase seem to derive from pronominal elements (which came to be reduced and attached to the verb). Thus, morphologically rich languages may keep more pronominal traces in their verbs than morphologically poor ones (as is evident, since Spanish verbs reflect number, person and tense, whereas most English verbs only reflect tense). Consequently, pronominal features could be more or less present in different types of agreement (subject-verb; subject-personal pronoun, subject-relative pronoun, etc.) in different languages, and the likelihood of semantic interference would be therefore related to the presence of pronominal features in the target (Vigliocco, 1996a: 289). This theory could explain the high number of attraction errors which are found in distributive sentences in Spanish, Italian or French but which are not found in English.

Vigliocco et al. (1996a) reasoned that a copy-percolation model of processing would never be able to account for their results, since in such models, semantic agreement is the result of the incorrect transmission of features, but this incorrect transmission should equally occur in structurally different languages. Thus, this theory cannot account for the Spanish/Italian/Dutch/French versus English results.

Vigliocco & Franck (1999) offered a new theoretical approach to agreement processes by developing two theories. They labelled these opposing hypotheses, “Maximal Input”, and “Minimal Input”. According to “Maximal Input” (Vigliocco & Franck, 1999: 458):

[...] conceptual structures may exert a stronger control on the workings of the grammatical encoder. In this view, agreement processing is responsive to features of the conceptual representation beyond using them to assign syntactic features.

On this view, “Minimal Input” entails that (Vigliocco & Franck, 1999: 457):

Conceptual connotations (e.g. male or female) are used to establish the syntactic features (e.g. masculine or feminine) of the agreement controller (the noun). After these syntactic features have been established, no other information is retrieved from conceptual structures.

The latter theory is obviously compatible with copy-percolation views of agreement processing which assume that no looking-back processes are possible in cyclic derivations, whereas Maximal Input assumes that every morph (every agreement cue) is a symbol and that as such they come with a meaning side to be consulted.

In summary, up to this point, two different approaches were taken: first, the “encapsulation view”, which posits that agreement processes are only dependent on syntactic features and disregard semantic information as a primary source for establishing agreement ties, and second, the Unification theory, which states that the semantic features of words are “checked” in each and every element of the sentence, and those which match are considered for agreement purposes. In the latter, semantic information is considered by the grammatical encoder in a phase later than that of lexical retrieval. Therefore, up to this point it looked as if copying was better for languages of the English-style and Unification for languages of the Romance-style.

2.3. Imageability and distributivity in English (Eberhard, 1999)

As has been said, up until now, semantic effects had only been observed in Romance languages and Dutch. However, the issue could become more complex if semantic effects could also be observed in a language like English. This is indeed what Eberhard found in 1999 in relation to the variable “distributivity”. In her experiments, she used different preambles from those employed originally by Bock & Miller (1991) and further replications of that study (Bock, Eberhard & Cutting (1992), Vigliocco et al. (1996a and b)), since methodological problems were, according to her, found in Bock’s experiments.

But what distinguished Eberhard's preambles from those used by Bock & Miller in 1991? According to Eberhard, it was the lack of *imageability* in the latter which led to the erroneous results. Thus, in order to avoid imageability problems, in her 1999 experiment Eberhard changed all the preambles as well as the methodology employed. Since Bock & Miller's sentences were very difficult to imagine, high imageability ratings could be assured by providing pictorial images of the given preambles. Additionally, two rating studies with different groups of native speakers of English showed that the phrases chosen by Eberhard were easier to imagine than the original sentences in Bock & Miller's study. As suggested in Eberhard (1999: 575):

[...] previous failures to find a reliable effect in English may have been due to the use of subject phrases whose distributive referents were difficult to imagine. This difficulty is assumed to have reduced the conceptual accessibility of the phrases' conceptual number to the verb-agreement processes.

As pointed out, when such methodological barriers were put down by Eberhard, significant distributivity effects were found in English. As a consequence, semantic interference was no longer only a matter of the type of language tested, but of language processing in general. Therefore, after 1999 the inherent influence of semantics at early processing stages of processing started to be considered.

In summary, Eberhard's results pointed to the fact that both conceptual and grammatical number are equally accessible during verb-agreement computation. Consequently, new theoretical approaches to the topic of agreement processing were developed. One such new theoretical formulation was that elaborated by Bock et al. (2001) under the name of "Marking and Morphing". This approach tried to meet the demands of previous results.

2.4. Marking and Morphing (Bock et al., 2001)

In light of the complex results achieved in various languages, i.e. English, Italian, Spanish, French, Dutch, etc., a new theoretical perspective to the topic was thought up by Bock et al. which could account for the new results. They named this theory “Marking and Morphing”, since it described agreement as a two-step type of process. Marking and Morphing was conceived as a hybrid theory, since it brings together both formal and semantic approaches. Thus, both control (copy-percolation) and compromise (features’ unification) are according to this new theory present during agreement processes (although they play independent parts). Thus, as these authors point out (Bock et al., 2001: 89):

Number marking occurs during the mapping between messages and lexical-grammatical representations, while number morphing occurs during constituent assembly.

In other words, number marking occurs in a first stage in processing where the semantic features of the subject are compiled after being retrieved from lexical selection. Notice that this procedure differs from that proposed by unification theories (as presented in Vigliocco et al., 1996a), since in the latter, both the subject phrase and the verb are responsible for number marking, that is, features are retrieved from both subject and verb in order to be checked. In Marking and Morphing, however, only the features of the subject phrase are responsible for marking. They base this assumption on the fact that in English, verbs do not usually carry any sense of singularity or plurality. English verbs were likely to have pronominal traces that could add a certain sense of number in past periods in the history of the language (Givón, 1976), but these number traces are completely eliminated in Present-day English, so present day native speakers cannot process any trace of singularity in verbs. After the *Marking* phase comes the *Morphing* operation. During Morphing “[...] the specifications of number in the lexicon are morphologically instantiated and, if necessary, reconciled with the number features on the subject” (Bock et al., 2001: 91). For instance, words such as “furniture” or “orchestra”, which have a plural conceptualisation (they

are formed by a set of things), have instead a singular morphology, and these opposing features have to be “reconciled” (the number specification of the whole phrase is adjusted) during the morphing stage. Morphing therefore corresponds to a pure morphosyntactic operation that takes place after the semantic features of the subject have been defined in the marking phase. Later on, those features are copied onto the verb through a copy-percolation operation, as formal models have always suggested. This model is able to account for the results achieved in various languages for distributive referents. According to Marking and Morphing, the plural verb in a sentence such as *the label on the bottles* is the result of the detection of notional plurality in the sentence subject during the marking stage and of copying that plurality onto the verb during morphing.

The following diagram, taken from Bock et al. (2001: 88) depicts the basis of this theory:

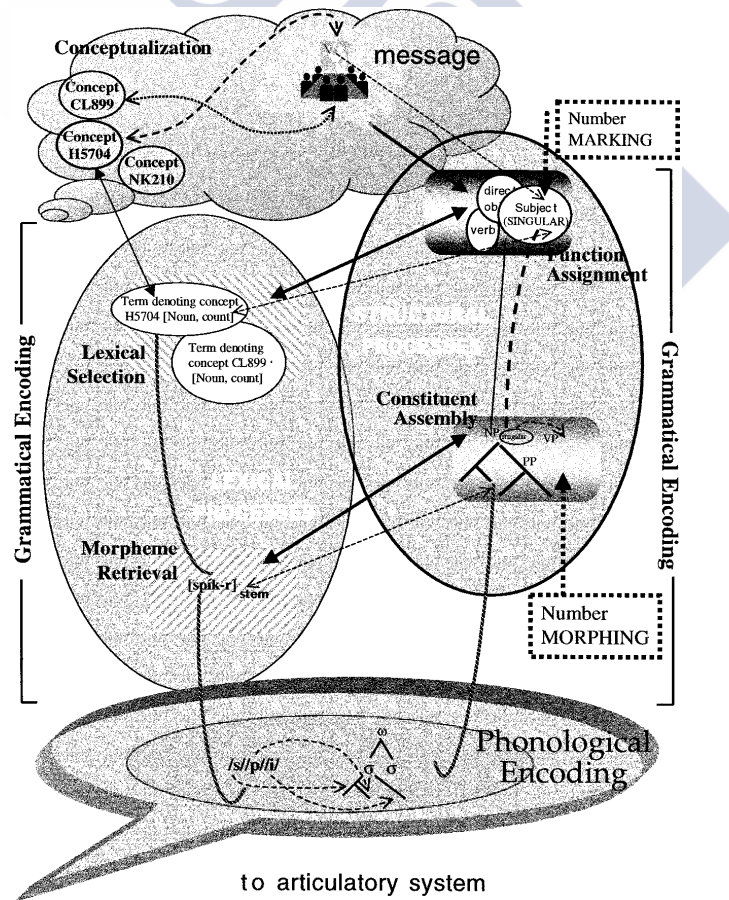


Figure 3-2: Exemplification of the processing mechanisms used during sentence computation according to the Marking and Morphing theory.

Thus, the occurrence of mistakes in distributive sentences is not attributed to attraction per se but to notional plurality in the subject. Whenever pure attraction happens (wrong copy of features from the local noun, as in **the baby on the blankets are...*) it should simply be attributed to the wrong copy of features in the morphing stage. In order to reinforce this theory, they tested the influence of three different types of words, namely summation plurals (*scissors*), collectives (*team*) and mass nouns (*rice*) in subject-verb agreement processes. These words, which convey a certain sense of plurality (or singularity in the case of bipartite objects like *scissors*) in their meanings, were inserted as local nouns in a series of sentence subjects that Bock et al. (2001) used as their experimental preambles in various experiments. The objective of the tests was to see whether the plurality/singularity of these elements on its own (but not of the whole subject phrase) could affect the number of agreement errors. What the results of the first experiment revealed was that whenever a summation plural such as *scissors* occupied the local noun position, fewer errors than with regular plurals (such as *cars*) were found. Bock et al. (2001) attribute these results to issues related to *contrastiveness*. That is, bipartite objects do not have a regular counterpart as they always appear in the plural form, therefore, it is more difficult to make mistakes when these nouns are involved, since there is no opposite singular form the word can be contrasted with. The same occurred with invariant plurals such as *suds*, which provoked fewer errors than invariant plurals due to the same reasons. So what these authors claim is that it is not the singular or plural meaning of the word which is decisive for agreement but its morphological contrastiveness.

In their last experiment, Bock et al. (2001) tested collectives and mass nouns such as *team* or *rice*, which are grammatically singular but notionally plural. A notional account of agreement would predict that the same number of mistakes would be found in those preambles containing such words as in those containing regular plurals (like *cars*), since both types of words convey the same plural meaning. Moreover, collectives and mass nouns should, according to these theoretical accounts, elicit more mistakes than variable singular local nouns. Bock & Eberhard (1993; experiment 4) had already

evidenced that *soldiers* produced attraction whereas *army* did not, so they tried to verify such results in this new experiment. As expected, no effect of the local noun's notional number was observed in the results. That is to say, it was confirmed that *army* did not attract more than *soldier*, but that its plural form *soldiers* did.

To sum up: “[...] the results argue that notional number is neither necessary nor sufficient for attraction to occur, whereas grammatical number is both necessary and sufficient” (Bock et al., 2001: 115). In addition, the crosslinguistic perspective acquired by testing the same materials in both English and Dutch revealed that the mechanism for processing agreement is the same in these two languages.

In conclusion, Bock et al. (2001) divide the processing mechanisms of agreement into two independent stages (Marking and Morphing). Marking takes place first, and it takes into account the notional features of words after lexical retrieval of the referents in the message. After this stage, morphing occurs, which acts independently of semantic information and via a copy-percolation mechanism. Whenever a pure attraction phenomenon occurs, it takes place during the morphing stage as the result of the faulty transmission of features, but such an effect can by no means be related to any notional cause. This theory seems to be applicable to various constraints (distributivity, collectivity, etc.) and to function in more than one language.

The Marking and Morphing approach gained importance in the subsequent years. In fact, Eberhard et al. (2005: 532) presented it as a theory that “[...] helps to unify the psycholinguistic evidence on agreement in English and other languages”. They first explained how marking and morphing could also apply to a type of target different from verbs, namely pronouns. According to their hypothesis, pronouns are at all times controlled by notional number whereas verbs are always controlled by syntactic number. That is, verbs are resolved in the morphing stage where they are given the morphological form specified for the whole subject during marking. So, they receive this number specification through a copy operation. Conversely, pronouns acquire their number directly through meaning: “[...] the process of selecting an appropriate pronoun being the same as the

process of selecting an appropriate word to denote a particular referent” (Eberhard et al., 2005: 535). This approach provides an explanation for previous experiments which reported a difference between subject-verb and pronoun-antecedent agreement, as in Bock et al. (1999).

In spite of the fact that hybrid theories arose which combined both semantically-driven and formal processes, the hypothesis which stated that meaning is present from the very beginning but also at all times in processing continued to be supported by some authors. Three studies deserve mention in this regard; Thornton & MacDonald’s (2003) paper on plausibility; and two papers on the topic of semantic integration, one by Solomon & Pearlmuter (2004) and the other by Gillespie & Pearlmuter (2011). We will now provide a review of each of these three papers, beginning with Thornton & MacDonald’s 2003 paper.

2.5. Plausibility (Thornton & MacDonald, 2003)

Thornton & MacDonald (2003) tested the influence of plausibility on subject-verb agreement. If plausibility (which affects the semantics of the sentence, and to some extent its pragmatics as well) could be held responsible for influencing the morphological form of the verb, then serial models of processing, where semantics plays no role in the first stages of processing, could be discarded, and this type of evidence could therefore also be added to that which reported distributivity, collectivity and other semantic effects.

In their first and second experiments, Thornton & MacDonald tested the effect of plausibility in production through a completion test in which, once again, a modified version of Bock & Miller’s 1991 preambles was used. In their last experiment (experiment 3), the same materials as those in the previous two experiments were used, but this time they were part of a comprehension task. In this way they tried to confirm whether or not production and comprehension followed similar patterns in subject-verb agreement processes.

Starting with the first two experiments (production), they used unfinished sentences of the type *the album by the classical composers* that participants had to complete with a given verb and some desired complements. The plausibility of the verb that they were encouraged to use was manipulated; either a verb such as *praised* was presented to them (both nouns; *album* and *composers*, could be plausible subjects of the verb, since both *albums* and *composers* can be praised) or a verb such as *played* was presented (only the head noun (*album*) could be a plausible subject for the verb *play*, since only *albums* (but not *composers*) can be played). As has been said, participants were provided with both the preamble and the verb to be produced (*to be*). This allowed for a high degree of control over the experimental preambles. Moreover, the form of the sentence beginnings (in addition to the use of *to be*) induced participants to create passive sentences, and this led to a high number of inflected verb forms in their responses, thus avoiding methodological problems such as those found in Bock & Miller's 1991 study, where the majority of verb forms had to be discarded from the final score due to the fact that they were not inflected for number. The hypothesis was that processing should be more difficult when the two noun phrases were plausible subjects rather than when only the head noun was plausible (Thornton & MacDonald, 2003: 753). Indeed, this is exactly what they found in their results. Whenever the two nouns were plausible subjects (as with the *praised* option), the number of attraction errors increased due to a simultaneous activation of two potential subjects for the verb. However, if only the head noun was a plausible subject for the given verb (as with *played*), then the number of errors drastically decreased.

In their third experiment, Thornton & MacDonald tried to see whether comprehension processes were analogous to production processes. They used the same preambles, although this time they introduced them in a self-paced reading task⁵. What they found in this experiment was that comprehension processes were also more difficult

5 A self-paced reading task is an online technique used for research in psycholinguistics where experimental sentences are presented in a "moving window" (individual words or parts of the sentence are presented one at a time and the participants have to press a button once they have read the word/ part of sentence presented). This methodology allows psycholinguists to measure the amount of time needed by a particular person in order to read the word/part of sentence presented on the screen. The more difficult to process a word is, the longer it will take the participant to read it.

when there were two plausible subjects within the sentence instead of just one (lower reading times where found). Thus, they concluded that plausibility affects equally both production and comprehension processes. Moreover, it is worth alluding to the fact that in these three experiments the plausibility effect was visible only in the singular-plural condition, thus corroborating the “markedness” effect found in Bock & Miller’s (1991) pioneering experiment.

The results obtained were interpreted in the light of the so-called “Constraint Satisfaction” models of processing (Haskell & MacDonald, 2003). As Thornton & MacDonald (2003: 755) point out in relation to these models:

[...] computing agreement is not the copying of the number feature from the subject NP to the verb, but a constraint-satisfaction process in which multiple cues are integrated in the production of an inflected verb form.

According to them, plausibility is one of those multiple constraints that can interfere in agreement processes and it does so in both production and comprehension. Thus, agreement is not a simple copy of features from the sentence controller to its target, but the result of multiple probabilistic constraints that can affect the process at every single step. These constraints may have different natures (semantic, syntactic, phonetic, etc.) and, as pointed out, they can influence the whole process at different levels.

In summary, the idea that all possible sources of information could be active during the whole process gained strength in the light of the work done by Thornton & MacDonald, and this trend seemed willing to discard the traditional idea that agreement processes are linear and independent from other sources of information.

2.6. Semantic integration (Solomon & Pearlmuter, 2004 and Gillespie & Pearlmutter, 2011)

By the term “semantic integration”, Solomon & Pearlmutter (2004) and later on Gillespie & Pearlmutter (2011) referred to whether the constituents in a subject noun phrase had either a tight or loose semantic relationship. In their tests, they showed a series of pictures to some participants, and the participants then had to describe the pictures using a complex noun phrase. For example, they were shown a picture in which there were some flowers painted on a drawing (the drawing and the flowers were “integrated”) together with another picture in which there were some flowers and a drawing (presented as separate or “unintegrated” elements). By using such pictures, they compared the semantic relation established between the constituents in *the drawing OF the flowers* with those in *the drawing WITH the flowers*. In the first sentence subject, the preposition *of* is used, which unifies the two referents (*drawing* and *flowers*) by forming a unique and integrated referent. Thus, the sentence was said to show a high degree of semantic integration between its elements. Conversely, in *the drawing WITH the flowers*, the two elements are loosely connected (they can easily be imagined as separate components and consequently as independent referents), so the semantic integration levels in it were said to be low. The idea initially expressed in Solomon & Pearlmutter (2004) was that semantically integrated nouns within the same sentence lead to simultaneous planning, thus increasing the chance of producing attraction errors. That is to say, the features of two semantically integrated nouns are processed in a parallel way in terms of time, and this could mislead the parser into establishing incorrect agreement connections. In fact, integrated pictures/sentences caused longer speech onset times and more agreement errors. The idea of semantic integration was complemented in Gillespie & Pearlmutter (2011), where they tested the relationship between linear distance and semantic integration in order to create the concept of “scope of planning”. According to them, linear distance to the head noun was far more important than hierarchical distance for the establishment of incorrect agreement ties. Thus, those nouns placed closer to the verb were more likely to interfere with verb number than the more distant ones. This contradicted previous purely

hierarchical feature passing accounts (Eberhard et al., 2005, Franck, Vigliocco & Nicol, 2002; Vigliocco & Hartsuiker, 2002, etc). The aforementioned hypothesis was tested and corroborated in their first experiment, in which they compared the amount of errors made in flat (e.g. *the highway to the western suburb(s) with the steel guardrail(s)* –notice that both *suburb(s)* and *guardrail(s)* modify the head *highway*) and descending structures (e.g. *the backpack with the plastic buckle(s) on the leather strap(s)*– notice that *strap(s)* modifies *buckle(s)*), that is, they analysed the differences in the participants' responses in sentences consisting of a head NP followed by two prepositional phrase (PP) modifiers, where the first PP modified the first NP, and the second PP modified one of the two preceding NPs (Gillespie & Pearlmutter, 2011: 2). In this experiment they held semantic integration between the head noun and the two other nouns in the PPs constant. As said, no effect of hierarchical distance was found, so only linear distance was responsible for the pattern of results obtained. In their second experiment, they analysed whether linear distance and semantic integration combined in order to contribute to an increment of the number of agreement errors. Their initial hypothesis was summarised in the following quote (Gillespie & Pearlmutter, 2011: 8f.):

An additional possibility is that linear order and semantic integration combine to determine the timing of planning of elements, in which case nouns linearly closer to the head would be more likely to interfere, but the extent of interference would be increased by greater integration with the head and decreased with reduced integration. This account suggests that the scope of planning during grammatical encoding may have an influence on agreement computation.

That is to say, semantically more integrated and linearly closer elements are planned together and as a consequence, they can be more easily confounded. Conversely, the lower the degree of semantic integration and the greater the distance between two elements in the sentence, then the more separately are they processed in terms of time,

and as a consequence, they are less likely to be mixed. This is precisely what they found in the results of their second experiment, namely that a combination of linear distance and semantic integration was responsible for an increment in the likelihood of making agreement errors. As has been advanced, they came to term this mixture of factors “the scope of planning account”. This theory is related to memory issues, since the fact that similar sentence components are retained in memory at the same time was thought to be responsible for an increment of agreement failures. Other memory-based accounts were also proposed in relation to agreement mistakes. One such account is the “Working Memory Retrieval Model” of Badecker & Kuminiak (2007). The basis of this model will be described in the next section.

2.7. A memory-based account: Badecker & Kuminiak’s Working Memory Retrieval theory (2007)

Badecker & Kuminiak’s approach to the topic of agreement production introduces working memory resources as an important part of the process. According to them, subjects are linked to representational elements that encode subjecthood; being in the nominative case, occupying a certain position within the sentence, etc. (Badecker & Kuminiak, 2007: 69). Consequently, when subjects are recovered from working memory, these subject features are used as retrieval cues. When more than one element in the vicinity of the subject share any of the cues of the actual subject, then multiple candidate controllers are activated in our working memory, leading to a potential failure in the retrieval of the right subject features. Thus, mis-selection due to the proximity of two nouns with the same retrieval cues is quite likely to happen due to memory misguidance.

Badecker & Kuminiak tested the above hypothesis in an experiment in Slovak. The results they obtained provided empirical evidence for their theory. As they observed, in Slovak, whenever there were two nouns close to the verb and those two nouns shared the form of the nominative case (the case form associated to subjects), a competition between the two nouns started to the point that the number of errors due to mis-selection increased.

According to their theory, since two different nouns had subject retrieval cues, both nouns were activated at the same time in working memory and consequently the processor was likely to fail in the right selection of features. In this way, they demonstrated the importance of the role played by working memory in the computation of agreement. So attraction errors do not seem to be only a matter of the prominence of syntax over semantics (or vice versa), but also of other influences during processing such as working memory failures.

3. CONCLUSIONS

Up to this point we have seen various theories that explain (in different ways) how agreement processes occur. Some of these theories clash, in the sense that they point to agreement being processed in different ways and constrained by different factors. Thus, further research in this area is needed in order to clarify what the exact sources of information are which influence agreement processes and to understand the extent of the influence these sources of information may have. To this purpose, and as our own contribution to the field, two different sets of research are to be shown and explained in the following chapters. Firstly, we are going to deal with a psychological variable that has been demonstrated to exert an influence on various linguistic processes, namely “emotionality”. Research will be conducted in both Spanish and English (two different types of languages) in order to see the functioning of agreement processes in relation to this variable. This will be dealt with in chapter 4. In chapter 5, a different variable (concreteness) will be analysed in relation to agreement operations dealing with number. The magnitude of the influence of such a semantic constraint on agreement operations will also be revealed through a series of experiments conducted in Spanish and English. In chapter 6, previously mentioned theories about agreement will be connected to the results obtained in the two sets of experiments which will be described in chapters 4 and 5. Thus, the premises postulated by all the theories which have been described in the present chapter will be assessed by comparing the main tenets of these theories with the results obtained in our experiments.

Chapter 4.

A STUDY OF EMOTIONALITY IN AGREEMENT OPERATIONS

1. INTRODUCTION

Various semantic forces were demonstrated to “meddle” in syntactic processing in the most recent literature on psycholinguistics. For the purposes of the present chapter, a new and quite unexplored force will be investigated in relation to the syntax-semantics interaction during the processing of complex noun phrases with the structure: NP-of-NP+ copula + complements. This new force is that of “emotionality”. Whether the positive/negative/arousing or non-arousing status of a particular word may interfere with the morphological form of words once placed on a word string will be analysed in this chapter. But, first of all, let’s define the general term “emotion” and more specifically, let’s define what we mean by “emotional words”.

2. ON EMOTIONS

The study of emotions and the impact that emotions have on human behaviour has a long tradition. However, in the last decade of the 20th century interest in “the emotional” was particularly strong when it became something which psychology, cognitive science and neuroscience all began to explore. What happens (both at a physiological and a psychological level) when a person feels angry, sad, happy or just excited has been the subject of much research in recent decades, but many questions concerning this topic still remain unanswered.

First of all, it is important to understand exactly what we mean by the term “emotion”. The average person might say that an emotion is a “feeling” or a “change

in mood” provoked by a certain event. However, if we want to be more precise, we could describe emotions according to three different parameters or “response levels”; the **cognitive level**, the **physiological level** and finally, the **behavioural level** (Lang, 1968). The cognitive level refers to the thoughts that a certain event produces in a certain subject, for example, an image depicting a car accident may lead to thoughts of sadness, fear or distress. So each type of emotion provokes different “mental reactions” that, we must not forget, are to some extent subjective and particular to each person’s psyche. The second response level according to which we can classify emotions is the physiological level. It includes all the bodily reactions that a subject undergoes due to an emotional stimulus. By physiological modifications or reactions we encompass, for example, changes in blood pressure, increases in blood sugar, activation of certain neural chains, increase in a person’s heart rate and even minor reactions such as sweating. These counteractions are responsible for consequent behaviour, since our organism is at least temporarily biased by such sudden changes. Here is when the third response level, namely the behavioural level, occurs. As has been said, emotions are responsible for changes in our body that may force us to react in particular ways. For instance, if someone is about to fall from a cliff, this person’s reaction might be to wave his or her arms in the air or try to grab onto something in order to stop themselves from falling. These can be considered as consequences of the behavioural level response. What is more, it all can be linked to the fact that, as some authors have pointed out, emotions may be a cognitive primitive which conditions the organism to react in a certain way when facing a certain stimulus (Damasio, 1995). The survival component may then be present in the development of emotional reactions, since originally, the main purpose of emotional reaction might have been that of providing the necessary physical responses on the part of our organism in order to make survival possible. In brief, emotions might be the result of an adaptation need for human beings. This “primitive” aspect of emotional events is also reflected in the fact that emotional stimuli are better remembered and recognized than neutral ones (Ferré, 2002). A possible explanation for this is that emotional stimuli use up more of our processing capacity

during acquisition than neutral stimuli do. This is a consequence of the fact that emotional events grab our attention quickly and automatically, while neutral stimuli do not seem to have this processing advantage. Several studies confirm the fact that certain emotional stimuli are better remembered and provoke a quicker reaction from participants (Dolan, 2002; Ferré, 2002; Kousta, Vinson & Vigliocco, 2009, etc). Again, this might be related to the importance of emotional stimuli in relation to the retrospective issues of survival and “adaptation to the environment”.

2.1. A classification of emotional stimuli

Emotional stimuli can be classified according to two different dimensions which most scholars have accepted as the most reliable criteria for the definition of emotions. These are **affective valence** and **arousal**. Valence refers to the degree of pleasantness or unpleasantness of a stimulus (an image, sound or word) as perceived by the subject. For instance, a picture of a baby sleeping would be rated as high by most people in terms of valence, since the image could be considered as good or pleasant. It does not present any threat to us and does not stir up any unpleasant feelings –quite the opposite, in fact. Valence is broadly related to the second parameter; arousal, which refers to the intensity of the stimulus. A particular stimulus may cause either excitation on the part of the perceiver, or calmness. The very same image of a baby sleeping would be rated by most people as low in arousal, since it is not likely to produce any sign of excitation on our organism. Obviously, there is a continuum between the two ends of the arousal spectrum, since a stimulus might also provoke only a certain degree of excitation or a feeling close to calmness (although different from absolute calmness). The same sense of a continuum is valid for valence, since there are neutral stimuli that are not perceived as either pleasant or unpleasant by the receiver but just as something neutral.

According to Lang (1994), all emotions can be placed in a two-dimensional space defined by coordinates of affective valence and those of physiological activation

or arousal. This is reflected in the following chart, which contains data on valence and arousal from the evaluation of a number of pictures (Bradley & Lang, 1994: 56):

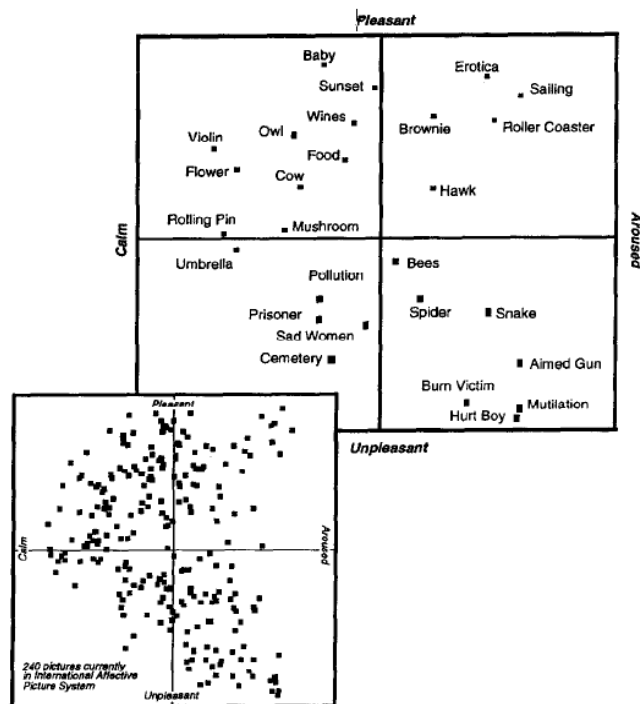


Figure 4-1: Picture-evaluation diagram (Bradley & Lang, 1994: 56).

As we can see, those emotions which are high in valence are normally high in terms of arousal as well, whereas emotions ranking low in arousal tend to be considered as neutral for valence. This is the usual distribution of the affective space. Notice also that, as can be seen in the figure, some responses are outside of this usual distribution.

So, in conclusion, emotions can be defined as being the result of a perception of certain stimuli which create a particular response in a subject. Moreover, they can be classified according to their valence and arousal levels, that is, according to the way they are perceived in relation to their degree of pleasantness/unpleasantness and the level of arousal or emotional excitation they cause in individuals.

3. EMOTIONAL WORDS

As mentioned previously, we can distinguish between different types of input that may be responsible for various emotional responses. The stimuli normally used in research to investigate the nature and character of emotions are **images**, **sounds** and **words**. It is worth noting that linguistic material in general, and words in particular, are considered by some authors to have limited arousing power. For instance, according to Carretié, Hinojosa, López-Martín, de la Gándara, Igoa & Sotillo (2008), human language is a quite recent “invention”, and is not comparable to other mental systems such as those which process images or sounds, with these being much more rooted in our neural systems. In this respect, emotional words could not be expected to show the same processing characteristics as other types of emotional stimuli, since it is possible that linguistic material does not have the same primitive bases as other types of emotional information. Moreover, it is easier to convey more emotional information through a picture, rather than through a word, or even a sentence. Words evoke their emotional content in a more indirect way. We are more likely to experience a feeling of sadness if we see an image of a wounded person, rather than just the word “wound”. However, we cannot rule out the possibility that linguistic material could also cause differences in language processing, and for this reason there has recently been an increase in the amount of research being done in the area of emotional language.

In the next section, we will delve more deeply into the world of emotional words and their classification. This is a step we must take before dealing with the processing characteristics of emotional words when inserted in sentences.

3.1. Two emotional dimensions for words: Valence and arousal

As explained for other types of emotional sources such as pictures and sounds, the emotionality of words can also be measured with respect to two different parameters; 1) Affective valence and 2) Arousal or intensity. Valence is basically a measure of conceptual

pleasantness, whereas arousal is a measure of internal activation. It is also very important to keep in mind that emotional words are not mere synonyms for emotional states (*happiness, sadness, sympathy*, etc.), but also words which can elicit emotional states as well (*attack, war, rainbow, bed*, etc).

In broad terms, valence can be subdivided into positive, neutral and negative, and arousal can have the subdivisions, high, neutral and low (although we must bear in mind that both valence and arousal are measured on a scale, and so in a strict sense we have to talk about a continuum). If we analyse these general subdivisions, we realise that any word at the very extremes of valence will usually correlate with high arousal ratings (extremely negative or positive words must obviously be accompanied by a high degree of arousal). This fact allows us to classify words into emotional or neutral words.

The question now would be whether the two parts of this division (emotional and neutral) would have the same weight in processing, that is, whether emotional words (both positive and negative) might show any processing preference over neutral words, especially with regard to speech. Many authors have found a facilitatory effect in remembering both positive and negative words in various laboratory studies (Dewhurst & Parry, 2000; Kleinsmith & Kaplan, 1963; Parkin, Lewinsohn & Folkard, 1982; Phelps, LaBar & Spencer, 1997; Rubin & Friendly, 1986). Some researchers have even gone further and suggested that there may be potential differences between positive and negative words. According to some researchers, negative stimuli in general provoke a significant slowdown in processing, since this type of input is associated with an innate defence mechanism which freezes all ongoing activity (the same as the freezing response that animals show when they are facing a threat (Algom, Chajut & Lev, 2004)). This effect is also applicable to linguistic material, as has been demonstrated by Pratto & John (1991), among others. These authors have found a particular effect involving negative words by using a Stroop task in which the speed of naming the colour of the font in which a word was printed was affected by the valence of the word, negative words showing slower response times due to the previously mentioned aversive effect of negative material.

Although there are many people who support the view which asserts the general slowdown effect of negative stimuli, there are also many people who defend the opposite point of view, and so the cases where emotion (both positive and negative) has been shown to facilitate, rather than slow down, responses in cognitive tasks must also be documented. According to the supporters of this second view, emotional words (regardless of their positive or negative polarity) would have a facilitatory effect in processing because of issues related to survival and attainment of goals. That is, emotionally charged words could provoke faster reaction times than neutral words because this immediate reaction would be necessary for the attainment of a particular goal on the part of the subject.

In summary, a definitive theory has not yet been put forward which satisfactorily explains the exact effect that emotional linguistic material may or may not have on cognitive processes. However, it is clear that emotional words show certain processing characteristics which are not shared by other types of linguistic material. For the purpose of research in this area, a database known as ANEW (*Affective Norms for English Words*), which contains the valence and arousal levels of a great number of words, was created by Bradley & Lang (1999a). This database (which will be described in the following section) has also been used for the research presented in this chapter.

3.2. The “ANEW” database

Bradley & Lang (1999a) are the authors of the so-called ANEW database. It contains 1034 words which were rated according to their levels of valence, arousal and dominance⁶. ANEW may be compared to other databases which record the emotional levels elicited by other kinds of stimuli: sounds (*IADS- International Affective Digitized Sounds* (Bradley & Lang, 1999b)); pictures (*IAPS- International Affective Picture System* (Lang, Bradley & Cuthbert, 1999)), or even to the more recent *ANET (Affective norms for English Text* (Bradley & Lang, 2007)), which contains emotional sentences and microtexts. Bradley &

⁶ By “dominance”, Bradley & Lang (1999a) refer to whether a person feels either controlled by or in control of a particular word and the referent it denotes.

Lang (1999a) compiled ANEW by evaluating 1034 words using the parameters of valence, arousal and dominance. For this evaluation, they used the Self-Assessment Manikin (SAM), which provided the participants with the option of selecting the emotionality values of the words they were given from pictorial representations. Such pictures were based on a 1-9 scale which participants used for each assessment response.

3.2.1. The self-assessment manikin (SAM)

As has been pointed out, the SAM was created as a guide for participants to use when evaluating the emotionality of words. Unlike physiological responses, affective states are quite a difficult parameter to evaluate in an objective way, and so the SAM was designed as a means of providing the most accurate numerical data possible for the evaluation of the emotionality of words as perceived by individuals. Here is the Self-Assessment Manikin:

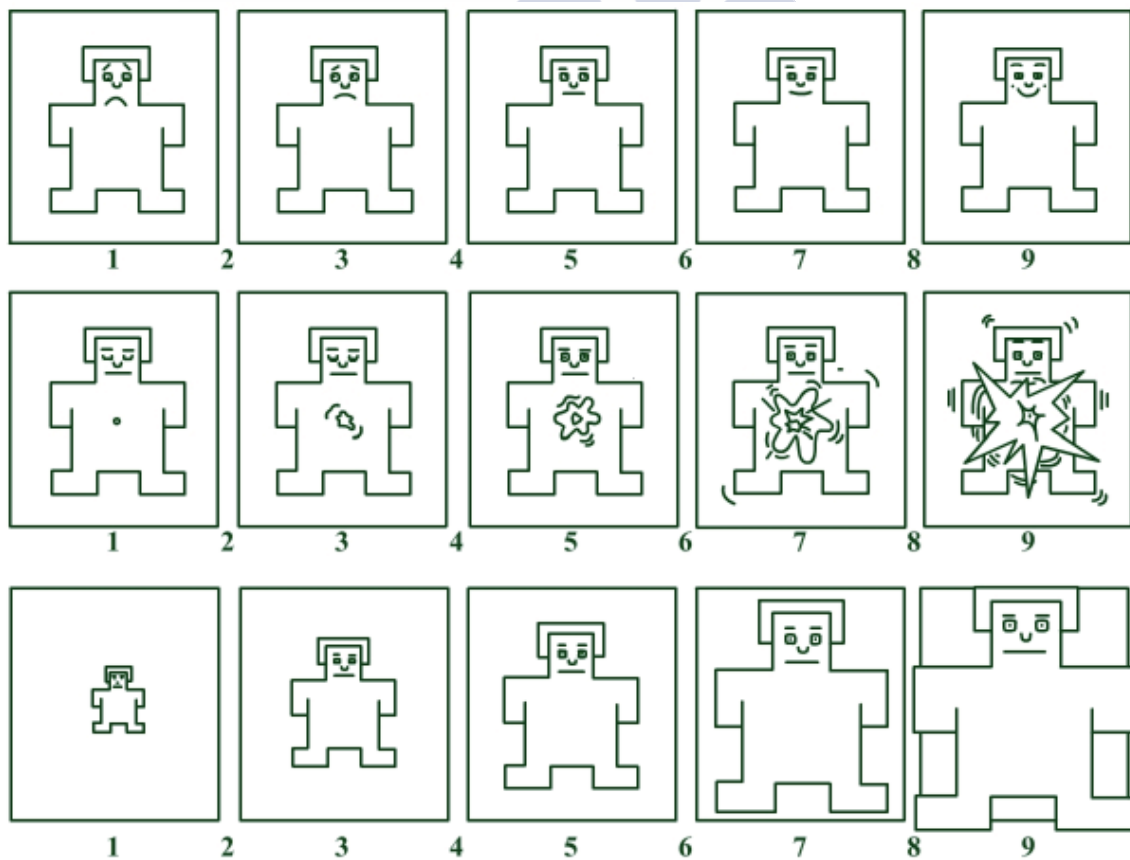


Figure 4-2: The Self-Assessment Manikin (Bradley & Lang, 1999a).

As we can see, they used a humanoid figure to represent the effect each of the stimuli had on each of the three parameters. In each category there are five manikins with different facial and body expressions which represent differing emotional states, allowing participants to evaluate the words on a scale from 1 to 9. Thus, for valence, the pictures start with a manikin which has a sad facial expression, and end with a manikin with a broad smile. So, if a word creates a very pleasant feeling in the subject, then this person should give the word a score close to 9, whereas if the word created an unpleasant feeling, then they would give this word a score close to 1. If the stimulus provokes indifference, then an intermediate value of around four or five should be chosen. As for arousal (represented by the second row of pictures), the pictogram goes from a relaxed, closed-eyed manikin, to a shaking and clearly aroused one (denoting a huge emotional reaction). Once again, the score will be close to 9 if the word provokes a huge emotional alteration in the participant, and a low value if the word causes feelings like calmness or relaxation. Medium arousal levels will be marked at around 5. Finally, for the parameter of dominance, Lang and his collaborators used a pictogram that goes from a very small manikin (indicating low levels of dominance, that is, the person does not feel in control of the concept), to a very big one, meaning that the experimental subject feels in complete control when experiencing that emotional stimulus. However, dominance has generally been seen in the literature as the least reliable of the three dimensions in the ANEW, since it is the most difficult concept for participants to understand. In addition, it was later shown that dominance has a high correlation with valence. For this reason, the parameter of dominance is not used in most research on emotional words, and it has also been discarded in the research work carried out for the purpose of this thesis.

In brief, the pictorial nature of the SAM makes it an intuitive, and time-efficient procedure for participants, and yields clear, solid experimental findings.

3.2.2. The Spanish adaptation of ANEW

Redondo, Fraga, Padrón & Comesaña (2007) created a Spanish version of the ANEW in which they tested the translation into Spanish⁷ of the English words contained in the original database. As with ANEW, the 1034 words were randomized in three different orders so that not all the participants would encounter the same words in the same sequence, thus avoiding possible side-effects which might be caused by the order in which the words were presented. The evaluation test contained all the words in 8 different response sheets, each one containing a total of 129 words. They all had to be evaluated according to the three parameters of valence, arousal and dominance, using a 1 to 9 Likert scale, as described above. Again, a SAM grid was included in order to guide participants in their evaluations. The scores for all the words were compiled in the database, and thus a Spanish version of ANEW was created. In addition, the Spanish database includes various psycholinguistic variables other than frequency, such as length, grammatical category of the word, and other subjective measures.

3.2.3. Words in the affective space

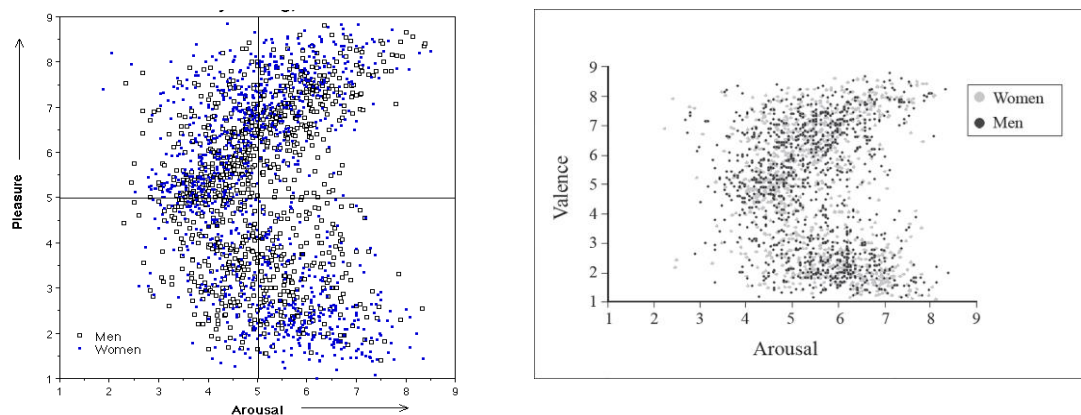


Figure 4-3: Distribution of words across the two-dimensional space in English (left) taken from Bradley &Lang, 1999a, and in Spanish, taken from Redondo et al., 2007 (right).

As was the case with emotional stimuli in general (see section 2.1.), words are also configured in a U-shape pattern in the emotional spectrum, meaning that unpleasant

⁷ This version of the database was based exclusively on the Spanish spoken in the Iberian Peninsula.

words (those scoring low in the dimension of valence) are frequently evaluated as high in arousal. That is to say, the lower the pleasantness of a word, the higher its arousal level. Furthermore, pleasant words also tend to show high levels of activation, and hence both ends of the valence continuum are correlated with high arousal levels. As for words with neutral valence, they also tend to be neutral in arousal, since neutral words typically do not modify our level of activation to any high extent. In this way, ANEW allows us to talk about general tendencies in words while providing very useful data for experimental research with words.

3.2.4. Alternatives to Bradley & Lang's (1999a) system for the evaluation of emotional words

Although the previously explained classification is the most widely used by researchers, other possibilities for the classification of emotional words do also exist. As Scott (2009: 22) points out, there has recently been a division in the field of emotion word research, with some investigators shifting their interest from general emotional states (i.e. positive, negative and neutral) to specific or discrete emotions (e.g. fearful, angry, guilty). This is based on the idea that emotions of the same valence have been shown to produce diverging results depending on the type of emotion they represent and on the areas of the brain in which such emotions are represented, meaning that different emotions of the same valence might be located in different places and therefore may cause different reactions. So the classification of emotions can possibly be made even more precise, however, this alternative classification has not been much developed. Additionally, the habitual classification of “positive”, “negative” and “neutral” emotional words has led researchers to coherent results in past studies, and therefore this is the classification which we will use as the basis of our research.

4. THE ROLE OF EMOTIONAL WORDS IN THE CONTEXT OF SENTENCE PROCESSING

Some authors have considered the emotionality of words to be a semantic constraint, whose effects (when inserted within syntactic structures) could be compared to other notional effects such as those reported in the literature on distributivity, collectivity, animacy, etc. Whether those semantic constraints are responsible for unconscious changes in the syntax of certain structures (as for example of subject-verb agreement in sentences with a complex noun phrase functioning as subject) is a topic which has been the cause of much debate. The research presented in this chapter will deal specifically with this particular controversy. Thus, we may ask ourselves the question: if emotionality is a semantic constraint, as some of the literature on the topic affirms, what is the processing of sentences containing emotional words actually like? This will be the main focus of a large part of the experimental research which will be presented in this chapter. We will devote our attention to the analysis of whether or not the presence of an emotional local noun in a complex noun phrase functioning as a subject would be able to influence the election of verb number, and more importantly, we will try to see whether it can influence verb number to such an extent that it puts at risk the grammaticality of the whole sentence.

In the next section, previous research which joins the areas of emotions and syntactic structures will be described, and research involving emotional words' processing in ambiguous relative clauses will be specifically dealt with. These studies will represent the preamble to our research, since they deal with the influence of emotionality on the resolution of a particular syntactic problem, that is, they deal with the interference of semantic information on an a priori syntactic process such as relative clause disambiguation.

4.1. An example of the effects of emotional words on sentence processing: The case of relative-clause disambiguation

In connection with the above hypothesis concerning whether or not emotional words could represent a constraint interfering in normal processing, it is worth making reference to a series of studies developed by Fraga, Piñeiro, Acuña Fariña, Redondo & García Orza (2012), in which the authors tested the effects of emotional words in the course of sentence processing. Or to be more precise, the effect that emotional words exerted on the disambiguation of ambiguous relative clauses, that is to say, of relative clauses preceded by two possible antecedents (and thus by two potential subjects) was the main focus of this collection of studies. Thus, they represent the starting point (and reference point) for the studies which we will present relating emotional words and agreement processing. From our perspective, the results achieved by Fraga et al. (2012) with regard to the processing of RC ambiguous sentences can be seen as an indicator of what might happen to agreement processes when an emotional word is involved.

Starting with the topic of relative clause disambiguation and emotional words, we find it necessary to allude to some precedents in the study of relative clause disambiguation in order to understand the previously mentioned studies of Fraga et al. (2012). Before Cuetos & Mitchell's (1988) research, it was always thought that in the case of a relative clause with two possible antecedents, as in *someone shot the servant of the actress who was on the balcony*, the preferred option would always be a local adjunction. Computational economy, as well as issues related to working memory, were thought to be the reasons for choosing the noun phrase closest to the verb ("the actress"), as the preferred subject of the relative clause ("who was on the balcony"), thus preferring a so-called *late closure strategy*. However, after the work of Cuetos and Mitchell, a number of studies demonstrated that in languages such as Spanish (Carreiras, 1992; Carreiras & Clifton, 1993, 1999; Cuetos, Mitchell & Corley, 1996), French (Frenck Mestre & Pynte, 1997; Zagar, Pynte & Rativeau, 1997), European Portuguese (Soares, Fraga, Comesaña & Piñeiro, 2010), German (Hemforth, Konieczny, Scheepers & Strube,

1998) and Dutch (Brysbaert & Mitchell, 1996), an early (instead of late) closure was preferred a significant proportion of the time. Moreover, some semantic variables such as contextual referentiality, animacy, etc. were seen to play a role in the disambiguation process, thus showing the influence of semantics on syntax. Indeed, this illustrates just how complex the issue of modifier attachment can be. Interestingly, it was observed that Spanish behaves in the opposite way to English when dealing with disambiguation (Spanish speakers prefer the non-local tie). Thus, in the same sentence: “*alguien disparó contra el criado de la actriz que estaba en el balcón*” (*someone shot the servant of the actress who was on the balcony*), Spanish speakers tend to think that the one who was on the balcony was the *servant* (*criado*), rather than the *actress* (*actriz*). In addition, it was demonstrated that these attachment tendencies for both English and Spanish were consistent when many relative sentences of this kind were presented to speakers of each of the two languages. In this sense, English speakers would disambiguate the sentence by making allusion to the second and nearest NP, which they would take as the whole sentence’s subject (*someone shot the servant of the actress who was wearing a pink sari*, for instance), whereas Spanish speakers would do the opposite, they would complete the sentence by disambiguating it towards the first NP, for instance: *alguien disparó contra el criado de la actriz que llevaba una bandeja en la mano* (*someone shot the servant of the actress who carried a tray on his hand*). These last results obtained for Spanish have in fact been confirmed by several studies: Acuña Fariña, Fraga, García Orza & Piñeiro (2009); Carreiras (1992); Carreiras & Clifton (1993), (1999); García Orza (2001) and Piñeiro (2006).

A new semantic factor with a possible influence on the parser’s attachment preferences was proposed by Fraga et al. (2012). The emotional dimension of the nouns to which the relative clause modifier could be attached was then tested in Spanish (a language normally showing NP1 attachment). In particular, the two dimensions that define the emotionality of words (valence and arousal) were manipulated. Thus, the following research questions were set out: what would happen if one of the two NPs of an

ambiguous relative clause in Spanish contained an emotional word? Would this reverse the disambiguation pattern in Spanish? Can it be demonstrated that emotional words have such a weight in processing that they could alter the normal course of syntactic processing in the case of ambiguous relative clauses? If they do, does that mean that emotionality is a semantic constraint that is processed at the same time that the syntactic structure of the sentence is formed? Can this be considered as reliable evidence in support of interactive models of processing? To answer all these questions a comprehensive experimental study was designed.

4.1.1. Analyzing the effects of emotional words in relative-clause disambiguation processes in Spanish (Fraga et al., 2012; Piñeiro, 2011)

A series of studies have been conducted by Fraga et al. (2012) in order to test the effects of emotional words in the above mentioned relative structures. In these studies the influence of both affective valence and arousal was studied by conducting off-line tasks.

Most of the studies that have investigated the role of emotional words in different contexts have found a facilitatory role of valence over arousal. For this reason, valence was the first thing to be tested in this series of studies, while arousal was kept constant. To this end, Fraga et al. came up with a number of ambiguous relative clauses which could contain (depending on the condition they were inserted in) 1) a pleasant word, 2) an unpleasant word or 3) a neutral word, in the NP2 position. All the nouns employed for the sentences were taken from the Spanish adaptation of ANEW (Redondo et al., 2007). Moreover, other variables that might bias the results were controlled, namely: length, frequency of occurrence of the word, imageability, familiarity, concreteness, etc. All of these data were taken from the B-Pal database⁸ (Davis & Perea, 2005). These sentences were presented to a series of participants, whose task it was to complete them. In the completion process, the participants had to necessarily disambiguate the sentences towards one of the two NPs (either to NP1, as in the default strategy followed in Spanish, or NP2). A pleasant, an unpleasant or a neutral word was collocated in the NP2 position

⁸ See page 189 for a description of the B-Pal database.

in the experimental sentences. In this way, the variable “arousal” was controlled or kept constant (always high), while the variable “valence” was the focus of the study.

As for the results, first of all it is worth mentioning that whenever no pleasant or unpleasant noun was collocated in a sentence the “default” attachment strategy was agreement with NP1, and this coincided with the pattern normally followed in Spanish (Acuña Fariña et al., 2009; Carreiras, 1992; Carreiras & Clifton, 1993, 1999; García Orza, 2001 and Piñeiro, 2006, 2011). However, this tendency was reversed in those cases in which a high-in-valence noun was present in the NP2 position. All of this means that affective valence was responsible to a large extent for RC disambiguation choices and it might therefore be considered as a semantic aspect influencing syntactic processing. With regard to the difference between positive and negative words (or pleasant and unpleasant), no significant differences were found between the two. As explained earlier, the literature on emotional stimuli cannot find an explanation which clarifies the differences in processing between negative and positive words. Actually, the results are likely to vary depending on the experimental context and the methodology employed.

In brief, when there is an emotional referent in the NP2 position, participants prefer to complete the relative clause by making an allusion to the second NP. A possible explanation provided by Fraga et al. (2012) is that emotional words deserve more attention than neutral words and therefore they are better remembered. As a consequence, people disambiguate those sentences with the noun which is more accessible to their working memory, namely, the emotional noun, which they prefer to give the status of subject.

The results obtained in the previous study in which affective valence was demonstrated to exert a strong influence on disambiguation processes allow us to think that the role of emotional activation (or arousal) might also be responsible for such an effect. But one might wonder whether these results could not be due to the presence of high arousal nouns in NP2. To answer this question, a second study was designed in which the variable which was to be manipulated was “arousal”. Contrary to what had been done in the previous study, affective valence remained constant in all the experimental variables

(all the words were pleasant and only differed in their level of emotional activation) which were present in the new test. The procedure followed was exactly the same as the one which was followed in the previous experiment.

The results obtained confirmed the fact that high-in-activation words attract the relative clause towards themselves. In this sense, the conditions that caused an NP2 disambiguation were those containing an emotional word. As expected, the only condition that showed the normal NP1 disambiguation pattern for Spanish was the NN-NN condition (where all nouns were neutral).

Since all the experiments proposed by Fraga et al. (2012) had an off-line nature, a final experiment by Piñeiro (2011) is going to be presented in which a different methodology was employed. Evoked-Response Potentials (from now on ERPs) were the on-line method chosen for this last piece of research. ERPs are pictures of electroencephalographic activity which are the result of the effects of certain stimuli. When there is brain activity, neurons produce electrical responses which can be viewed with the technological support of a scanner. The basis for this on-line study was another study by Carreiras, Salillas & Barber (2004) in which ambiguous relative clauses were used, although they did not contain emotional words. What was found was electrophysiological evidence of the fact that Spanish speakers prefer an NP1 disambiguation type when processing ambiguous relative clauses. Piñeiro's objective, then, was to test whether or not the presence of an emotional word could invert this processing pattern. This information taken from electrophysiological data could also be compared to data previously obtained from the series of off-line tests discussed above. The main objective was to see if high-in-arousal and pleasant nouns were likely to cause a broader P600 wave. P600 is a wave which reflects syntactic reanalysis during the processing of a sentence (Kaan, Harris, Gibson & Holcomb, 2000). Thus, if NP2 disambiguation was read as a weird or unexpected option by our brain, the amplitude of such a wave would increase. Conversely, if NP2 was regarded as the "preferred" option by our processor (that is, the one that needs no reanalysis), no P600 effect would be found. The data obtained with the ERPs suggest that

when the sentences were disambiguated towards NP2 there was a review or reanalysis of the syntactic structure (independently of the presence or non-presence of an emotional word in this second NP). This reanalysis effect was evidenced with the appearance of a broad P600 wave in the recorded brain activity. Thus, an early-closure strategy was preferred by Spanish speakers, since it was observed that this had a facilitatory effect on processing. Interestingly, these data are not consistent with what was found in the off-line experiments carried out by Fraga et al. Thus, these differences would fit in the modular models' account explained in section 2.2. of chapter 1. These models assume that sentence processing takes place in two separate steps. Only semantic information is taken into account during the first step, and only later would semantic or pragmatic information be considered. Since the amplitude in the observed P600 wave reveals the primacy of syntactic processing over a semantic constraint such as emotionality (at least in the first processing stages), only modular models would be able to explain these results.

To summarise, the research done by Fraga et al. (2012), as well as that by Piñeiro (2011), has paved the way for further research on the effect that emotional words may have on language processing. How the presence of emotional words could affect syntactic processing is a somewhat unexplored field at this point, since the investigation we have previously mentioned has left some questions still unanswered. In relation to the focus of this thesis, it would be interesting to investigate to what extent emotional words can interrupt or reverse agreement processes. It is probable that agreement, which is an a priori syntactic type of process (understood as formal co-occurrence of features; Chomsky, 1995), could be biased by the semantic quality of lexical items. In this vein, emotionality could be a type of information which could take part in the resolution of agreement. This will be the topic of the sections which follow, which relate agreement and emotionality to each other.

5. EMOTIONALITY AND AGREEMENT PROCESSES

5.1. Preliminary remarks

As has been seen, at least in off-line studies both valence and arousal seem to play a role in sentence processing. It has been demonstrated to some extent that high arousal and pleasant words are more likely to influence syntactic processing than neutral words. The question now is whether a speaker would be more likely to commit agreement mistakes when a word with such characteristics is present in a sentence, that is, whether the emotionality of a word is able to compromise the syntactic structure of a clause.

Although Fraga et al.'s experiments can be considered the prelude to the series of studies here presented, it is important to bear in mind that, as previously stated, the hypotheses are not exactly equivalents, in the sense that in RC disambiguation, the speaker's inclination towards either NP1 or NP2 does not put the syntactic acceptability of the sentence at risk. That is to say, if the RC was disambiguated towards either NP1 or NP2, the result was always a grammatical sentence. However, in the studies that will be presented here, the influence of an emotional word could result in a completely ungrammatical and incorrect sentence. From our point of view, grammatical mistakes caused by the presence of an emotional word are less likely to occur than grammatical choices pushing in the direction of the emotional word's location. Nevertheless, we wanted to explore the magnitude of the effect when agreement mechanisms are biased by the presence of an emotional word in order to see what type of effect emotional information exerts and the magnitude of such an effect. Finally, we wanted to give these studies a crosslinguistic perspective, therefore the main studies were carried out in two languages (Spanish and English), which are structurally very different from each other, and the results were compared in order to see whether or not the inner characteristics of different languages can make semantic influences more liable to have weight in syntactic processes.

5.2. Pilot study

As a first step in the research, a pilot study was conducted. As it was just an exploratory piece of work, it was only carried out in one of the two chosen languages, namely Spanish. For purposes of this test, we used “preliminary” materials, as we only wanted to get a hint of whether or not significant results could be obtained, as well as to decide upon which type of materials ought to be used. Since significant results were obtained, the materials were later improved and subjected to rigorous control. In brief, this pilot test was treated as a prelude to later experiments we were to carry out in both Spanish and English.

For this initial questionnaire, 45 incomplete sentences were presented to 10 Spanish participants who volunteered to complete them. The beginning of each of the 45 sentences was read aloud by the experimenter, together with the verb they had to use in order to complete the sentence (read in its infinitive form). The participants were encouraged to complete the sentence precludes immediately after they heard them. The exact procedure was the following: the participants first had to repeat (as quickly as possible) the sentence beginning, and then immediately complete it with a conjugated form of the given verb and the complements they desired to use. The only rule laid out for the participants was that they had to create plausible sentences. For example, the experimenter offered a sentence beginning such as, “*el comienzo de las aventuras...*” (“the beginning of the adventures...”) and asked the participant to immediately complete it with the verb *SER* (to be). So the participant had to say something like: “*el comienzo de las aventuras ES siempre la mejor parte*” (the beginning of the adventures IS always the best part). They could use any verbal form and all the complements they wanted to use as long as they did not stop while uttering the whole sentence or show a very slow reaction time. In other words, spontaneity was the key priority, since our objective was to force participants into creating sentences that were as natural as possible, in imitation of real speech acts.

With regard to the distribution of the experimental items, they were all complex noun phrases with the following structure: “article (sg) + noun (sg) + de (of) + article

(pl) + noun (pl)”. The second noun phrase had to necessarily appear in its plural form in order to increase the possibility of making a mistake. It is widely attested in the literature that it is the plural form of nouns which cause more attraction effects (Bock & Eberhard, 1993; Antón Méndez, Nicol & Garrett, 2002; Eberhard et al., 2005; Haskell, Thornton & MacDonald, 2010), so this sentence structure was perfect for eliciting a number of attraction mistakes that could be subjected to analysis.

As regards their classification, all the sentences belonged to one of the following three types:

Neutral-Neutral: as in “*el tamaño de las estufas*” (“the weight of the stoves”), in which both the first and the second nouns were neutral. The singular-plural asymmetry was used for these preambles. This was considered as the **control condition**, since the experimental sentences would be compared to those belonging to this group. There were 11 sentences of this type.

Neutral-Emotional: as in “*el sabor de los besos*” (“the taste of the kisses”), in which the first word was a singular neutral word (*sabor*-taste) and the second one a plural emotional word⁹ (*besos*-kisses). This was the **experimental condition**, and there were 15 sentences of this type in the test.

Fillers: were sentences which had the same syntactic structure as the experimental sentences, but in these filler sentences, the two words appeared in the same number, that is, either *singular-singular* or *plural-plural*, and so there was little or no chance of participants making mistakes in the verb in these sentences. The responses provided to this type of sentences were neither analysed nor computed. The only reason for including this type of sentence was to distract the participants from the real focus of the study, that

9 By “emotional words” here we refer to high arousal and positive words.

focus being the sentences containing emotional words (N-Emo) as well as those from the control condition (N-N).

Some of the words used in the experimental preambles were taken from the Spanish adaptation of ANEW. However, this database did not contain a sufficient number of words which we could use for the purposes of this experiment. On the one hand, only nouns could be used in this experiment, but the number of nouns contained in the ANEW is somewhat limited for a task such as ours. What is more, we needed both singular and plural neutral nouns and plural emotional nouns, and this again restricted our search. So we did not have control of the exact values of some of the words chosen for the preambles, which we just viewed as being intuitively emotional or neutral (for instance, words such as “kiss” were taken to be emotional although this exact form of the noun was not contained in the ANEW).

With regard to the so-called “fillers”, the reason why the same syntactic structure with different number values was chosen (instead of sentences with a totally different syntactic structure) was that for participants, distinguishing between two different structures in the test could lead them to think that there existed two different types of sentences, and as a result, they might have figured out the purpose of the test and which structure was the one that we intended to evaluate.

In addition, the experimental sentences, as well as the fillers, were randomized across the test, so that not all the sentence preambles belonging to the same condition appeared together (see appendix A).

Concerning the results obtained, it is worth mentioning the fact that among the participants’ responses, we encountered a number of controversial structures which we had to analyse separately. Unexpected effects of collectivity and distributivity, among other things, were found in the participants’ responses, and we concluded that these sentences ought to be analysed independently. Finding such controversial structures was helpful in the sense that they provided us with hints and ideas as to how these new materials could be utilised in the test which was to be created after the pilot study.

Four different statistical analyses were carried out for this pilot study: first, a participants' analysis of the results obtained for all the sentences (including those showing parallel effects such as collectivity or distributivity). Second, an items' analysis of the same sentences. Third, a participants' analysis of those sentences which did not present any parallel effect, that is, those whose number election was guided exclusively by the presence of an emotional word. Finally, an items' analysis of the last preambles. The statistical methodology employed was a matched pair t-test in the case of the participants' analysis and another t-test for independent samples for the items' analysis. To summarise, all the results obtained showed a statistically significant effect caused by the variable "emotionality" (all $ps < .05$). That is, whenever an emotional word was present in a sentence in the N2 position, the probability of making a number mistake in the verb was statistically significant (both in the analysis over participants $t(9)=2.28, p < .05$ and in the analysis over items $t(26)=3.12, p < .05$). Moreover, this seemed to happen in both situations, namely when the controversial sentences were included in the analysis and also when they were excluded from it and only those sentences which showed an exclusive effect of emotionality were taken into account ($t(9)=2.73, p < .05$ for participants and $t(19)=2.19, p < .05$ for items). What these data demonstrate is that when an emotional word in its plural form is placed near the verb, it tends to attract the verb towards its number form. Even if we discard the "controversial sentences" of the pilot test, we still find emotionality has a significant effect. To show this more clearly, the following figure displays the percentage of errors made in both the N-N and the N-Emo conditions:

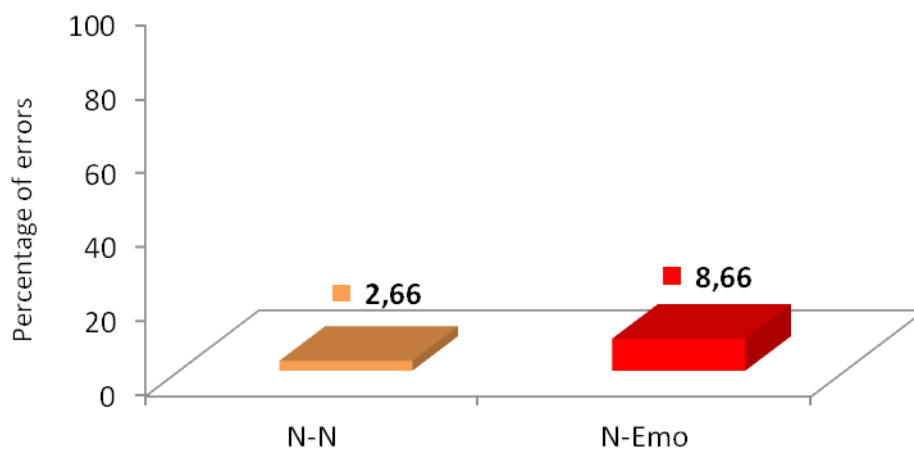


Figure 4-4: Results of the pilot study.

These preliminary results led us to believe that significant results could also be obtained in a second test which made use of more elaborate and controlled preambles. However, neither the quality nor the quantity of data is enough to allow us to draw any firm conclusions. For instance, the exact valence and arousal values of some of the words were not known, since they were not contained in the ANEW database. For this reason, a second test, in which all the materials used underwent an exhaustive control, was conducted. Also, a version of this second Spanish test was designed in English in order to be able to make comparisons across the two languages. The details of these two tests will be explained in sections 5.4. and 5.5., but firstly, it was necessary for us to create our own set of materials so that we would have the material we needed for the test.

5.3. Creating a set of materials

5.3.1. Description

As explained, the ANEW database does not contain a sufficient number of words which have the characteristics we demanded for our agreement test. For this reason, we had to find new materials that could in addition fit in both the Spanish and the English questionnaires. Therefore, a certain number of words with the characteristics that we were searching for were tested within the parameters of both valence and arousal. To this

purpose, two evaluation questionnaires (one in Spanish -see appendix B- and another one in English- see appendix D-) were created and delivered to a number of participants, who gave their personal scoring to a series of words. After the evaluation of this new set of words, those which had the valence and arousal levels necessary for the sentence completion test were introduced in the sentence preambles. Thirty experimental sentence beginnings (15 belonging to each of the two conditions analysed) were thus formed for each one of the tests (Spanish and English) using the words obtained from this word-evaluation test, and were later presented to different groups of participants who had to complete them.

5.3.2. Objective

The main objective of this part of the study was to compile the set of materials which were necessary for the tests we wanted to carry out. The words chosen had the right characteristics (they were all nouns, some of the words were in the plural, some of them were potential emotional words, etc.) for the type of sentence preambles that we needed for the two completion studies. Notice also that the words in the Spanish and the English questionnaires were almost exact translations.

5.3.3. Method

5.3.3.1. Participants

Sixty-four participants from the University of Santiago de Compostela volunteered to complete the evaluation test in Spanish and in a written form. Four of those volunteers had to be discarded either because they were non-native speakers of Spanish or because they did not understand the task correctly. Among the final 60 participants there were 11 men and 49 women. Their mean age was 19.89. They were all university students studying English Language and Literature. About the English participants, another 60 students from the University of Lancaster (with a similar age range and distribution) completed the English evaluation test in a written form. None of them had to be discarded.

5.3.3.2. Materials

The word evaluation test (see appendices B and D) consisted of 100 words (some of them in the singular and some of them in the plural) that the participants had to evaluate on a scale of 1 to 9 according to the parameters of valence and arousal. To facilitate the task, the participants were presented with the SAM (Self-Assessment Manikin) together with a series of written instructions about how to interpret the SAM, and how to proceed with the evaluation test. In addition, oral instructions were given, and any doubts expressed by the participants were assuaged before the task began. Three different orders of the same test (order 1, order 2 and order 3) were created for each one of the two languages. Counterbalancing of emotionality across the three lists prevented a straightforward evaluation of the variable. The three versions were each delivered to the same number of participants in each one of the two languages (order 1 completed by 20 people, order 2 completed by 20 people, order 3 completed by 20 people). As explained, the reason for there being three different lists was mainly in order to avoid parallel effects in the evaluation of words, that is, when all the participants evaluate a certain word in a certain way because of its position within the test (for example people tend to give lower ratings to words which appear at the end of the questionnaire compared to those words which appear at the beginning, for unconscious reasons such as tiredness). Finally, the participants' responses were recorded for each of the words, following the procedure which will be explained in section 5.3.4.

5.3.3.3. Procedure

As previously pointed out, in order to create a set of materials which could take into account the levels of emotionality of the 100 tested words, a population of 60 Spanish students was asked to do the evaluation test in Spanish, and another 60 English participants completed the English evaluation test. They all completed it in a written form, individually and in less than half an hour.

5.3.4. Results

First of all, it is worth mentioning the fact that we took the Spanish data as the main reference. Since the Spanish and the English sentences in the next completion questionnaire had to be exact translations, we selected some words from the Spanish set of materials which fulfilled the requisites needed as regards their valence and arousal characteristics, and only if the values of their equivalent English words coincided in their valence and arousal ratings were they used to create the sentences in both languages. Therefore, once all the word evaluation data were gathered, the first step was to eliminate all those values considered as outliers among the Spanish data (those above and below 2 Standard Deviations). After the outliers were removed from the list, the mean values for every one of the 100 words were computed. So each of the words had a mean value for valence and another for arousal, which were the two parameters within which the words were evaluated. The minimal and maximal values for all the words, their general means and the general SD (Standard Deviation) are summarised in the following chart:

Table 4-1: *Minimum and maximum values, means and standard deviations of the selected words.*

	Valence	Arousal
Minimum value	3.20	3.43
Maximum value	8.53	8.27
Means	5.87	5.49
Standard Deviation	1.23	1.25

Among the 100 words, those whose values were between 1 and 4.5 were considered to be low in terms of valence (or negative). From 4.5 to 6.5 they were rated as neutral, and from 6.5 up to the highest value they were considered to be high or positive. As for arousal, the rank between 1 and 4.5 contained those words producing feelings of calmness, from 4.5 to 6.5 the level of emotional activation increased until it reached a neutral state, and finally those words with a rating between 6.5 and 9 were considered to be high arousal words, and therefore producing high levels of activation.

Once we had evaluated all the words contained in the two tests, we could confirm that there was indeed enough material for us to use to form sentences for two questionnaires; one in Spanish and one in English. The two tests are described in the following sections.

5.4. First study: Emotionality test (Spanish)

5.4.1. Description

After the word evaluation test, we had enough emotional and neutral words to create a completion test formed of sentences with the previously mentioned structures (either “neutr_{sg} – neutr_{pl}” or “neutr_{sg} – emo_{pl}”). So 15 N-N and 15 N-Emo sentences were formed by combining the words from the recently created set of materials. Concerning the formation of the preambles, experience acquired from the observation of the results of the pilot study was taken into account, and so certain structures which may have biased the final results were avoided. For instance:

-Collective structures. Words like “*grupo*” (group) were not used in any of the preambles in order to avoid the potential effects of collectivity. Sentences like “*el grupo* (sg-although notionally plural) *de los niños* (pl)” (“the group of children”) were not included in the test since the multiple referent of the whole sentence could lead the verb towards its plural form, as in “*el grupo* (sg-although notionally plural) *de los niños* (pl) *van* (pl) *de excursión*” (literally; “the group of children **go** on a day trip”). The intention of this test was to look only for attraction errors caused by the emotional status of the word which was closer to the verb, so alternative effects such as collectivity were avoided in order not to contaminate the data.

-Use of the preposition “con” (with). Prepositions different from “*de*” (of) were avoided, especially the preposition “*con*” (with), since it brings to the sentence a sense of “addition” that could bias the election of the verb number, as in “*el niño con sus primos*

(pl) *están* (pl) *jugando*” (literally; the boy with his cousins **are** playing). “*Con*” (with) has an additive meaning that might lead towards a plural interpretation of the subject and as a consequence to the election of a plural verb form without it being related to emotionality.

-Distributive constructions. Sentences with a clear distributive meaning were tried to be avoided in the test. An example of a distributive sentence might be “*la etiqueta de las botellas*” (“the label on the bottles”). The interpretation of this sentence is that there is a label on each one of the bottles. As a consequence, the subject has a multiple referent, since there are many labels, one per bottle. Thus, a sentence continuation of the type “*la etiqueta de las botellas* (pl) *eran* (pl) *verdes*” (the label on the bottles **were** green) would depend on the plural interpretation of the whole sentence rather than on the quality (emotional vs. non-emotional) of the last noun. However, a total isolation of distributive effects is very difficult to achieve. For this reason, whenever any trace of distributivity was present in one of the sentences, the same levels of distributivity tried to be counterbalanced by introducing an equally distributive sentence in the opposite condition. This way, any effect caused by the variable “distributivity” was somehow neutralized.

-Sentences with two possible subjects. There are some sentences which may have two possible subjects, namely the preverbal and the post-verbal noun phrases. In English, subjects tend to go preverbally, so the first NP is always regarded as the sentence subject. However, and as has been explained in previous chapters, Spanish shows a high degree of syntactic flexibility, so it is not difficult to find sentences in which the subject appears after the verb rather than before it. For this reason, sentences that were likely to be completed with plural post-verbal subjects were avoided, e.g. *el objeto* (sg) *de sus deseos* (pl) *eran* (pl) *los coches* (pl)—the object of his desires **were** cars— (notice: *los coches eran el objeto de sus deseos* -cars were the object of his desires-). In Spanish, the subject of this sentence could be either “*el objeto de sus deseos*” or “*los coches*”. So, the use of a plural verb could not be attributed to the presence of an emotional word placed right before the

verb (in this case “*deseos*”), but rather to the election of a postverbal plural subject (“*los coches*”).

With all this in mind, 30 experimental preambles were created which, together with the 45 fillers, formed the test which was presented to the participants. This questionnaire was delivered to 51 native speakers of Spanish who volunteered to participate. Further details regarding the methodology which was used will be given in proceeding sections.

5.4.2. Objective

As previously stated, the aim of this oral test was to ascertain whether the presence of an emotional word is a force strong enough to compromise the syntactic structure of a sentence. If it is, we would have to consider the possibility that various types of information are simultaneously present during the processing of sentences, or at least that syntactic phases are permeable to other types of information.

5.4.3. Method

5.4.3.1. Participants

Fifty-six students from the University of Santiago de Compostela (all of them in the second year of a psychology degree) volunteered to participate in the experiment. Among the 56 participants, there were 46 women and 10 men. They were all rewarded with a course credit. Of the total number of participants, 5 had to be discarded because either their reaction times were too slow or they left too many sentences unfinished, and therefore only the responses of 51 of the participants were taken into account at the end, all of them being native Spanish speakers.

5.4.3.2. Materials

The test (which can be seen in appendix C), consisted of 75 sentence beginnings, of which:

- Fifteen had the structure: article + neutral noun_{sg} + preposition (normally “de”) + article + neutral noun_{pl}. These were taken as the **control condition** (e.g. *el aspecto de las uvas* -the appearance of the grapes).
- Another 15 had the structure: article + neutral noun_{sg} + preposition (normally “de”) + article + emotional noun_{pl}. These sentences were taken as the **experimental condition** (e.g. *la duración de las vacaciones*- the duration of the holidays).
- The remaining 45 preambles were **fillers** with the structure: article + noun_{sg} + preposition + article + noun_{sg} or article + noun_{pl} + preposition + article + noun_{pl}.

Notice that no *sg-sg* or *pl-pl* combination was inserted in the experimental sentences since, in the case of *sg-sg* preambles, no possibility of recognising attraction errors due to the emotional status of words was possible ((for example in the case of a sentence like “*el material del radiador ERAN hierro*” (*the material of the radiator WERE iron), neither “*material*” nor “*radiador*” could be blamed for the use of the plural verb form “*eran*” (were) since the two potential subjects are singular in number.

Only with few (and controlled) exceptions were the structures described above slightly modified. Moreover, three different orders for the same preambles were created so that list could not be claimed to be responsible for any agreement decision on the part of the participants. Thus, of the 51 experimental participants, 17 completed the “order 1” version of the test, 17 completed “order 2” and the remaining 17 completed “order 3”. Items of the experimental condition, that is to say, those which contained a plural emotional noun in the N2 position were separated by at least two items of a different condition (either fillers or N-N items) in order to keep the purpose of the test hidden from the participants.

5.4.3.3. Procedure

All the participants were asked to enter into a quiet room, one by one, where they signed a consent form which informed them of the task they were being asked to perform. After receiving instructions and practising with a few mock sentences, the participants

then performed the task properly. In the consent form, the participants were warned that their responses would be recorded on audio equipment. For this purpose, the “All2wav” recording programme was used. The participants were then given a microphone and the “All2wav” programme was started. While being recorded, the participants had to read aloud 75 incomplete sentences which they then had to immediately complete with the verbs *ser* or *estar* (“to be”) in a suitable conjugated form and with all the complements that they found necessary. Only these two verbs were allowed in order to adhere as much as possible to the methodology that was going to be employed in the English version of the questionnaire (in English, only the verb *to be* in the present or in the past could be allowed since these are the only forms in which number agreement is morphologically expressed in that language). In this way, an excessive number of uninflected verbs in the participants’ responses would be avoided, thus avoiding the methodological problems found in some of the previous literature on this topic (Bock & Miller, 1991, for instance). All participants were instructed to complete the questionnaire as quickly as possible while trying to avoid hesitancy. They were also encouraged to create coherent and full-sense sentences. Moreover, they were told they could not stop for long between sentences, that is to say, they were asked to keep reading the sentence preambles and completing them (the aim of this task was to imitate actual speech acts as much as possible). Whenever they felt completely unable to complete a sentence, they were encouraged to simply drop that sentence and continue with the following one. The mean time they spent in doing the task was approximately 5.23 minutes. Since the participants had to first read the written sentence beginnings and then complete them out loud, we could say that the nature of the task was a mixture of both comprehension and production (they had to understand the sentence preamble, try to establish a mental referent for it and then formulate and utter a suitable continuation).

5.4.4. Results

The design employed was a 2X3 factorial design. Emotionality (with two levels: N-N and N-Emo) was considered a within-participants factor in the analysis over participants and

a between-participants factor in the analysis over items. List (with three levels: list 1, list 2 and list 3) was considered as a between-participants factor in the analysis of participants and a within-participants factor in the analysis by items. The DV was the percentage of attraction errors. A repeated-measures ANOVA was run for both participants (F_1) and items (F_2). It was based on the number of attraction errors found in the verb. The repeated-measures ANOVA showed the following results as regards Emotionality: [$F_1(1, 48)=4.59; p<.05; F_2(1, 28)=1.27; p>.05$]. A marginal effect of Emotionality was found in the analysis over participants ($p=.037$). However, in the analysis over items, Emotionality resulted non-significant ($p>.05$). In addition, there were no significant effects of the List factor [$F_1(2, 48)=1.55; p>.05; F_2(2, 56)=3.05; p>.05$], and more importantly the same was true for the interaction among List and Emotionality [$F_1(2, 48)=.24; p>.05; F_2(2, 56)=.14; p>.05$]. These results were considered as not solid since only the p in the participants analysis resulted significant (.037), but the same did not happen in the items analysis. In addition, the number of mistakes in the two conditions was unusually low. In this respect, it can be concluded that emotionality have not been a strong enough factor as to significantly increase the normal percentage of errors in the participants' responses.

The following figure summarises the results achieved for the Spanish test:

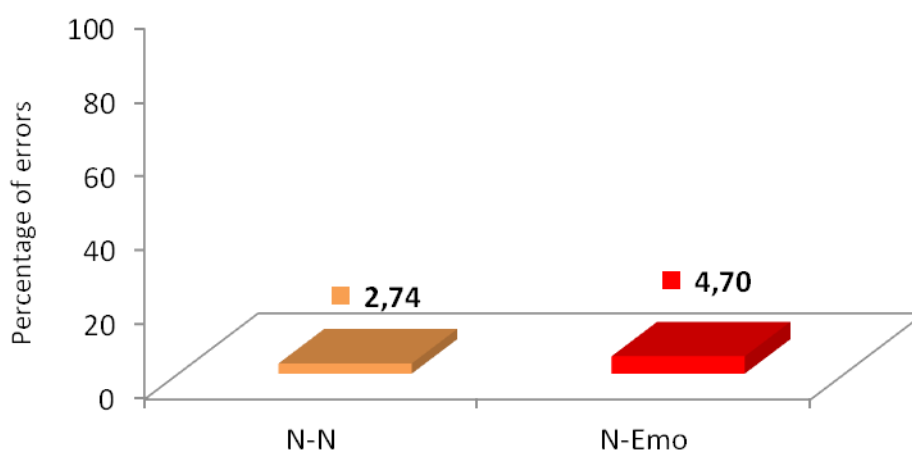


Figure 4-5: Results of the Spanish test.

5.4.5. Discussion

Contrarily to our initial hypothesis, the results obtained in this test, whose main objective was to test the influence of the variable “emotionality” on the syntactic processing of agreement, point to the fact that emotionality is not a parameter likely to jeopardize the syntactic structure of a sentence. These results seem to be in line with the on-line results achieved by Piñeiro (2011) but not with the results obtained in the series of off-line experiments carried out by Fraga et al. (2012). In addition, they have to be confirmed in the other language that constitutes the research focus of this thesis, so the same experiment was carried out in English. This study will be described in the next section. Our ultimate purpose will be that to compare two languages with almost opposite structural characteristics in relation to the processing of agreement and in the context of emotionality.

Finally, it is worth mentioning that although the results achieved in Spanish were non-conclusive as regards the emotional status of the words that formed the sentences, the number of general mistakes made by participants was surprisingly high. This fact will be discussed in further sections together with the reasons that could have led participants to make such errors.

5.5. *Second study: Emotionality test (English)*

5.5.1. Description

The results obtained in Spanish could not demonstrate a strong effect of the variable “emotionality” on agreement operations. However, there existed a possibility that positive results could be achieved in English. As was seen in chapter 2, languages with a tendency to morphological attrition are more open to semantic interference, so we thought it could be interesting to observe what would happen with the same emotional test when carried out in a structurally different language. Thus, an almost exact translation of the Spanish test was created in order to observe how English native speakers behave when facing the same sentences with the same processing problems. We will analyse whether potential

mistakes are caused by the emotional nature of some of the local nouns or by any other constraint that could be present in the experimental items. If the emotional component cannot produce more mistakes in this language it would indicate that the emotionality of words is not able to put the syntactic structure of a sentence at risk.

5.5.2. Objective

As previously explained, the main objective of this new version of the test will be to observe the behaviour of speakers of a structurally different language (English).

5.5.3. Method

5.5.3.1. Participants

Fifty-one students from the University of Lancaster (United Kingdom), from various degree courses, volunteered for the experiment. Participants were 18 men and 33 women. All the participants were unaware of what the purpose of the experiment was and they were not given either extra academic credits or money in return for their participation. None of the 51 participants were discarded from the experiment as they all followed the instructions correctly and spent the expected amount of time completing the task. The native language for all was English.

5.5.3.2. Materials

The test (which can be seen in appendix E) consisted of 75 sentence beginnings belonging to one of the following three types:

- Fifteen preambles had the structure: article + neutral noun_{sg} + preposition (normally “of”) + article + neutral noun_{pl}. They were taken as the **control condition** (e.g. *the report of the commissions*).
- Another 15 sentences had the structure: article + neutral noun_{sg} + preposition (normally “of”) + article + emotional noun_{pl}. These sentences were considered as the **experimental condition** (e.g. *the duration of the holidays*).

- The remaining 45 preambles were **fillers** with the structure: article + noun_{sg} + preposition + article + noun_{sg} or article + noun_{pl} + preposition + article + noun_{pl}.

Only with a few (and controlled) exceptions were these structures modified, as occurred in the Spanish version. All the sentences were revised by a native English speaker who found them to sound natural and appropriate for the task. Again, three different orders were created so that list could not be claimed to be responsible for any agreement decision on the part of the participants. Seventeen participants completed each one of the three lists.

5.5.3.3. Procedure

Again, all the participants individually entered a quiet room where they signed a consent form which explained to them the nature of the task they were being asked to perform. After having received instructions and having practised with a few mock sentences, the participants then performed the task properly. Once again, the participants were asked to consent to having their voices recorded by the “All2wav” computer programme. The task was exactly the same as in the Spanish experiment; the participants had to read a series of 75 incomplete sentences and then try to complete them with either the present or the past forms of the verb *to be* (as has been said, only the verb *to be* has inflected forms for both the present and the past in English) and all the complements that they wanted to add. They were encouraged to complete the task as promptly as possible, dropping any sentences for which they could not quickly find a continuation. The mean amount of time spent completing the questionnaire was 5.41 minutes.

5.5.4. Results

Regarding the statistical analyses, a repeated-measures ANOVA was carried out in order to judge the effects of emotionality. The design was a 3X2 factorial design where List was considered as a between-participants factor in the analysis of participants and a within-participants factor in the analysis by items, and where Emotionality was considered a within-participants factor in the analysis over participants and a between-participants

factor in the analysis over items. The DV was the percentage of attraction errors. The ANOVA was run for both participants (F_1) and items (F_2). The repeated-measures ANOVA with List (1,2,3) and Emotionality (Neutral-Emotional (N-Emo) vs. Neutral-Neutral (N-N)) as factors, revealed no principal effects of the List factor [$F_1(2, 48)=.42$; $p>.05$; $F_2(2, 56)=1.47$; $p>.05$]. These results showed that participants' preferences did not differ significantly across the lists. The effect of emotionality was neither significant by participants [$F_1(1, 48)=1.52$; $p>.05$], nor by items [$F_2(1, 28)=.02$; $p>.05$]. In other words, the presence of an emotional plural word in local position did not produce a significantly higher number of attraction errors than when the N2 position was occupied by a plural neutral word. In addition, there was no significant interaction between Emotionality and List [$F_1(2, 48)=1.70$; $p>.05$; $F_2(2, 56)=.26$; $p>.05$].

The following figure summarises the results achieved for the English test:

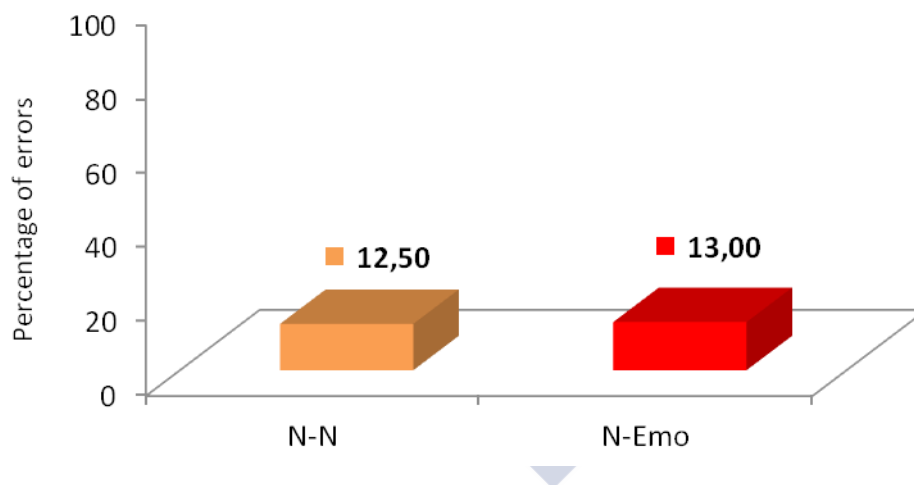


Figure 4-6: results of the English test.

According to the above results, an emotional and plural local noun does not have any effect on the morphological resolution of verb number in English either. That is to say, whenever a mistake of the kind: “*the taste of her kisses WERE sweet” is made by a speaker, the source of such a mistake cannot be claimed to be the emotional nature of the local noun (in this case *kisses*). So the “emotionality” factor does not seem to be decisive in subject-verb agreement processes.

5.5.4.1. Language differences

A 2X2X3 mixed factorial design (Emotionality X Language X List) was applied to the materials used in the two tests in order to compare them. The Emotionality factor was considered as a within-participants factor in the analysis over participants and a between-participants factor in the analysis over items. Both the Language and the List factors were taken as between-participants factors in the analysis over participants and as within-participants factors in the analysis over items. On first analysis, List was non-significant, so a second analysis was carried out in which the three lists were collapsed. Therefore, an ANOVA was carried out whose results showed a significant effect of Language [$F_1(1, 100)=31.15; p<.001; F_2(1, 28)=26.27; p<.001$]. However, Emotionality was non-significant [$F_1(1, 100)=1.70; p>.05; F_2(1, 28)=.27; p>.05$]. Also, the interaction between Language and Emotionality was non-significant [$F_1(1, 100)=.57; p>.05; F_2(1, 28)=.17; p>.05$].

Figure 4-7 illustrates the language differences found in the two tests (in orange the N-N condition and in red the N-Emo condition):

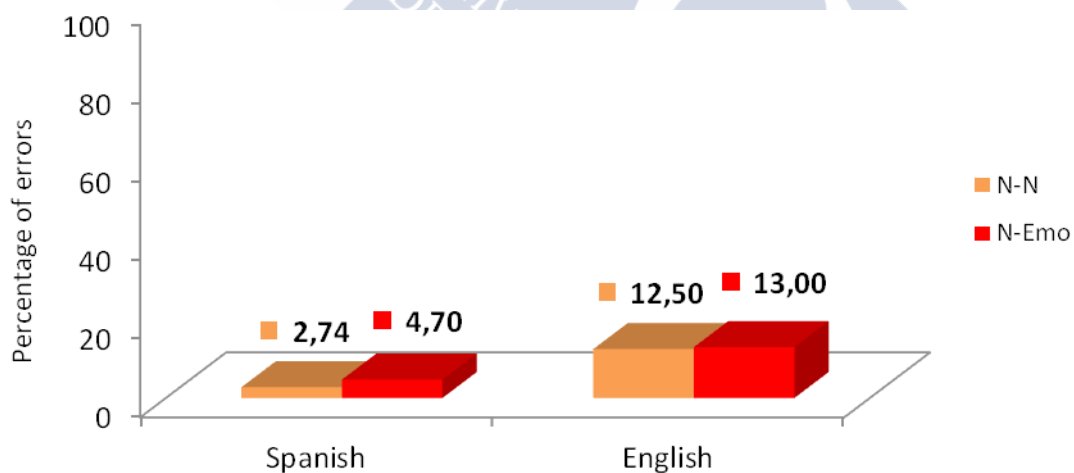


Figure 4-7: Differences between Spanish and English found in the emotionality tests.

As expected, the number of mistakes made is much higher in English than in Spanish. This is due to the fact that morphologically poor languages such as English are more open to interference from non-syntactic forces (Berg, 1998; Acuña Fariña, 2012, and Riveiro Outeiral & Acuña Fariña, 2012). The only question which remains unanswered is

that which asks: which variable is responsible for the large number of mistakes made in this test (once the emotionality of the local noun was seen as a statistically not powerful factor)? This issue will be thoroughly dealt with in the set of experiments presented in chapter 5.

5.5.4.2. Parallel results

In addition to the results obtained in relation to the variable we were testing, namely emotionality, it is worth mentioning the fact that an unexpected morpho-phonological effect was found in the English test (this effect being practically absent in the Spanish version). In the sentences considered as fillers in which two plural nouns were combined (e.g. *the cases for the pencils...*), a singular form of the verb was chosen by a surprisingly high number of participants, as in: **the cases for the pencils WAS/IS big*. Interestingly, this effect was non-existent in those preambles in which two singular nouns were combined. The mean values for the two conditions in the filler sentences (.065 for the plural-plural condition and .002 for the singular-singular one) were compared statistically and the following results were obtained: $t_1(50)=6.66, p<.001$; $t_2(42)=3.83, p<.001$. As said before, fillers were not the focus of our study, and it was not our intention to statistically analyse the number of mistakes made in those sentences. However, since this unexpected and strong effect captured our attention, we thought it necessary to carry out a separate analysis of those particular sentences. Interestingly, what we found was a clear phonological effect based on the repetition of the *-s* morpheme. Curiously enough, the *-s* morpheme in English is a plural mark for nouns but a singular mark (for the third person) in verbs. Notice “*the boys are*” and “*the boy is*”. This is a peculiarity of English (possibly derived from questions related to the evolution of this language over time) which is not shared by other languages, and particularly not by Spanish (or at least not in all their singular verb forms). Whenever the participants encountered two nouns in the plural, as in “*the players in the teams...*”, they were quite likely to use a singular form of the verb (e.g. *is*), apparently because this singular form shares the /s/ phoneme which was present in both the head and the local nouns, thus forming clearly incorrect

sentences such as “**the players in the teams IS ready for the match*”. In our view, this failure in the processing of such agreement marks is caused by the automation of a purely phonological operation resolved during the last stage of processing. That is, we may be facing a case of *shallow processing*. The reasoning would be as follows: whenever we encounter the same correspondence between a morphological mark and its meaning, that is, whenever we find an operation of the kind (/s/ equates plural) more than once in a very short space of time (as happens in the experimental preambles we are alluding to), our linguistic system automates and repeats such an operation. In terms of frequency, it would be quite likely to encounter the same correspondence a third time, so perhaps this is just a prediction mechanism which is used to speed up our processing. What happens in English, is that this mechanism clashes with the fact that nouns and verbs share the same morphological ending –s but they indicate a different number specification in different grammatical categories (as has been said, the –s morpheme indicates plural in nouns but singular in verbs). In this particular case, the meaning associated with the morpheme –s is overlooked for reasons of processing economy, thus causing an agreement failure. So, meaning is ignored and form becomes the only player whenever the system thinks that automaticity based on previous experience with the same association of form and meaning might speed up a mental operation. Interestingly enough, the presence of an additional /s/ phoneme in any other part of the noun phrase seemed to contribute to the processor getting lost. In fact, the two sentences which caused the highest number of agreement failures were those which contained an /s/ (additionally to the /s/ denoting plural) within each of the two nouns which made up the noun phrase (for instance, **the cases for the pencils IS...* and **the results of the analyses IS...*, had 10 and 16 mistakes respectively). Here, the processor had to separate different /s/ phonemes, some of them bearing a plural meaning and some of them having no meaning at all. So, in brief, automation becomes easier when the processor encounters the same form in a very short space of time, but does not seem able to distinguish between the different roles that such an item might play in different contexts.

5.5.5. Discussion

This test has provided three different sets of results: first, no effect of the variable “emotionality” was evidenced in the data obtained; second, the number of attraction errors found in English was significantly higher than that found in its analogous experiment in Spanish (and since emotionality could not be blamed, a source for such a number of mistakes occurring could not be found). And thirdly, an unexpected effect of “shallow processing” was found which pointed to the existence of phonological processing during agreement computation.

Starting with the first statement (the lack of an “emotional effect” on both the Spanish and the English data), a possible explanation for these results may be related to those results achieved in a recent study by Díaz Lago, Fraga & Acuña Fariña (submitted), in which gender agreement violations (in sentences containing emotional or non-emotional words) were analysed with an ERPs methodology. These authors obtained a set of results which pointed to the following: a very early effect related to the recognition of emotional words was found, and in this line, emotional words seemed to be detected in an apparently automatic way (effects appeared between 80 and 130 ms). Thus, as these authors suggest:

In view of the early stage when these differences are detected, they could be taken to reflect an index of perceptive and attentional processes related to the processing of stimuli (emotional vocabulary) that are treated as more relevant than others.

(Díaz Lago et al. (submitted))

That is to say, emotional stimuli seem to be quickly recognised (even only via their visual shape) and therefore given a preferential status. This fact might be related to issues of survival, since our organism must be ready to emit attitudinal responses which are sufficient for survival. This piece of research has also analysed another time window (350 to 450 ms.) in which an effect of grammaticality was found. A LAN¹⁰ wave was

¹⁰ LANs (or Left Anterior Negativities) were classically associated with the processing of incongruous morphosyntactic marks (Friederici, 2002).

observed whenever a gender violation was made. Interestingly, at this later stage in processing, no effect related to emotionality was found. Even more relevant is the fact that no statistical interaction between emotionality and grammaticality was found either in this time window or in a later one (from 500 to 700 ms.) where reanalysis usually takes place. In other words, the processing of grammar seems to be independent from that of emotional stimuli (they seem to run in parallel rather than to influence one another). These results make us think that the processing of emotional stimuli in general is previous to grammatical analysis and to semantics¹¹, since when emotional words are (according to these results) recognised, the processor has had no time to detect either morphosyntactic violations or the word's meaning.. Moreover, it also seems to be parallel to other types of processing, therefore running on different "rails".

As a conclusion, the processing of emotional words perhaps cannot be compared to that of other semantic variables (such as distributivity, collectivity, etc.), since the time processing of those variables could happen at a different (later) stage, as they are not treated as "preferential information".

The question then would be why the results obtained in the previously mentioned studies by Fraga et al. did show a robust effect of the emotional quality of words on a syntactic process such as relative clause disambiguation. A possible explanation would be that in Fraga et al.'s studies (contrary to this study) the syntactic structure of the sentences was never put at risk, whereas in the present study the grammatical structure of the sentences was always in conflict. In other words, in relative clause disambiguation, the participants had to choose between two possible correct continuations (they did not have the choice of creating a grammatically incorrect sentence). One of those continuations contained an emotional word whereas the other did not, but, for both options, the result was a perfectly correct relative clause. In contrast to this, in the agreement study, the election of either the actual head or the local noun as the syntactic subject of a sentence was related to the grammaticality and syntactic acceptability of the whole structure. That

¹¹ Here we interpret the term "semantics" in an encyclopaedic way, as all the knowledge acquired in relation to a word's meaning throughout experience.

is to say, whenever a plural local noun (emotional or non-emotional) attracted the verb towards a plural form, the syntactic acceptability of the whole sentence was jeopardized. So we could state that here the syntax-semantics interference is tested whereas in relative clause disambiguation processes such interference is not present to the same degree. Moreover, the nature of the two tasks was different, which contributes to the difference found in the results. First of all, Fraga et al.'s study dealt with relative clause adjunction, not with agreement, and second of all, the procedure followed was markedly different; for whereas Fraga et al.'s task was a written one, in our present questionnaire participants had to give their responses verbally, and this makes our task a more automatic one in which different linguistic processes are reflected.

6. CONCLUSIONS

As pointed out, the emotionality of the local noun does not seem to influence agreement choices either in Spanish or in English. A potential problem for our hypothesis was that, as explained in section 5.5.5., perhaps emotionality was mistakenly taken as a semantic factor when it should not have been. The accounted pre-lexical type of processing of emotional stimuli in the ERPs studies mentioned by Díaz Lago et al. (submitted), as well as the fact that emotional processing seems to work in parallel to semantic processing (with no possibility to influence one another), might be the cause of the lack of robust effects found in this completion test and in both languages. If emotional and syntactic processing take place at different times and then they run "in parallel", then emotionality could by no means influence agreement processes.

Although no emotional effect was found, the number of mistakes made in the preambles contained within the English version of the test was extremely large. Slightly fewer than 400 agreement mistakes (a 26.7% of the total data) of the kind "**the shape of the dolls WERE round*" were made by the 51 English participants in the experimental preambles. Such a large number of errors must have some cause or set of causes, since it definitely exceeds the average number of attraction errors that participants tend to make,

which according to Eberhard et al. (2005), is 13%. In addition to this, the number of errors made by the English participants was larger than the number of errors made by the Spanish participants. The reasons why these results were obtained deserves to be analysed further, and this analysis will be provided in the next chapter by making use of new experimental data.



Chapter 5.

THE INFLUENCE OF CONCRETENESS ON AGREEMENT OPERATIONS

1. INTRODUCTION

Based on the observation of the responses provided in previous tests, in this chapter, a new semantic constraint (concreteness) will be tested in relation to subject-verb agreement processes. The procedure followed will be once again that of completion tests since we find them a reliable way of testing this kind of variables.

2. ON CONCRETENESS

It is widely known that words possess different characteristics that allow us to classify them on the basis of semantic criteria. One of these classifications is related to the distinction between “abstract” and “concrete” nouns. Concepts such as “*table*” or “*dog*” undoubtedly belong to the category “concrete” and they can be said to oppose abstract terms such as “*happiness*” or “*size*”, for instance. Although this concrete-abstract classification might seem easy and intuitive, it is not clear exactly what this classification is based on from the point of view of their processing. The common-sense notion is that an entity is abstract whenever it is not easily perceived by our senses, or is less imageable, or is more difficult to contextualise, whereas concrete words are thought to be highly perceivable, imageable and easily put in context. Concrete words have been shown to have quicker processing than abstract words, while also being better understood and more efficiently processed in a variety of cognitive tasks including paired associative learning, translation, comprehension tests, lexical decision and free recall (e.g. Day, 1977; de Groot, Danenburg & Van Hell, 1994; Holmes & Langford, 1976; James, 1975; Paivio, 1971, 1986 –see also

Barber, Otten, Kousta & Vigliocco, 2013 for a recent ERP perspective–). This processing advantage came to be labelled the “concreteness effect”. It has also been observed that the meanings of abstract words in definition tasks differ more across languages than do the meanings of concrete words (Taylor, 1976). For such reasons, the brain mechanisms which underlie the processing of the two word classes must not be the same, that is to say, the organization of lexical knowledge in the brain must honour categorical distinctions such as that of concrete-abstract by taking advantage of different brain circuits in order to process such distinctions. In fact, work in this field which employs an ERP methodology has demonstrated that we have distinct brain systems (involving differentiated brain areas) for processing concrete and abstract concepts (Binder, Westbury, McKiernan, Possing & Medler, 2005). The same conclusions were reached when dealing with brain damaged patients. Depending on where their lesion was located, the patients suffered selective impairments of either concrete or abstract words (Warrington, 1975, 1981). However, the idea that there are different brain circuits involved in the computation of concrete and abstract words has not always been believed. Up to now, two theories have been put forward which seek to explain how the processing of concrete and abstract words differ and what the specific causes are for such processing differences. The first of these theories believes in a dual coding system involving differentiated brain areas. The second theory, on the other hand, attributes the differences in processing to issues related to the amount of contextual information a word evokes in our mental lexicon.

2.1. The dual coding theory (Paivio, 1971, 1991)

The following quote contained in Papagno, Fogliata, Catricalà & Miniussi (2009: 78), summarises the basis of Paivio’s (1971, 1991) “dual coding theory”:

The dual-coding theory claims that the processing of abstract nouns relies on verbal code representation of the left cerebral hemisphere only, whereas concrete nouns additionally access a second image-based processing system in the right hemisphere.

As the quote suggests, Paivio (1971, 1991) pointed to the idea that the representation of concrete words is formed on the basis of two different systems which complement each other. An imagery system provides the image representation for a certain term, which is at the same time complemented with the verbal information the word evokes (the word itself and all the associates related to it). This hypothesis provides support for the idea that concrete words are processed more efficiently than abstract words, since the former have two different representations (based in different areas of the brain), while the latter are only activated in one of the two systems, namely the verbal one. The explanation for this is quite an intuitive one; abstract words have referents which are very difficult to imagine since they do not have a visual referent that might be activated in our imagery system at the same time as the word is being processed in the areas related to verbal information. For this reason, abstract words have smaller cognitive support, which is reflected in both production and comprehension, as they are more difficult to process and remember. On the other hand, concrete nouns are related to images that are an important part of their semantic representation and which make the cognitive connection stronger.

The dual coding theory has been complemented with (or rather split into) a second version which postulates that the imagery system is present in concrete word processing, but only when the systems finds this cognitive resource to be necessary. In other words, processing is for the case of concrete words “strategic” (hence the name “*the strategic imagery hypothesis*” given to this theory (see Paivio, 1986)). What this hypothesis posits is that: “[...] imagery is invoked strategically by persons when they see imagery as being helpful toward meeting the goals of a task” (Schwanenflugel, Akin & Luh, 1992: 96). According to this view, images are not always activated during the processing of concrete words but only when such activation facilitates the process. For instance, in a task such as recalling lists of unrelated words, imagery is regarded as useful by participants, and in this case having two codes at work helps us remember isolated words.

Both the dual and the strategic coding hypotheses believe there is the possibility of two distinct systems based in different areas of the brain working in parallel. However, this

view has been questioned, and other theories such as the “context availability hypothesis” have been proposed.

2.2. The context availability hypothesis (Bransford & McCarrell, 1974; Schwanenflugel & Shoben, 1983)

The second hypothesis concerning the processing of concrete and abstract words was dubbed the “context availability hypothesis”. This hypothesis put forward the idea that the different computation of abstract and concrete material does not depend on the use of a distinct non-verbal system for concrete words, but rather on the greater contextual support that concrete nouns have by default. Schwanenflugel et al. (1992: 97) perfectly summarise the basis of this theory in the following words:

Abstract verbal materials are said to be more poorly comprehended and, therefore, poorly recalled, because people experience greater difficulty in accessing the relevant word knowledge necessary for understanding such materials. Therefore, abstract materials are recalled more poorly than concrete materials, not because of the lesser availability of imagery, but because of the availability of associated contextual information in memory for such materials.

So this hypothesis (currently supported by ERP studies, such as that of Xiao, Zhao, Zhang & Guo, 2012) ascribes the advantage in the processing of concrete nouns to the availability of more contextual information in semantic memory which supports their processing. If abstract and concrete stimuli were both presented in supportive contexts, they would be comprehended and recalled equally. Thus, we have a classification of *concrete* and *abstract* which is based solely on verbal information. The more contextual information is recalled in relation to a word, then the more concrete that word is and the faster its processing. Conversely, the less associative information a word activates in our memory system, then the more abstract that word will be and the harder it will be to

recall. However, if an abstract word is accompanied by a supportive amount of contextual information in a task, the processing differences between that word and a concrete one would be eliminated (equal processing times and equal cognitive effort would be found for both words). A possible argument against this view would be that imageability and context availability are strongly correlated (contextual information in relation to one word inevitably activates a certain degree of imagery), so it is often very difficult to discern an independent influence from one of these two factors.

2.3. An approach to the topic from the point of view of acquisition

Perhaps the difference in processing between *concrete* and *abstract* words will be more easily discerned if we pay attention to their acquisition. In recent studies the notion of Mode of Acquisition (MoA) has been explained and connected with the processing of concrete and abstract words. This notion was introduced by Wauters, Tellings, van Bon & van Haaften (2003) and, as has been pointed out, it is linked to the way speakers acquire words. Notice that although Mode of Acquisition (MoA) and Age of Acquisition (AoA) correlate, they represent different concepts. MoA (as opposed to AoA) is grounded in the assumption that: “the meaning of a word can be acquired perceptually, linguistically or by a combination of both” (Della Rosa, Catricalà, Vigliocco & Cappa, 2010: 1043). Della Rosa et al. (2010) conducted an experiment in which they asked a series of participants to score some words with respect to many semantic variables (one of which was MoA). They found that the difference in their ratings pointed to the fact that: “concrete words are acquired mainly through experience, while the meaning of abstract words is tightly bound to language” (Della Rosa et al., 2010: 1047). This fact would add support to the dual coding hypothesis in the sense that the answers given by the participants suggested a double-way processing system. An imagery system is more closely related to experience, and seems to be necessary for the acquiring of concrete nouns. However, these data do not mean we should dismiss the context availability hypothesis, as the information provided by participants is not enough to allow us to talk about two different processing systems.

As a consequence, the question about the nature of the difference between the processing mechanisms of abstract and concrete words is still unanswered. In any case, what is clear is that concrete and abstract items have a different nature (which allow them to be classified into two different groups of words) and that such a difference has to somehow be reflected in their processing. It is quite likely, then, that concrete and abstract words would behave in different ways when inserted in a sentence.

Since the structure being studied in this thesis is subject-verb number agreement with complex subjects, we are going to try to relate the topic of concreteness (or “palpability”) to the processing of this structure. If concrete words have a general processing advantage, then the integration of concrete and abstract words into syntactic structures would be likely to produce certain effects. One such effect might be the elicitation of a significantly different number of attraction errors. Our hypothesis, then, is that since the processing of concrete nouns shows an advantage over abstract words (according to the two theories mentioned above), concrete words should induce the parser to establish agreement with them, rather than with abstract terms (even in cases in which this link is erroneous according to syntactic rules, leading to grammatical errors). It is logical to think therefore that those words which have such processing facilitations will be better attractors for the verb and will be most easily taken as subjects. This hypothesis will be verified in two experiments. In addition, once again, we are going to provide a crosslinguistic perspective on the previously mentioned studies. But, first of all, it is necessary to analyse the precedents in the study of attraction errors in relation to concrete and abstract words. To this end, we are going to refer to a relevant study which joins the methodology of agreement error elicitation to concreteness. In the next section we will summarise the main results obtained by Bock & Miller in their 1991 study, results which are related to the subject of our present research.

3. AN ANALYSIS OF BOCK & MILLER (1991)

To our knowledge, the only work dealing with the relationship between concrete/abstract words and number agreement is that by Bock & Miller (1991). In this article, they started dealing with the problem of which sources of information are responsible for grammar lapses such as the ones they report (Bock & Miller, 1991: 46):

- (1) **The time for fun and games are over.*
- (2) **The readiness of our conventional forces are at an all-time low.*
- (3) **I don't think it much matters where the final reinterment of these men are.*
- (4) **The learning skills people have entering college is less than it should be.*

All these sentences follow the same pattern; they are complex noun phrases whose local noun has a different number specification than the head. In all of them, it is precisely the local noun which establishes an erroneous agreement connection with the verb, thus giving rise to an attraction error. Bock & Miller examined whether the incidence of such errors has something to do with the presence of semantic features such as animacy or concreteness (thus supporting an interactive view of processing) or whether they are driven only by morphosyntactic issues (simply having to do with the position of the different elements within the sentence). Semantic features such as concreteness and animacy are likely to be part of Noun Phrases denoting topics (Givón, 1976) and as a consequence they are prone to control grammatical agreement. For this reason, Bock & Miller thought it necessary to investigate if the semantic features of animacy and concreteness could be responsible for agreement mistakes such as the ones previously reported. According to them, a sentence like **the blanket on the babies were small* would be far more probable than one such as **the baby on the blankets were small*, since in the first sentence, the noun which has subject-like characteristics (the one which is animate) is in second position (closer to the verb) and in the plural (the marked form for number). Thus, according to Bock & Miller, animacy (as well as concreteness) would be likely to violate the normal

structure of a sentence under certain conditions. In order to test this hypothesis, they carried out a series of experiments in which they manipulated both the semantic and the syntactic information of the sentences being analysed.

In their first experiment, they manipulated the amount of material separating the head and the local noun in order to test whether memory can play a role in agreement processes with two possible antecedents. For this reason, they included both prepositional and clausal postmodifiers in half of the experimental preambles which were presented, and therefore the linear distance between the head noun and the verb was increased in some of the preambles but not in others. What Bock & Miller found in this experiment was that linear distance was not a decisive factor in agreement computation, since the number of agreement errors did not increase in those sentences in which more linguistic material separated the subject and the verb. Thus, memory overload did not seem to be responsible for mistakes, and the only constraint which seemed to play an important role in those sentences was the number specification of the local noun. Specifically, plural nouns produced a significantly higher number of attraction errors when they were placed in local noun position (as in: **the key to the cabinets are...*). However, singular local nouns did not produce the same number of mistakes. In brief, whenever the number of the head and the local noun mismatched, agreement mistakes were more likely to occur, and this happened more often when the local noun was in the plural and the head in the singular. A possible explanation for this phenomenon is that the plural feature of the marked local noun is erroneously transmitted to the head noun, and this noun then transmits the plural feature to the verb, thus creating an erroneous agreement connection (Nicol, Foster & Veres, 1997: 571). As pointed out, this seemed to be a recurrent effect in the test, and it was connected to issues of a purely formal nature.

Distributivity issues were also tested in Bock & Miller's first experiment (as explained in previous chapters), in which they obtained negative results for this semantic variable (although different results were later on obtained by Eberhard in 1999, in whose experiment more errors were produced following distributive phrases).

In Bock & Miller's second experiment (which is the one we are more interested in since it tests the genuine effect of concreteness), both concrete/abstract and animate/inanimate words were inserted into the preambles which were presented to participants. These conditions were counterbalanced across preambles, thus testing whether semantics would be able to challenge an a priori fully encapsulated phase. The number of the two nouns in each one of the sentences was modified so that all the possible number combinations were included for the same preamble. As regards the results obtained, no effect caused by the variable animacy was found. Both animate and inanimate local nouns produced the same number of attraction errors. The only cause for the mistakes made was the number of the local noun, as plural local nouns (independently of their animacy levels) produced, once again, a higher number of errors. Evidently, this happened when the two nouns in the sentence presented a mismatch in number. Concerning the role of concrete words, it was found that concrete local nouns were only marginally more likely than abstract local nouns to create agreement errors, but again, only when they mismatched the head's number, that is, when they were plural (Bock & Miller, 1991: 71). These results suggest that neither animacy nor concreteness (or their interaction) was responsible for a rise in the number of agreement mistakes on the verb. So up to this point in the research, no semantic variable was found to be responsible for any agreement alteration in the verb.

Therefore, both the first and second experiments reached the same conclusion, that is that only the plurality of the local noun in the mismatch condition can influence agreement processing and produce an erroneous number on the verb. In conclusion, agreement was regarded as a phase (in a strictly generative sense) of a purely syntactic type of processing. However, Bock & Miller explain a methodological problem they faced in relation to the preambles which they manipulated in the second experiment. When they scored the responses given in this second test, they found that most of the responses given by participants contained uninflected verbs, that is, they were unable to judge for the majority of sentences whether or not the participants were establishing agreement with the first or the second noun, since the verbs they employed were in the future or

past forms (uninflected in English). These responses were consequently eliminated from the final score and thus did not contribute to the results. We find this methodological problem very controversial; firstly because the amount of data was dramatically reduced, and secondly, because it could have become unbalanced across conditions. This problem could have been avoided by asking participants to complete the sentences only with the verb *to be*, which is inflected in both its present and past tenses in English. In this way, the number of invalid responses would have been considerably reduced and the data used for analysis would have been much more robust and reliable. This aspect of the methodology will be taken into account and improved in the series of studies about concreteness which we will present in further sections of this chapter.

To summarise, the conclusions reached by Bock & Miller point to the fact that neither linear distance as tested in experiment 1, nor the semantic variables as tested in experiment 2 are responsible for agreement failures on the verb region.

In experiment 3, a more complex syntactic structure was used for the preambles and a possible interference of animacy on such a structure was again tested. Bock & Miller used relative clauses followed by two verbs (one referring to the “upstairs subject”, which was the actual subject of the sentence, and the other one referring to the “downstairs subject”, which was the subject of the relative clause) instead of complex noun phrases. Moreover, in these sentences they manipulated the animacy levels of the two nouns. Let’s illustrate this with an example: in a sentence such as “*the king that the colonies oppose is a tyrant*”, there are two subjects: an upstairs one (“*the king*” which must agree with the second verb) and a down stairs or relative clause subject (“*the colonies*”) which must agree with its most immediate verb, which in this case is “oppose”. In this particular example, the animate noun (*king*) is in first position and the inanimate one (*colonies*) in second position, but this variable was counterbalanced across sentences. So Bock & Miller tested whether the same tendency to make agreement mistakes in a mismatching condition in which the preverbal noun was in the plural was present in these non-intervening sentences as well, or whether these preverbal nouns behaved differently with regard to agreement

computation. That is to say, they investigated whether intervening nouns (local nouns in complex subjects) may have a stronger influence on agreement mistakes than non-intervening ones (as in relative clauses of the type exemplified above). The theoretical reasoning behind this is that when there is attraction in complex noun phrases, it is due to a wrong copy of the local noun's features being made onto the subject, whereas in clauses with non-intervening nouns, attraction results from the occasional confusion about which noun is the relative clause subject and which is the matrix subject, and this is perhaps due to the complexity of the object relative clause structure (Staub, 2009: 2). Moreover, Bock & Miller tested whether animacy could play a role in such structures, given that in relative clauses (as opposed to in complex noun phrases) the two noun phrases have a subject status. The results suggested that 1) non-intervening nouns did not influence agreement to the same extent than intervening local nouns did in the previous two experiments, and 2) animacy was only responsible for the appearance of mistakes when the two nouns had a subject status (in relative clauses), since more mistakes were found when the animate noun was in the first position. Thus, whenever the syntactic status of subject is attributed to a noun phrase, it is less likely to produce attraction mistakes, since attraction only happens when there is an intervening noun phrase which "confuses" the parser and should by no means be taken as the actual subject of the sentence. Therefore, according to Bock & Miller, these data support the idea that syntax is autonomous and that it works independently of semantics or other sources of information. However, the same problem which was present in experiment 2 as regards the high number of uninflected verbs found in the participants' responses was also present in this experiment. 57.0% of the total number of responses were discarded because they contained uninflected verbs, and if we add this percentage to the 16.0% of miscellaneous responses, we are left facing the fact that well over 50% of the experimental data collected was not included in the final statistical results. From our point of view, this fact undermines Bock & Miller's final conclusions.

To sum up, Bock & Miller did not find any effect which was caused by concreteness, they only found an animacy effect in relative clause structures where the two nouns had the syntactic category of subject. Apart from this, the only source of agreement mistakes found was in the plural-singular asymmetry of the two nouns in a complex noun phrase subject. Thus, plural local nouns were always responsible for attraction errors, independently of linear distance or semantic biases. However, we think that if the materials used by Bock & Miller are improved, then it might be possible to get different results. Specifically, the problem surrounding the fact that too many of the total number of subject responses were discarded because of their lack of inflection can be avoided, and thus the data used would be more reliable and able to lead us to more solid conclusions. For this reason, we designed two experiments (one in Spanish and another in English) in which the preambles used were rigorously controlled. The aim of these experiments was to demonstrate that the variable “concreteness” can in fact elicit a significant number of agreement errors on its own.

For the selection of the materials to be used in these concreteness tests, we employed two databases which contained the values for the nouns that we used in the preambles. These word-value search tools (one containing concreteness rates for Spanish words and the other one for English words) will be described in the following section.

4. THE B-PAL AND THE MRC DATABASES

Those wishing to construct word sets as stimuli for research in psycholinguistics must take into consideration a large number of characteristics for the words they want to use in their experiments. Such word properties are not normally contained in dictionaries, since these only provide us with lexico-syntactic information (their word class, number, etc). For this purpose, there exist databases which have been created in order to meet these needs. Two examples are the so-called B-Pal and MRC databases which are described in the next two sections. These two were used in our investigation.

4.1. B-Pal (*Busca Palabras - Wordsearch*)

This useful database for research in psycholinguistics was created by Davis & Perea in 2005. B-Pal is a Windows program which is used to obtain a broad range of statistics concerning the properties of both word and non-word stimuli in Spanish. It contains a default vocabulary of 31.491 words in total. Most of the lexical items it contains belong to the grammatical category of “noun” and they can mostly be found in their singular form. The statistical information for these words is divided into four categories, namely; “orthographic statistics”, “phonological statistics”, “neighbourhood statistics” and “other statistics”. The last group includes subjective measures such as concreteness, familiarity, imageability, valence, arousal and age-of-acquisition. Measures such as those of concreteness, imageability or familiarity score on a scale from 1 to 7, where higher scores indicate greater concreteness/imageability/familiarity. B-Pal is the Spanish version of the original N-watch program (Davis, 2005) that contains verbal stimuli in English. However, the former contains more measures (such as concreteness, for example) than its English counterpart.

4.2. The MRC (*Medical Research Council*) Psycholinguistic database

This database was originally created by Colheart in 1981, but its 2.0 version corresponds to Wilson (1988). Like B-Pal, it has been designed to be of use in psycholinguistics (among other functions), as it provides valuable stimulus materials for testing. The updated version we are alluding to contains up to 150.837 English words and a total of 26 linguistic and psycholinguistic attributes for each, although information about every property is not available for every word (note that this database was created by the assembly of smaller and more specific databases which had limited access). Moreover, most of the nouns included in the database appear only in their singular form (as is the case in B-Pal, too).

The majority of the words used in the experiments which are to be described in the following sections have been tested with the help of these two computer resources so

that we might have complete control and understanding of the materials. Once the words that would be contained in the tests were selected, the completion tests were designed and then delivered to the participants. All the details regarding the experiments and how they were conducted are provided in further sections. But firstly, we thought it necessary to discard the only possible semantic variable that could influence the preambles presented in the test, namely “distributivity”. To this end, we designed the norming test which is presented below.

5. NORMING STUDY: DISCARDING POTENTIAL DISTRIBUTIVITY EFFECTS

5.1. Description

As explained in chapter 3, since Eberhard’s (1999) study, the variable “distributivity” was thought to have an influence on agreement processes. Consequently, we found it necessary to remove any influence it might have in our experimental preambles through which we were trying to test the effects of another semantic variable, namely concreteness. For this purpose, a distributivity norming test was designed in which the sentence preambles that were to be used in the concreteness questionnaire were included. The sentences were only tested in one of the two languages which represented the focus of our investigation, that is, in Spanish. Distributivity levels should not differ across the two languages, since exact translations of the same sentences were used in both the Spanish and the English tests, and therefore, this norming study was only carried out in Spanish.

5.2. Objective

Our objective is to remove any possible influence of the variable “distributivity” from the preambles created for the concreteness test. Our ultimate end is to prove the genuine effect of “concreteness” on agreement and therefore all other potential effects from other variables (such as distributivity) have to be discarded.

5.3. Method

5.3.1. Participants

Twenty students from the University of Santiago de Compostela (all in the fourth year of an English Language and Literature degree course) volunteered to complete this test. Among the total number of participants there were 17 women and 3 men. None of the participants' responses were discarded as they all understood the procedure and completed the task in the correct way. Their ages ranged between 21 and 29 years, with a mean age of 22.8 years. They were all native speakers of Spanish.

5.3.2. Materials

The test consisted of 75 sentence beginnings whose levels of distributivity the participants had to evaluate. The 75 preambles were organised as follows:

-Fifteen corresponded to the first type of control sentences. They clearly showed high levels of distributivity (with a mean value of 5.71).

-Fifteen corresponded to the second type of controls and had very low distributivity levels (mean value: 2.41).

-Fifteen corresponded to the third type of control sentences. They were considered to have medium levels of distributivity (mean value: 4.3).

- In addition, the 30 items which were to form the concreteness test were interspersed between the 45 control sentences. Fifteen of them corresponded to the C-C condition and the remaining 15 to the A-C condition. Non-significant differences in distributivity levels should be found among the items in the two conditions (C-C and A-C), and if this is indeed what is found, then distributivity could not be thought of as being an influential semantic constraint meddling in the participants' responses in the next concreteness test. Therefore, if any semantic effect *was* found, it could only be attributable to a genuine effect of concreteness.

5.3.3. Procedure

Prior to the evaluation task, participants were given instructions as to how they were to complete the written test. The instructions explained what is meant by the term “distributivity” and how the participants should evaluate distributivity levels in sentences. Before the evaluation, the participants were provided with examples of distributive and non-distributive sentences and told that they should rate each of the 75 sentences anywhere on a scale of 1 to 7 (1 meaning low distributivity, and 7 meaning very high distributivity). They were also informed that intermediate levels (2, 3, 4, 5, and 6) could be chosen. All participants completed the evaluation test in about 20 minutes. Both the instructions sheet and the evaluation questionnaire can be seen in appendix F.

5.4. Results

A planned comparison revealed no significant differences in the level of distributivity between the C-C (M=3.16; S.D.=.74) and the A-C (M=3.59; S.D.=.93) conditions ($t_1(19)=1.63, p>.05$; $t_2(28)=.92, p>.05$). Moreover, the two conditions obtained ratings in the medium-low distributivity level when compared to the three groups of filler sentences, since those which were inserted as high distributivity sentences were ranked with a mean value of 5.71, those considered to be low distributivity sentences had a mean value of 2.41, and those which were thought to have medium levels of distributivity had a mean value of 4.4. In conclusion, since distributivity was equal across the two conditions, this semantic variable could not be responsible for any difference in the number of agreement mistakes of the two conditions (C-C and A-C) in the subsequent concreteness test.

5.5. Discussion

Since the statistical analyses carried out revealed the absence of significant differences between the distributivity levels of the two conditions in the concreteness test, those preambles were considered as perfectly valid for the purposes of the subsequent test. As

has been pointed out, we tried to remove the influence of a powerful semantic constraint in the questionnaire, and this was achieved, as the results of the norming test showed. Thus, we could proceed with our investigation.

6. FIRST STUDY: CONCRETENESS TEST (SPANISH)

As mentioned earlier, since a disproportionate number of mistakes were made in the sentences presented in the emotionality experiment, an explanation for this tendency had to be found. Such a high percentage of mistakes could not be attributed to the presence of emotional words, since as previously explained (section 5.5.5. of chapter 4), the number of errors involving emotional and neutral words was quite similar. So a new constraint must be present in that test which was not under our experimental control. The observation of the responses provided lead to concreteness having an influence on those errors. Those plural local nouns showing higher levels of concreteness were more likely to attract verb number whenever the singular head noun was very abstract, as in “*el aspecto de las uvas...*” (“*the appearance of the grapes...*”), where *aspecto* (appearance) is obviously abstract, and the second noun (*grapes*) is undoubtedly concrete. As previously explained, Bock & Miller (1991, experiment 2) did not obtain results supporting a possible correlation between concreteness and attraction mistakes. However, the limitations of the data used by Bock & Miller could have been the cause of such results. For this reason, and in order to ascertain whether concreteness could be the source of all the attraction errors made in the previous test, a questionnaire was designed in which the sentences were carefully selected according to the levels of concreteness that the two nouns had. Moreover, participants were encouraged to use verbs in their responses which elicited inflected forms (i.e. the verb *to be*).

6.1. Description

Seventy-five preambles were again created for this new test. The whole set of sentences used can be seen in appendix G.

6.2. Objective

The objective of this test was to prove whether or not the abstract status of a singular head noun in combination with a concrete local noun in the plural could lead the parser to produce more attraction errors in the systematic computation of agreement. If concrete words activate more brain areas than abstract words and have a facilitatory role in processing, they could be stronger attractors for verbs when they appear in the marked form (plural). This is our initial hypothesis.

6.3. Method

6.3.1. Participants

Fifty-one students were chosen for this experiment. All were second year Psychology students at the University of Santiago de Compostela. The students' participation was voluntary, although they were given extra academic credit in one of their course subjects in return for taking part in the experiment. None of the participants knew about the purpose of the experiment, and only after they had completed the task were they told what the experiment was about. Of the 51 volunteers 15 were men and 36 were women. No participants had to be discounted from the final results as they all followed the instructions they were given and performed the task correctly. The mean amount of time each participant spent on the task was approximately 5.6 minutes.

6.3.2. Materials

As advanced in the “description” section, the test consisted of 75 sentences which were distributed in the following proportions:

- Fifteen concrete singular - concrete plural (C-C) sentences formed the **control condition**.
- Fifteen abstract singular - concrete plural (A-C) sentences formed the **experimental condition**.

-Forty-five **fillers** in which both nouns were either singular or plural. No possibility of semantic attraction was possible in these filler sentences and so they were not going to be analysed as part of the experimental data.

As happened in the emotionality test, no *sg-sg* or *pl-pl* combination was inserted into the experimental sentences since (especially in the case of *sg-sg* preambles), no possibility of recognising attraction errors caused by the concrete status of words was possible (e.g. if a participant produced a sentence like “**el sueldo del trabajador SON muy bajo*” (*the salary of the worker ARE very low), neither “sueldo” (salary) nor “trabajador” (worker) could be blamed for the use of the plural verb form (are) since the two potential subjects were both singular in number).

It is also worth noting that the second noun within the control condition (C-C) had in almost all sentences an animate (and even human in some cases) nature (as in *the office of the girls*, for instance). Although Bock & Miller (1991) did not find positive results for this variable in their second experiment, thus suggesting a lack of influence from this variable in syntactic processing, there is posterior evidence in the psycholinguistics literature that animate entities are conceptually highly accessible and, as a consequence, tend to be privileged during syntactic processes of production (see Branigan, Pickering & Tanaka, 2008: 172, among others). This is based on the fact that, since production is incremental, highly accessible information is processed first. The same occurs in comprehension, where this type of information is more easily retrieved from memory (see, for instance, Holmes & Langford, 1976). In addition, since subjects tend to be animate beings and most likely humans, animate nouns could be very strong attractors for verbs. Moreover, animacy tends to be related to topicality and subjecthood and as a consequence animate nouns are likely to be sentence subjects. Our research hypothesis, then, is that even though we allocated such strong agreement attractors (namely, animate nouns) to the N2 position in the C-C condition, the number of attraction mistakes in these sentences would be much smaller than that of sentences in the experimental condition (even though sentences in the experimental

condition contained no animate or human nouns at all). In other words, we introduced an extra constraint in order to reinforce the power of concreteness in case the results of the test are positive with regard to this variable.

The concreteness values for each of the words employed were taken from the B-Pal database (Davis & Perea, 2005). Thus, 41 concrete words ($M=5.16$; $S.D.=.73$) and 15 abstract words ($M=3.72$; $S.D.=.81$) were selected. As regards the concrete nouns, 30 of them were selected for the C-C condition, and 15 for the A-C condition (note that 4 words were present in more than one sentence, but their concreteness values were only entered once). In order to confirm that the concreteness levels of words were as expected, a one-factor analysis was carried out. The results showed that abstract words were significantly different from concrete words ($F(3, 55)=14.26$; $p<.001$). Post-hoc tests carried out among the four sets of words (three sets of concrete words and one set of abstract words) revealed that there were significant differences between the set of abstract words and each set of concrete words (all $ps<.001$) and that there existed no significant differences between the three sets of concrete words (all $ps>.05$).

Sentences from each of the three conditions were distributed among the tests in a randomized order. Between the sentences of the experimental condition there was a separation of at least two or three sentences, with the first three sentences of the test always being fillers. Three experimental lists were created with exactly the same preambles in order to avoid list effects. The above mentioned rules regarding the collocation of sentences were applied to each one of the three lists.

All these control measures were designed to make sure that participants did not realise that there existed three different types of sentences. This meant that the objective of the questionnaire was not guessed by any of the participants.

6.3.3. Procedure

The same procedure used in the emotionality test was employed here. After having signed a consent form, participants had to verbally complete seventy-five incomplete sentences

which were presented to them in a written form. Their responses were again recorded with the sound-recording software, “All2wav”. The tests were conducted in a quiet room and the participants were provided with instructions to help them to complete the task successfully. The experimenter was present at all times during the execution of the task.

6.4. Results

A 2X3 repeated-measures ANOVA was conducted separately for participants (F_1) and items (F_2). The analyses were based on the number of attraction errors found in the verb (DV). The orthogonally crossed factors were concreteness (with two levels, C-C and A-C), which was considered a within-participants factor in the analysis of participants and a between-participants factor in the analysis of items, and List (with 3 levels; 1, 2, 3), which was considered a between-participants factor in the analysis of participants and a within-participants factor in the analysis of items. An effect was considered significant when it was reliable at or beyond the .05 level. The results revealed that the effect of Concreteness was significant for both participants [$F_1(1, 48)=17.95, p<.001$] and items [$F_2(1, 28)=16.73, p<.001$]. However, neither any principal effects of the List factor [$F_1(2, 48)=.45, p>.05$] $F_2(1.51, 42.27)=.38, p>.05$], nor a significant interaction between List and Concreteness [$F_1(2, 48)=.29; p>.05$; $F_2(1.51, 42.27)=.28; p>.05$] were found.

In summary, the results of the ANOVA revealed that the presence of an abstract singular word in head position followed by a plural concrete noun produced a significantly higher number of attraction errors between N2 and the verb than when the N1 position was occupied by a singular concrete word (see Figure 5-1 below).

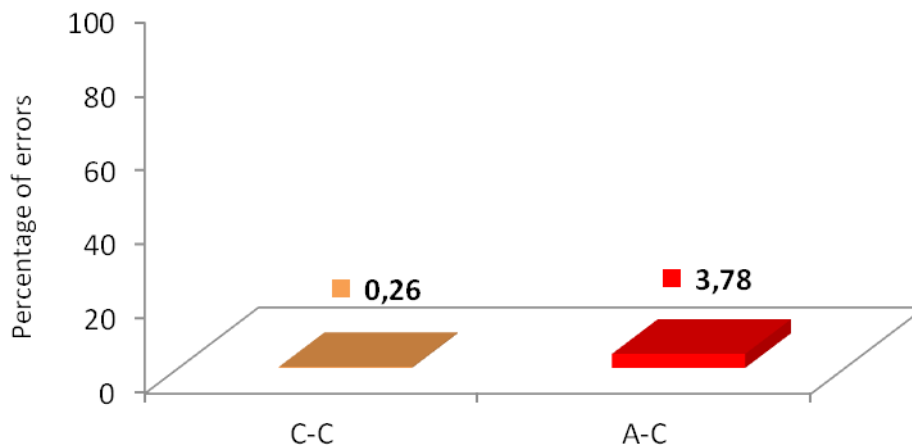


Figure 5-1: Percentage of mistakes made in the C-C condition vs. percentage of mistakes made in the A-C condition in Spanish.

6.4.1. Parallel results

As regards the alliteration of the *-s -s* morpheme (which constitutes a priming effect) observed in the filler items of the emotionality test carried out in English (no such results were found in the Spanish data from the same test) some analyses were carried out in order to ascertain whether or not the same effect was present in this test (note that exactly the same fillers as in the emotionality test were used again, in order to double check this effect). The results of the t-test revealed that there is a significant difference between the number of errors made in the condition in which both N1 and N2 were singular (means: .001) when compared to the plural-plural condition of the fillers (means: .013): $t_1(50)=2.79, p<.05$; $t_2(42)=2.69, p<.05$. Therefore, the alliterative effect could also be found in Spanish. Further attention will be paid to this effect in the next part of the concreteness test carried out in English.

6.5. Discussion

As the results reflect, concreteness exerts an influence on subject-verb agreement in Spanish. The number of mistakes made was not very high, but the few grammatically incorrect sentences which were found do indicate that whenever there is a singular abstract

word in the N1 position within a complex noun phrase, and the N2 position in such an NP is occupied by a plural concrete word, then the probability of making an attraction mistake on the verb significantly increases. These results are in part consistent with the idea explained in Bock & Miller (1991, experiment 1) that the marked number in a complex NP tends to attract the verb towards its number configuration. Nevertheless, this effect is enhanced in our results by the fact that an abstract word was in the N1 position, that is to say, semantics did play a role in causing the attraction mistakes which were found in our data. This contradicts Bock & Miller's 1991 results obtained in their second experiment, where there was found to be no effect of the semantic variable "concreteness". In the next experiment to be discussed, (a replication of Bock & Miller's test but in a different language, namely English), the same disparity in the rate of agreement errors is expected to be found, although, as English is a morphologically poor language, a higher number of attraction errors are thought to occur in general. If such results are obtained, then Bock & Miller's results will have been contradicted.

7. SECOND STUDY: CONCRETENESS TEST (ENGLISH)

7.1. Description

An almost exact English translation of the Spanish test was used and the same procedure was followed, now with native English speakers as the experimental participants.

7.2. Objective

Again, the main objective of this test was to prove whether or not the abstract status of a singular head noun in combination with a concrete local noun in the plural could lead the parser to misguide the normal systematic computation of agreement. This time the chosen language was English. Our aim was to establish a comparison between the results

obtained in Spanish and the results obtained in English, and to also compare these results with other results in the literature.

7.3. Method

7.3.1. Participants

Fifty-six students from the University of Swansea, Wales, participated in the experiment, the majority of whom were studying for a Psychology degree. They received an extra academic credit for completing the test (a small number of participants took part in the experiment as volunteers and therefore did not receive any academic credits). Of the fifty-six participants, only fifty-one of the responses provided were taken into account. Those who had completed the test very slowly or who did not understand the purpose of the questionnaire or the procedure they had to follow, were discounted from the final list of participants, and their data was excluded from all the statistical analysis as a result. The mean amount of time the participants spent on the task was approximately 5.65 minutes.

7.3.2. Materials

A native speaker of English evaluated the translated sentences and found them to sound natural and appropriate for the task (the whole set of sentences can be seen in appendix H). As in the previous test, the questionnaire consisted of 75 incomplete sentences which the participants had to complete with a conjugated form of the verb *To Be*. They were encouraged to react spontaneously in an attempt to imitate normal speech. The same proportion of items were included in this English version as were included in the Spanish version of the test:

- Fifteen concrete singular-concrete plural sentences formed the **control condition**.
- Fifteen abstract singular-concrete plural sentences formed the **experimental condition** (some of the preambles employed were taken from the previous emotionality test).

-Forty-five **fillers** in which both nouns were either singular or plural were interspersed among the experimental preambles. They were exactly the same sentences as had been used in the previous test on emotionality.

Again, three orders were created in accordance with those of the Spanish test, so the sentences were organised in exactly the same manner as in the Spanish version of the questionnaire.

The concreteness values (ranked on a scale going from 100 to 700) for each of the words employed (either in the N1 or N2 position in each one of the two conditions; C-C and A-C) were taken from the MRC psycholinguistics database (Wilson, 1988). The scale was almost the same as the one employed in the B-Pal database for the Spanish words. The only difference being that the MRC words had to be divided by 100 in order to achieve the same exact measure (The scale went from 100 to 700 in the MRC and from 1 to 7 in the B-Pal). The concreteness values of only 40 of the 60 words used in the test were found among the 150.837 words composing the database (10 corresponding to each one of the four groups of words). The mean value for the concrete nouns (30 nouns found) was 539.37 (S.D. =87.98), and the mean value for the abstract nouns found in the database (10) was 379.9 (S.D. =73.46). As with the Spanish materials, a one-factor analysis showed differences due to Concreteness ($F(3, 39)=12.82; p<.001$). Further comparisons revealed that abstract words significantly differed from all sets of concrete words (all $ps<.001$) and that the three sets of concrete words did not significantly differ among themselves (all $ps>.05$). Therefore, the materials were considered as being perfectly adequate for the completion test and for the purpose of the study.

7.3.3. Procedure

Participants who wanted to take part in the experiment had to sign into a computer application called “psychology subject pool” which was provided by the Psychology Department of the University of Swansea. The participants had to choose a date and

time which suited them and book that time slot in order to come and take part in the experiment. They entered into a quiet cubicle one by one, where they were asked to sit down and before being given a set of instructions regarding the nature of the experiment. The participants had previously been informed of the guidelines set by University's ethics committee and had signed a consent form which had explained the nature of the task they were being asked to perform. The participants were told that their responses would be kept confidential and would only be used for the purpose of gathering data for the experiment. They were also informed that their responses would be recorded and that they could quit the experiment whenever they wanted to. After having signed the consent form, after having listened to the instructions, and after having practised with a few mock sentences, the participants were asked to put a small microphone close to their mouths. They were then given a list of incomplete sentences which they had to read and complete out loud. Again, participants were encouraged to complete the sentences with a present or past form of the verb *to be* (*is, are, was* or *were* could be used), since they are the only forms in English that allow a clear morphological distinction to be made between the two number forms (singular and plural). Once the participants were ready to start, the audio recorder was switched on, and the experiment began.

7.4. Results

A 2X3 ANOVA based on the number of attraction errors found at the verb was conducted separately for participants (F_1) and items (F_2). Concreteness (with two levels: Concrete-Concrete and Abstract-Concrete) was considered a within-participants factor in the analysis of participants and a between-participants factor in the analysis of items. List (with three levels; 1, 2, 3) was considered as a between-participants factor in the analysis of participants and a within-participants factor in the analysis of items. The DV was the percentage of attraction errors. The repeated-measures ANOVA revealed that the effect of concreteness was significant by participants [$F_1(1, 48)=75.82, p<.001$] and items [$F_2(1, 28)=32.29, p<.001$], showing differences in the percentages of attraction errors across the

two experimental conditions. No effect of the List factor was found in the participants' analysis ($F_1(2, 48) = .90, p > .05$) although such an effect was found in the analysis of items ($F_2(1.65, 46.39) = 5.71, p < .05$). More importantly, no interaction was found between the two factors [$F_1(2, 48) = .015, p > .05$; $F_2(1.65, 46.39) = .035, p > .05$], so this fact was not considered as important.

In summary, the presence of an abstract singular word in head position produced a significantly higher number of attraction errors between N2 and the verb than when the N1 position was occupied by a singular concrete word (see Figure 5-2).

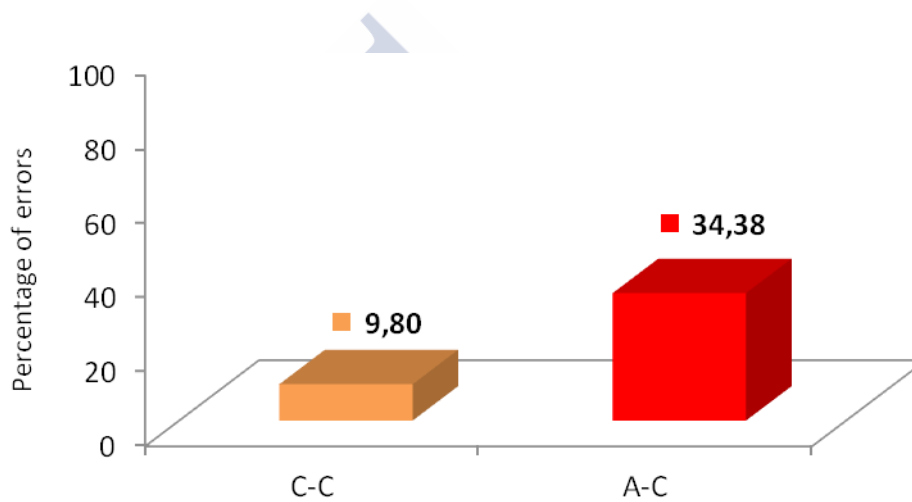


Figure 5-2: Percentage of mistakes made in the C-C condition vs. percentage of mistakes made in the A-C condition in English.

7.4.1. Language differences

An ANOVA was carried out whose results showed a significant effect of Language ($F_1(1, 100) = 72.07, p < .001$; $F_2(1, 28) = 88.75, p < .001$), therefore indicating that the percentage of errors made in English is significantly higher than the percentage of errors made in Spanish. Concreteness resulted also significant ($F_1(1, 100) = 94.87, p < .001$; $F_2(1, 28) = 38.07, p < .001$). A further comparison between English and Spanish showed a significant interaction between Language and Concreteness ($F_1(1, 100) = 53.19, p < .001$; $F_2(1, 28) = 24.41, p < .001$). These results agree with the premise that morphologically rich languages (such as Spanish) are more likely to block semantic interference than

morphologically limited languages (such as English) are. There is therefore a consonance between these results and those of Lorimor, Bock, Zalkind, Sheyman & Beard (2008), Foote & Bock (2012) and Acuña Fariña (2012), which predict more semantic interference in languages which have a poor morphology than in those in which morphological operations are constantly carried out by the parser.

The comparison of the data obtained in the two tests (Spanish and English) is provided in the following diagram, where the orange colour corresponds to the control condition (C-C) and the red colour to the experimental condition (A-C):

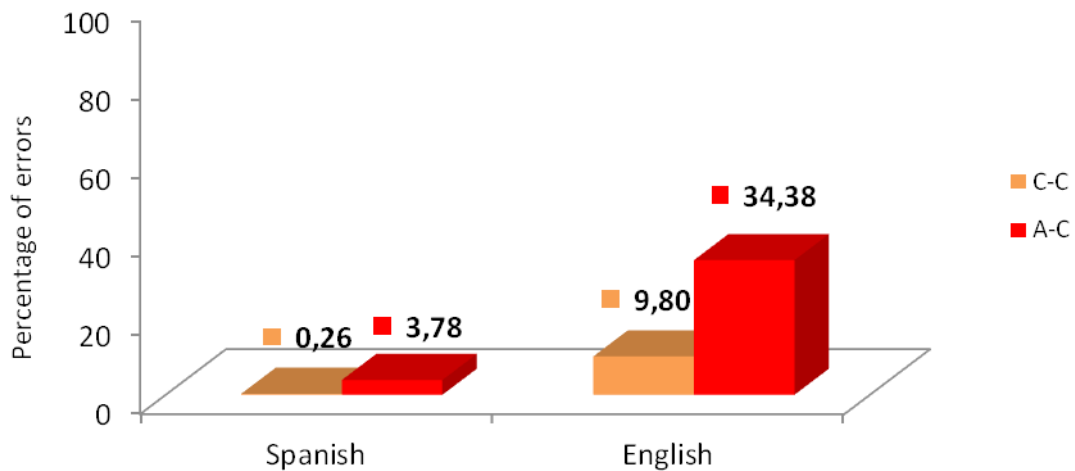


Figure 5-3: Comparison of the Spanish and the English data in the concreteness tests.

7.4.2. Parallel results

Once again, the –s –s morphological combination in the plural fillers (**the results of the analyses IS*) created an unexpected number of agreement mistakes in English. However, no effect was found in the singular items: $t_1(50)=5.99, p<.001$; $t_2(42)=3.99, p<.001$. Again, this effect was even more robust whenever one of the two nouns in the noun phrase preceding the verb contained an –s (as in results) within the word itself (not only in the number morpheme mark). This may lead us to think that those operations which are repeated very often in a very short period of time tend to be automatized by the

parser, that is to say, the connection (–s = plural) is automatized whenever it happens more than twice in a very short space of time, thus creating a visible priming effect. This phenomenon seems to be enhanced in a language in which the same mark used for the singular in verbs is shared by almost all plural nouns (the effect was also visible in Spanish, but in a lower proportion since not all singular verb forms in Spanish contain an –s morpheme). This “plural –s - plural –s” effect might open the way to misleading computations, that is, the processor might equivocally take an –s morpheme within a word as another mark of plural, thus increasing the probability of making a mistake. This unexpected outcome would be quite easy to understand if we assume that our parser is always active and trying to make predictions. As happens with the “filled gap effect”, for instance, in which it has been demonstrated that the processor is able to plan ahead with regard to what is supposed to come next¹² (Stowe, 1986; Clifton & Frazier, 1989), the parser would be in a constantly active and anticipating state when dealing with agreement operations as well. In this sense, the anticipation of plural morphological marks would be quite likely to occur in quick processing, but this would probably lead to an increasing chance of failure during such operations (as in the previously mentioned example: **the results of the analyses IS positive*). It is quite interesting that these fillers reflected for the second time (notice that the same results were achieved in the same fillers inserted within the emotionality test) a robust alliterative effect. Indeed, even with two different sets of participants, the two sentences which created the highest number of mistakes (namely *the results of the analyses* and *the cases for the pencils*) were exactly the same for both tests.

12 (1) My brother wanted to know **who** Ruth will bring us home to at Christmas.

(2) My brother wanted to know **if** Ruth will bring us home to Mom at Christmas.

In a task in which reading times were measured, Stowe (1986) found that readers slowed down at *us* in *wh*-sentences, that is, in (1), but not in controls (introduced by *if*, for instance) such as (2). This effect was believed to occur because the parser, after encountering the filler *who*, posited a gap in the direct object position, that is, the earliest possible position, after the verb *bring*. However, this position was already occupied by *us*, which means that the parser has to revise its analysis and keep on looking for a suitable gap. This process has been known as the FILLED-GAP EFFECT (FGE).

7.5. Discussion

Both a “concreteness” and an unexpected “phonological priming” effect were found in the two tests. Both effects were quite powerful in light of what the statistical analysis suggested. Language differences were also found. Therefore, concreteness seems to have an important processing weight in a language like English, which is characterized by its morphological attrition. Perhaps this fact could be extended to other morphological attrited languages, since it seems that the lack of morphological marks causes the processor to rely on semantic information and to make the process, at the same time, a less automatic one. The results found as regards concreteness could be compared to those achieved for other semantic variables such as distributivity and imageability (Eberhard, 1999), plausibility (Thornton & MacDonald, 2003), etc. As previously pointed out, semantically rich languages such as Spanish seem to take concreteness into account as well, but to a lesser extent, since they have the support of a rich system of inflections which allow speakers to devote a lesser attention to the inner semantics of each of the words. Finally, phonology also seems to play a role in agreement operations, since the repetition of phonological cues in short time periods can be responsible for wrong associations which may lead to speech errors.

In addition to the results mentioned above, a further potential finding (which has not been previously mentioned) has been discovered after a careful analysis of the responses provided by the participants. This finding relates to the possibility that among abstract head nouns, those showing lower degrees of *semantic richness* could increase the probability of there being attraction errors. It is evident that abstract words are by default semantically poorer than concrete words (they have poorer semantic representations since they are not connected to tangible or visual referents). However, there is a possibility that within abstract words, we could trace a gradient going from semantically poor abstract words to semantically rich ones. For example, the word “size” would be an example of a semantically very poor noun, since its referent is not easy to define and has a complex mental representation. In fact (and as can be evidenced in the continuations provided to

some of the preambles in the concreteness test), whenever a semantically poor noun was in head position in a preamble, the tendency to complete the sentence by making reference to the local noun, rather than to the semantically poor head, seemed to increase. For instance, whenever participants were provided with the preamble: *the size of the presents...* they normally completed it in a way such as: **the size of the presents WERE big*, which seemed to be an equivalent to “*the presents were big*” (that is, the participants tended to prefer as the sentence subject the word with the stronger semantic representation). However, in a preamble like “*the story of the affairs...*”, participants tended to say something like: “*the story of the affairs is long*”, which equates to “*the story is long*” rather than “*the affairs are long*”. In other words, semantically poor nouns like “size” tended to be overlooked as possible subjects of a sentence, whereas semantically richer nouns such as “story” (which in spite of being an abstract word has a rich semantic representation) tended to be regarded by the parser as potential subjects. This characteristic of nouns is obviously related to issues of topicality as well. Topics in discourse tend to be those referents which have a clear mental representation and, as a consequence, are those which tend to be mentioned a greater number of times in discourse. In this sense, a word like “size” is not likely to be a topic, whereas another abstract word such as “story” has a higher probability of becoming a topic (although possibly a lower probability than a concrete word such as “car” for instance).

With this in mind we considered analysing the preambles of the Abstract-Concrete condition separately, in order to explore the levels of semantic richness which the words of these preambles contained. However, the amount of data we have in relation to semantic richness is too limited for us to be able to perform a thorough analysis, and therefore we leave the question of semantic richness open for further research.

8. CONCLUSIONS

Although in 1991 Bock & Miller did not find an effect of the variable concreteness, this semantic constraint was demonstrated to have an effect on the resolution of number agreement. The variable concreteness was not controlled in further experiments (as for example in Bock & Eberhard (1993), where it can be observed that in some cases abstract words occupy the head position in some of the preambles that these authors presented) in which other semantic variables (distributivity, collectivity, etc.) were tested, so it is possible that the results achieved in these experiments could have been influenced by the presence of abstract words in initial position.

A potential effect of the variable “semantic richness” was also observed in the test. However, our data was thought to be insufficient for establishing any firm conclusions, and so we propose a new study in which the sole effect of “semantic richness” can be controlled.

Finally, a powerful priming effect was also found in the English test, involving sentences which contained two plural nouns. This enhances the feeling that it is not only pure syntactic analysis which is present in agreement processes, but that there are other sources of information such as semantics and phonology which are also present. So it seems that our parser is able to rely on different sources of information in an opportunistic manner.

Chapter 6.

GENERAL DISCUSSION

One of the main conclusions of this work is that agreement is not a formal co-occurrence of features, otherwise sentences like “*the hash browns at table nine is getting angry*” (Steele, 1978: 610) would not contain agreement (see chapter 1 for a set of similar examples). Therefore, the minimalist idea that agreement features need to match (since they are the result of a copy-percolation operation in a phase) has to be questioned. The strong influence of semantic factors seen in chapter 2, and especially in the data found in chapter 5, completely contradicts a model of agreement production in which agreement occurs solely during grammatical encoding and where non-syntactic information is claimed to be non-influential in the process. The occurrence of semantic agreement is too habitual for it to be thought of as happening exclusively because of a failure in a formal mechanism. This clashes not only with our results but also with results obtained by several other studies in which semantic variables were manipulated (Eberhard, 1999; Vigliocco & Franck, 2001; Solomon & Pearlmutter, 2004, among others). Once minimalist theories have been discarded, we can turn our attention to its rival unification and lexicalist theories (De Smedt, 1990; Shieber, 1986; Pollard & Sag, 1994; Wechsler & Zlatić, 2003). These theories posit that structures bear feature indices. These indices are checked and when they match, they are given their morphological shape. This theory could accommodate our data from chapter 2, since although subjects are singular for most of the structures employed, they bear a certain notional plurality within them (see for example collective subjects such as *couple* or *gang*). Therefore, their plural indices could possibly match a plural verb. That is, the plurality of the verb could be the result of a checking operation. However, these theories do not accommodate our data from chapter 5 so easily. In a sentence like “*the duration of the holidays*”, where the head noun is singular and abstract, there is apparently no reason for the head noun and subject “*duration*” to contain a plural

feature index, since no sense of plurality is apparently contained in the word's meaning (it is not a collective noun). However, the fact that this subject is abstract, and abstract words have a weaker notional weight which makes them infrequent subjects (Paivio, 1971, 1991), could be the reason why such a large number of agreement failures were made when a completion was provided for this sentence (in the line of: "*the duration of the holidays WERE too long*"). Therefore, it is not only a matter of words bearing feature indices that contain information about their plural/singular meaning, but also a matter of the word's "status". That is, words must bear all the information possible on them (their meaning, lexical category, number specification, the type of word it is, etc.), and the processor must take advantage of all that information when necessary. Even the abstract/concrete quality of words is taken into account for the final production of a sentence (and therefore the likelihood of words becoming sentence subjects). But this is not the only reason why unification is likely to be discarded. The main reason is that agreement does seem to have a strong formal and syntactic component. The repetition of formal cues within very short time lapses indicates that the mechanism which underlies agreement is extensively formal and automatic (notice that in a sentence subject such as "l-a-s bicilet-a-s de l-o-s niñ-o-s" –The boys' bikes– in Spanish contains up to 8 agreement marks and that those marks are processed in a matter of milliseconds). If this were not the case, our ability to create agreement connections would be visibly reduced. This is also evidenced in the set of parallel results presented in sections 5.5.4.2., 6.4.1. of chapter 4 and 7.4.2. of chapter 5. The rapid repetition of morphological cues causes failures in the process, and this is evidence that the majority of the time agreement is based on cue-repetition.

Staying with pure semantics, not even the level of semantic integration (in the sense explained by Solomon & Pearlmuter, 2004 and Gillespie & Pearlmuter, 2011, see section 2.6. of chapter 3 for a review) of the words contained in our experimental preambles can be blamed for the number of attraction mistakes found in our sentences. The preposition that we used in almost all the preambles chosen for the test was *of*, so the levels of semantic integration of the two conditions were not unbalanced by

means of the use of different prepositions which could have established different types of semantic relationships among the two nouns in different experimental sentences. In brief, the concreteness component of words was thought to exert an influence on the final morphology of the verb, whereas issues related to semantic variables such as distributivity, plausibility, semantic integration, etc. are thought to have had no effect on the sentences used.

Since both full encapsulation and full interactivity are discarded (on the basis of the numerous pieces of evidence already discussed), the question is now to what extent interactivity is possible and how our system relies on “opportunism”, that is, how often it takes advantage of the most valuable type of information in order to speed up processing. The Agreement Hierarchy (Corbett, 1979), for instance, rests on the notion of structural distance: the bigger the distance between controllers and targets, the more semantic interference there is. However, the Agreement Hierarchy is not able to explain semantic interfacing in all cases. For this reason, we can switch our attention to the hybrid models which are found in the literature, such as that of Marking and Morphing (Bock et al. 2001). According to this theory, in processing there is an initial marking stage where constituents are “marked” for number depending on both their notional and their syntactic features. Eberhard et al. (2005: 8) explain this processing stage in the following words:

Marking is needed to deal with abstract phrase number (e.g. the number of phrases like *what*, *who*, and *which*, which can be either plural or singular), conjunctions (e.g. *ham and eggs*, *Karin and Scott*, which can be either singular or plural without any of the component elements having the relevant value), vague quantification (e.g. phrases like *a number of boys* are normally plural), elided or lexically unrealized phrases (more common in other languages but possible in English; e.g. normal imperatives along with casual expressions such as *doesn't matter*, *does too*, *are not*, *is too*, etc.) as well as differences in the number behavior of pronouns and verbs.

After Marking comes Morphing, which represents the encapsulated part of the process. It occurs after functional assembly and deals with the morphosyntactic specifications of words. According to this theory, when the Marking features clash with Morphing features, the latter normally prevail. Finally, the features are copied onto the verb (notice that here features are not checked but copied). Whenever notional effects are visible in the final result (as with collectives), it is the result of a prevalence of Marking over Morphing, which, although unusual, is still possible. Connecting this theory to our own data, we can see that in our concreteness questionnaire there is absolutely no reason for the subject to be marked as plural in the marking stage. In a sentence such as *the story of the affairs*, for instance, there is no way the processor could interpret the whole complex subject as semantically plural (*story* conveys a singular meaning, the sentence is not distributive, there are no traces of collectivity in any of the words nor in the sentence as a whole, etc). So in the Marking and Morphing framework, *the story of the affairs* should by all means be marked as singular, and as a consequence of this the morphing stage should provide the verb with singular morphological marks. Therefore, such a big number of attraction mistakes showing plural marks on the verb ought not to be found.

In brief, it seems that neither partially nor totally formal theories can fully explain actual speech errors. In addition, full interactivity on its own is also unable to explain agreement processes (as was pointed out earlier in this section). Therefore, the combination of both semantic and syntactic information **at all levels** in processing (and not just these two types of information, but also other sources of information such as the concrete/abstract status of words) could be regarded as the most suitable explanation. In other words, our processing mechanism must be one that takes into account all types of information about every single linguistic item at any moment of the process. Our system therefore seems to be more porous than expected. In this respect, it is worth alluding to Badecker & Kuminiak's (2007) Working Memory Retrieval Model (WMRM), which takes into account several constraints during processing. According to Badecker & Kuminiak, working memory is an important resource when processing agreement ties.

Thus, this model posits that those nouns showing more resemblances to subjects (being in the nominative case, appearing in pre-verbal position, etc.) are immediately retrieved from our working memory. In addition, whenever more than one noun can be retrieved as a potential candidate for being the subject (because the two nouns share subject cues), the system starts to have some trouble in ascertaining which one of the two is the actual subject. This confusion involving two nouns which are active simultaneously in our working memory leads to agreement mistakes. In the light of this theory, we may consider the possibility that working memory issues are somehow meddling in our concreteness test. The sentences used contained two nouns which were potential subjects for the verb. In the Abstract-Concrete condition (the one that led to a greater number of agreement mistakes), the noun that interrupted the normal agreement process was a concrete one. Subjects tend to be concrete entities, since we are prone to talk about people and things that are perceivable by our senses, and which can therefore be classified as concrete. However, the head noun in our A-C sentences was always an abstract noun. Abstract nouns are less frequent subjects than concrete nouns, since they denote complex notions which are not normally linked to referential images (and as a consequence they are not seen as potential discourse topics). For this reason, the local noun in our preambles had numerous opportunities to be confounded with actual subjects when the two nouns were activated in our working memory. Thus, the memory retrieval theory of Badecker & Kuminiak (2007) could in some way explain the results we obtained. To this theory we could add that it is not only the nominative case and the pre-verbal position which are retrieval cues for subjects, but concreteness also. Again, this leads us to think that the agreement processor is always active, and takes all types of information into account. However, there is one part of the experimental evidence we obtained which cannot be explained by this processing model. This is the fact that different results have been found for Spanish and English. In our opinion, the cause for this difference lies in the radically opposite morphological components of these two languages. On the one hand, Spanish has a very rich morphological system. In Spanish, nouns and adjectives contain both gender and

number marks, and as for verbs, they possess tense, number and gender morphological traces. However, English, on the contrary, has only number inflections for nouns, no inflectional marks at all denoting gender and only a few tense marks for verbs. The fact that English has a poorer morphological system may be the reason why English speakers rely more on semantics and less on syntax/morphology, as these are linguistic tools which native speakers of English are used to dealing with. Conversely, Spanish speakers may rely more on morphological cues, due to the abundance of them in that language. This theory contradicts previous approaches to the topic which posited that poorer morphological systems lead to less semantic interference and that a rich morphology was always accompanied by a high degree of semantic interference (Vigliocco et al. 1995-1996a and b). Our theory, in fact, supports other approaches such as those of Berg, 1998; Acuña Fariña, 2009, 2012, and Riveiro Outeiral & Acuña Fariña, 2012 (discussed in chapter 2), which affirmed that grammatical structures were more porous to semantic interference in poorly inflected languages rather than in richly inflected ones. Thus, a processing system which allows different sources of linguistic information to interfere at different processing stages and at different levels is, in our opinion the only explanation for both our data and that published in the literature over many years. As has been said, the processor must therefore be “opportunistic” and take advantage of different types of information, including morphology and the inner characteristics of each language. Thus, as Acuña Fariña (submitted) explains:

An important reason why all models of agreement production fail in part is that none of them incorporates an adequate measurement of the morphological component of each language examined.

Therefore, the morphological characteristics of a language are important enough as to be incorporated into any processing model. Acuña Fariña explains this in his theory of “leaking and blocking”:

[...] in a production task, conceptual structure is activated before morphosyntactic encoding can begin. However, the message representation cannot simply disappear as soon as morphosyntactic operations actually begin and may spill over into the natural domain of these operations. Such spilling (leaking) cannot be contained (blocked) in languages with a poor morphosyntax (like English).

What this theory adds to the literature on the topic is the idea that the processor is open to constant conceptual pressure and that there is a recurrent access to morphological information whenever such information is advantageous to the parser. In addition to this, the model continues to rely on automatic computations (again, when they are beneficial for processing) with no need to check conceptual structure. In conclusion, the processor must be one that is constantly looking for the most efficient way to solve each and every particular agreement process, thus taking advantage of different sources of information at strategic moments and making the whole process as “profitable” as it can. This is in fact what the various results obtained in the set of experiments we have here presented seem to suggest.

In our opinion, the set of agreement theories which exist in the literature have not taken into consideration the morphological component of language to the extent they should have. For this reason, our proposal is to conceive the agreement system as one for which the more morphological cueing we find in a language, the more insulation there is from anything other than automatic cue harmonisation (including meaning and other word-class characteristics).



Chapter 7.

CONCLUSIONS

1. Outline

The aim of this dissertation was to investigate how agreement is computed and resolved in certain syntactic structures. This line of research has been dealt with from both a theoretical and an experimental perspective. Both these perspectives were needed for us to be able to work towards a comprehensive understanding of the phenomenon of agreement. Specifically, this thesis was concerned with the analysis of number agreement, with the focus of the study being on two structurally and morphologically different languages, Spanish and English. From the comparison of agreement mechanisms employed by the two languages we deduced our conclusions.

2. Summary of chapter 1

Chapter 1 provided an overview of the main views regarding agreement from the viewpoint of grammar. First, the perspective provided by generative grammarians was explained. In their opinion, agreement is strictly directional; it starts in an element that they call “controller” and ends in a “target” (which is the recipient of the controller’s features after a copy-percolation operation which takes place within a specific domain). For generativists this is a purely syntactic operation which is isolated from other types of information. Agreement is then unidirectional and encapsulated. However, section 4. of this chapter gave various examples of real speech in which at least a certain amount of semantic interference is noticeable (taken from grammars such as that of Huddleston & Pullum, 2002, for instance). Structures used in every-day speech, such as those involving collective subjects, reference transfer, coordinated subjects, indefinite expressions,

measure phrases, proportional constructions, interrogatives, existential constructions, singular plurals, distributive sentences, and the use of the third person in cleft relatives, demonstrate that sometimes semantics is the force which exerts the strongest influence on agreement resolution, even challenging syntactic rules. Interestingly, the previously mentioned structures have been accepted as “grammatical” structures (as their introduction in grammars demonstrates) due to their common use by native speakers. Finally, pure morphological agreement was described with the introduction of the notion of “attraction” or “proximity concord”. Attraction consists of the wrong copy of features from an intervening word bursting in between the controller and the target. In this way, morphology was included as another source of interference in the a priori syntactic operation of agreement. All these facts add weight to the idea that agreement computation is not as straightforward as generative grammarians have always maintained. The processing of agreement seems to respond to more complex processes in which more than one type of information is at work. Precisely this idea was pursued in chapter 2 on the basis of experimental work.

3. Summary of chapter 2

Chapter 2 constitutes an analysis of certain structures which, although considered as grammatical, are clear examples of semantic interference in syntax. The main study presented aims to replicate a previous study by Berg (1998) in which this author compared a number of structures in English and German which deal with the syntax-semantics dichotomy of agreement. Berg analysed the following eight structures: morphosyntactically singular but semantically plural words (*the couple*); morphosyntactically plural but semantically singular words (*pancakes*); postmodified NPs of the kind (ART+(ADJ)+N(sg)+of+(ADJ)+N(pl)), as in “*a gang of thugs*”; coordinate structures conjoined by *and*, *or*, or *neither...nor*, as in “*both he and she*”; comparative NPs of the kind: *more than one X* and *fewer than two Xs*; expressions such as *many an X*; NP-copula-NP structures with nominal predicates as in “*the cause of the accident (be) bad*

brakes” and clefts or pseudoclefts such as “*it (be) the politicians who ...*”. The comparison of such structures in two morphologically “antagonistic” languages, English and German (note that English has a poor morphology and a clear syntactic rigidity whereas German has a complex and rich morphological system and a less rigid syntax than is found in English), can offer a clear perspective on whether the degree of semantic penetrability in a language is dependent on its morphological characteristics. The results obtained seem to suggest that morphologically poor languages, such as English, are much more compliant as regards semantics than morphologically complex languages such as German. In other words, participants in Berg’s research were more liable to use plural verbs whenever the semantic interpretation of the subject was plural in English than when the same happened in German. In an attempt to replicate these findings and extend them to another language, Acuña Fariña (2009) and Riveiro Outeiral & Acuña Fariña, (2012) carried out the same experiment but with a different language; Spanish. The results acquired demonstrate that Berg’s hypothesis pointed in the right direction and that the complexity and variability of a language’s morphology is an influential factor in agreement processes. The richer the morphological system of a language, the more difficult it will be to for this language to show a semantic type of interference, and viceversa, and the results shown and discussed in the second chapter of this thesis seem to point in exactly this direction. However, it is necessary to bear in mind that (as pointed out earlier) all these structures are allowed by grammars, so we are not dealing with the production of speech errors, which would represent a significantly more potent effect. Speech errors were the focus of the fourth and fifth chapters of this dissertation.

4. Summary of chapter 3

Chapter 3 is an approach to agreement from the perspective of psycholinguistics. It contains a theoretical description of the models that have been created and debated in this field over the last few decades. Psycholinguistics offers a more experience-based approach to the topic. In addition, it focuses its attention on the mental processes which allow us to create linguistic structures. The first theories about agreement had a very encapsulated and serial nature and they placed syntactic information in a privileged position. This approach (which was started by Chomsky in his *Generative Grammar* (and later on in *Minimalism*)), has been widely questioned. As explained in previous chapters, other linguistic constraints such as semantics or morphology are able to meddle in agreement processes and this fact is not compatible with a model based solely on encapsulated syntactic phases.

The creation of the notion of “attraction” (illicit agreement with a local noun), and all the research revolving around this concept, helped to untangle some aspects of agreement processing. It was Bock and Miller’s 1991 paper which started to investigate attraction errors in relation to both semantic and morphosyntactic aspects. Their first results pointed in the direction of encapsulated models, where agreement was only founded on syntactic parameters. In this sense, attraction errors were just the result of the wrong percolation of features. It was not until Vigliocco (1995-1996a and b) that relevant effects caused by a semantic variable were found on Romance languages. Distributivity effects were therefore regarded as a sign that processing might not be simply a syntactic issue, at least in Romance languages. When they tested distributivity in English in order to compare the results in this language with those found in the Romance languages, they observed no effects. The explanation given for such results was that semantic interference was possible in the Romance languages because of their strong morphology. In other words, the richer the morphological system of a language, the more porous it would be to non-syntactic information, since in an usage-based view of grammar every morph has a meaning and therefore semantics is more likely to interfere in the process. They

called this theory the “Maximal Input Hypothesis”. However, in 1999 these results were contradicted when Eberhard found a visible effect of distributivity in English as well. She attributed such effects to purely semantic influence, thus affirming that agreement had a strong semantic component. Later on, hybrid models appeared in the literature, such as that of Marking and Morphing (Bock et al., 2001). According to these theories, semantics comes first, but morphology also has an important role to play in agreement operations. There is a first stage (Marking) in which the subject retrieves its features according to semantic criteria. Once the “Marking” phase is completed, access to meaning is “blocked” and the “Morphing” stage begins. During “Morphing” words are given their morphological exponents on the basis of those features selected during the previous “Marking” stage. Therefore, “Marking and Morphing” was interpreted as a hybrid theory combining both semantic and morphosyntactic ways of processing, there simply being a different timing in the process. In spite of the fact that such combined theories seemed to gain credibility in the subsequent years, new studies appeared which emphasised the fact that semantic influence was present during all stages of processing. Three papers deserve special mention in this respect: Thornton & MacDonald’s 2003 work on “plausibility” and both Solomon & Pearlmutter’s 2004 and Gillespie & Pearlmutter’s 2011 papers on the effect of “semantic integration”. Thornton & MacDonald’s work on “plausibility” tested whether or not a sentence like “*the album by the classical composers was **praised***” (notice that this sentence projects two potential subjects since both albums and composers can be praised) was able to elicit a higher number of attraction mistakes (due to an extra processing difficulty caused by the presence of two possible subjects) than a sentence such as “*the album by the classical composers was **played***”, where only the noun *album* can be regarded as a potential subject (composers are not played but albums are). The authors found that the processing of the first sentence was more difficult and caused more attraction errors than the second sentence, not only in production but also in comprehension. The cause, as has been said, was the simultaneous activation of two potential subjects. Therefore, semantics (or pragmatics) seemed to be present at all times

during the processing of these sentences. In a similar vein, the previously cited studies on semantic integration by Solomon & Pearlmuter (2004) and Gillespie & Pearlmuter (2011) tested whether or not “*the drawing of the flowers*” (which is interpreted as an integrated referent) could elicit more attraction mistakes than “*the drawing with the flowers*”, where the referent is multiple since both *drawing* and *flowers* are separate parts of our mental referent. Their results pointed in this direction: the more integrated the two nouns were, the easier it was to make attraction errors due to a simultaneous planning of the two nouns. In their 2011 study, Gillespie & Pearlmuter combined linear distance to the verb with semantic integration. They concluded that the closer to the verb and the more semantically integrated a noun was, the easier it was to find attraction effects. They labelled this the “scope of planning account”. All these results provided evidence in support of the idea that semantics and pragmatics can play their roles at different times in processing.

The last model presented in chapter 3 was Badecker & Kuminiak’s “Working Memory Retrieval Model” of 2007, according to which the processor is always looking for those words which have subject-like features (being in the nominative case, etc.) in order to give them a subject status. Attraction errors occur whenever there is more than one noun in the vicinity of the verb which shares those subject features. Mistakes are then more easily made due to the activation of more than one candidate for the subject function. This model draws attention to the fact that memory issues are extremely important when talking about agreement. We must not forget that we are able to compute agreement marks at a very high speed, and therefore memory must have a very important role to play. So agreement theories must not be so “simplistic” as to disregard issues such as memory constraints, for instance.

In summary, there have been many theories which have tried to provide an explanation for how agreement processes work. In the literature up to this point, however, no consensus as to what the most comprehensive and accurate theory is has been reached, and so more research needed to be carried out in order to try and resolve this issue.

5. Summary of chapter 4

In chapter 4, the influence of the variable “emotionality” is discussed and related to agreement processes. By emotional words we mean those which have high levels of both valence and arousal (or low valence and high arousal in the case of emotional negative words). A description of the ANEW database (Bradley & Lang, 1999a), which contains the measure of the emotional levels for a number of words, was provided in this chapter. The same description was given for the Spanish adaptation of the database. The basis for the study presented in this chapter is a study by Fraga et al. in which a visible influence of emotionality was found in relative-clause disambiguation processes. Therefore, the experiment presented in chapter 4 started with the following hypothesis: if a variable such as emotionality can interfere in a process such as syntactic disambiguation, then, in principle, emotional words could be likely to tamper with another syntactic process such as agreement. This is in fact what the two experiments (one in Spanish and a replication in English) tried to demonstrate. The structure chosen in the design of the experiment was that of complex noun phrases of the kind N -of- N + verb, for which the first noun was singular and the second noun plural. By choosing this combination for the two nouns’ number, we have been trying to reinforce the “markedness” effect (Bock & Eberhard, 1993; Eberhard et al., 2005; Haskell, Thornton & MacDonald, 2010) mentioned in previous chapters. This way, the results would be more visible since both the emotionality effect and the markedness effect could occur together. With regard to the experimental procedure, it was designed as an oral completion test whose aim was to try and cause spontaneous agreement mistakes in order to later on analyse what led to the processing failure. The results achieved in these two tests do not reveal a robust effect of the variable “emotionality” on the resolution of number agreement, probably due to the fact that emotionality may have a pre-lexical status previous to any semantic type of processing. Only markedness can be held responsible for agreement mistakes in the sentences which comprise the two tests. However, this experiment has shown that another variable (namely, concreteness) could be responsible for all the agreement errors in the

tests. Since this was only a hypothesis, further research was needed, and it is this further research which comprises the content of chapter 5, where we analyse the influence of concreteness on agreement processes once emotionality had been discarded.

6. Summary of chapter 5

In chapter 5, the semantic variable “concreteness” was considered as a potential source of agreement errors. No effects had been published in the literature after Bock & Miller (1991) had tested the influence of “palpability” (or concreteness) on subject-verb agreement processes in English. However, both the fact that some methodological problems were found when reviewing Bock & Miller’s 1991 materials and the evidence in the previous emotionality test which pointed in the direction of there being a potential influence from concreteness, were the reason for creating a new experiment to test concreteness, and this experiment was discussed and explained in chapter 5. The structure of the test was very similar to that of the emotionality tests. However, new preambles were designed in which both concrete and abstract words were manipulated. In addition, other semantic effects were controlled in order to test only the genuine effect of concreteness. Therefore, two conditions were created: a C-C (Concrete-Concrete) condition, and an A-C (Abstract-Concrete) condition. The results were compared and it was observed that the A-C condition was much more prone to agreement mistakes than were the items in the C-C condition, thus confirming that the presence of an abstract noun within a complex noun phrase produced more attraction mistakes than a concrete head noun. So, the influence of concreteness was demonstrated for the first time in the literature. Moreover, since this study was also given a crosslinguistic perspective, we compared the results obtained in the English test with those obtained in the Spanish version of the same test. What we observed was that English was once again more prone to attraction mistakes when a semantic variable was manipulated in the experimental sentences. These findings are in line with theories positing that a language with a robust morphosyntactic system is less prone to allowing semantic interference than is a language which has a small number

of morphological marks (Berg, 1998; Acuña Fariña, 2009, 2012). As a conclusion, it seems that our processor is “opportunistic” in the sense that it takes advantage of different sources of information when convenient. This could happen in order to minimise mental resources and to speed-up processing. Therefore, early theories that conceive the language processor as an independent module which worked only on formal rails must, in our opinion, be discarded.

7. Summary of chapter 6

In chapter 6, all the theoretical models presented in chapter 3 were compared with the data obtained in the concreteness test. Both syntax-based and semantics-based models were called into question as they do not fit into the pattern of our results at all. What our data revealed was that both syntax and semantics were present during the processing of the sentences we presented to our participants. Both the general results (which confirm the influence of semantics) as well as the crosslinguistic differences reported (which support the role of morphology in agreement processes) and even a certain syntactic automation explained in the set of parallel results, point to the idea that agreement is open to various information sources. Therefore, those models which divide the process into separate and impermeable stages must be abandoned. In our opinion, the parser must be “time-serving” in the sense that it takes advantage of the most valuable information in order to speed up the processing. This is precisely the type of processing that Acuña Fariña (submitted) proposes in his theory of “leaking and blocking”. According to this theory, the parser is able to select the most valuable information depending on the type of language (and the kind of morphological system the language has) and on the particularities of each and every structure. This is the only theory that accommodates the data obtained in chapter 5 and it is the theory we support here.

8. Final remarks

This dissertation has offered new data which shed light on some aspects of language processing. However, there are many gaps in the literature on agreement processing which still need to be filled. The work in this thesis paves the way for further research in new areas and some of the possible topics for this new research will be discussed in the following section.



Chapter 8.

SUGGESTIONS FOR FURTHER RESEARCH

During the development of the series of studies presented in this thesis, new questions have arisen which might be the subject of future research. In this section we are going to explain what we consider to be the four main lines of research which have been opened up by the investigations of this dissertation.

The first of such questions is related to the influence of **semantic richness** on agreement operations. In the data found in chapter 5, we detected that perhaps not only concreteness could be blamed for attraction mistakes, but also the semantic richness of the words employed. As pointed out in that chapter, it is very difficult to separate these two semantic constraints, since they in some way correlate (the more abstract a word is, the semantically poorer it usually (but not always) is). However, correlation does not mean equivalence. In our opinion, concreteness and semantic richness are not the same thing (notice that a word such as *happiness*, for instance, is semantically rich and yet at the same time deeply abstract). Therefore, it would be interesting to delimitate whether the force of concreteness alone was what gave us our results, or whether to some extent semantic richness could have also contributed. For this reason, we think that a study of semantic richness could be a fruitful area for future research.

Another question which remains open is that mentioned in chapter 4 regarding the exact **nature of emotional words**. As said, whether the emotional component of a word is present during or prior to lexical processing is a question which deserves further investigation. The study by Díaz Lago et al. mentioned at the end of chapter 4 has opened the way for further research along these lines. Therefore, before giving a definitive explanation of the results obtained in chapter 4, it is necessary to clear up what the actual time-processing of emotional words is. In this respect, new data will tell us whether emotionality can be considered as a semantic constraint comparable to

concreteness, collectivity, etc., or whether we are talking about a type of information which is pre-lexical (consequently having a privileged status) and therefore prior to semantic processing (in line with previous research by Bernat, Bunce & Shevrin, 2001; Citron, 2012; Kissler, Herbert, Peyk, & Junghofer, 2007, and Scott, O'Donnell, Leuthold, & Sereno, 2009).

A third potential line of research would deal with the **comparison of** the agreement systems of **more languages**. Only Spanish and English have been experimentally dealt with in this dissertation, while a brief allusion was made to German with the work of Berg (1998), being mentioned in chapter 2. However, it would be interesting to compare the behavior of more agreement systems. By observing the functioning of the agreement systems of languages which do not belong to either the Germanic or the Romance linguistic branches (Arabic, Chinese or Russian, for instance), we could probably draw more conclusions about the general mechanisms which underlie agreement processes. Therefore, we propose a replication of the series of studies here presented for other languages belonging to different genealogies.

Finally, the unexpected results which deal with a potential powerful **effect of shallow processing** as evidenced in chapters 4 and 5 (see sections on parallel results in these chapters) might be the object of extensive research. This dissertation has mainly dealt with semantic and morphological interference, but a perhaps fruitful new area of research would be that of phonological interference. It would be interesting to measure to what extent each of these constraints can influence agreement operations and why some of them are more influential than others.

The list of topics related to the processing of agreement which could be the subject of future research is potentially endless. For this reason, only a very few have been mentioned here. In any case, agreement is definitely a topic which deserves special attention since it can be seen as the basis for an understanding of higher-level linguistic processes.

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APPENDIX A

Questionnaire used in the pilot study about emotional words in

Spanish:

- El paciente con los tobillos rotos (ESTAR)...*
La trampa para el ratón (ESTAR)...
Los profesores de las chicas (ENSEÑAR)...
El comienzo de las aventuras (SER)...
La carta de mi primo (ENVIAR)...
El productor de la película (GANAR)...
La tela de los sombreros (SER)...
El objeto de sus deseos (SER)...
El contenido de los camiones (SER)...
El ascensor de las oficinas (ESTAR)...
Las cubiertas de los libros (ROMPERSE)...
El sabor de los besos (SER)...
El valor de los tesoros (SER)...
Los uniformes de los soldados (SER)...
El comienzo de las fiestas (SER)...
Los jinetes de los caballos (CORRER)...
El dueño de la furgoneta (SEGUIR)...
La historia de sus affairs (SER)...
El material de los radiadores (SER)...
La teoría de los glaciares (SER)...
El puente hacia la isla (CONSTRUIR)...
La longitud de la sombra (SER)...
El destino de las vacaciones (SER)...
Los pájaros cerca de los arbustos (ASUSTARSE)...
Los marineros de los botes salvavidas (PEDIR)...
El maletero con los cráneos (ESTAR)...
La frecuencia de los orgasmos (SER)...
La cuerda con los nudos (ESTAR)...
El camarero del conde (LLEVAR)...
El dueño del gato (COMER)...

El blanco de los chistes (SER)...
El descuento de la camiseta (SER)...
El jefe del trabajador (TRABAJAR)...
La historia de los milagros (SER)...
La foto de los reptiles (ESTAR)...
El grupo de los licenciados (SER)...
El tamaño de las estufas (SER)...
La ilustración de los coitos (ESTAR)...
El secreto de los rescates (SER)...
Los derechos de los trabajadores (SER)...
El director de la escuela (SOLUCIONAR)...
La escena de las victorias (ESTAR)...
Los barcos cerca de las pequeñas islas (ANCLAR)...
Las chicas de las fotografías (VESTIR)...
El resumen de las ganancias (SER)...

Items in the N-N (neutral-neutral) condition:

El paciente con los tobillos rotos (ESTAR)...
La tela de los sombreros (SER)...
El contenido de los camiones (SER)...
El ascensor de las oficinas (ESTAR)...
El material de los radiadores (SER)...
La teoría de los glaciares (SER)...
El maletero con los cráneos (ESTAR)...
La cuerda con los nudos (ESTAR)...
La foto de los reptiles (ESTAR)...
El tamaño de las estufas (SER)...
Los barcos cerca de las pequeñas islas (ANCLAR)...

Items in the N-Emo (neutral –emotional) condition:

El comienzo de las aventuras (SER)...
El objeto de sus deseos (SER)...
El sabor de los besos (SER)...
El valor de los tesoros (SER)...
El comienzo de las fiestas (SER)...
La historia de sus affairs (SER)...

El destino de las vacaciones (SER)...
La frecuencia de los orgasmos (SER)...
El blanco de los chistes (SER)...
La historia de los milagros (SER)...
El grupo de los licenciados (ESTAR)...
La ilustración de los coitos (ESTAR)...
El secreto de los rescates (SER)...
La escena de las victorias (ESTAR)...
El resumen de las ganancias (SER)...





APPENDIX B

Instructions given for the evaluation of the Spanish words:

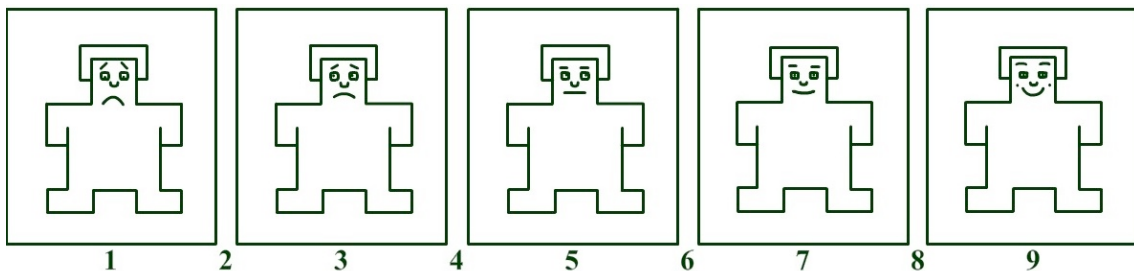
INSTRUCCIONES

Gracias por participar en esta investigación sobre las respuestas emocionales ante distintos tipos de palabras. Como verás, dispones de una “Hoja de Respuestas” con un conjunto de palabras que tendrás que evaluar mediante el Maniquí de Auto-Evaluación (MAE) incluido en esta hoja. Observa que el MAE consta de 2 dimensiones:

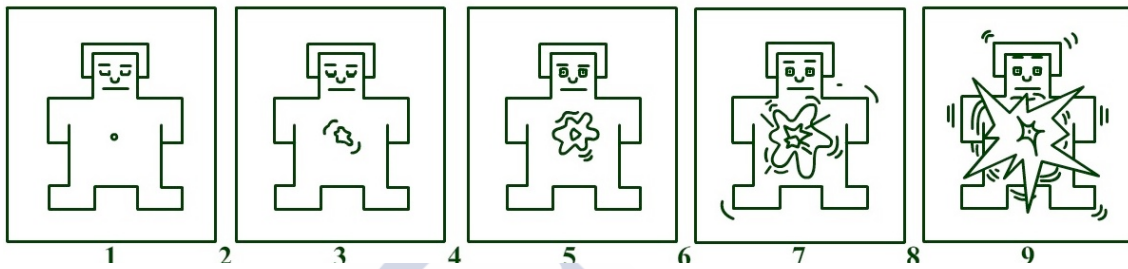
- AGRADO: desde la tristeza a la alegría.
- ACTIVACIÓN: desde la calma hasta la excitación.

Observa que cada dimensión del MAE dispone de una escala que va desde 1 hasta 9. Utiliza estos valores para evaluar cada palabra en las 2 dimensiones de acuerdo con los siguientes criterios:

- **AGRADO:** Si la palabra te hace sentir completamente triste, la evaluarás con un 1. Si te hace sentir completamente alegre, la evaluarás con un 9. Si no te hace sentir ni alegre ni triste, sino neutral, la evaluarás con un 5. Puedes utilizar otros valores si la palabra te hace sentir un poco triste (3) o un poco alegre (7). Observa que también puedes evaluar tu nivel de alegría o tristeza utilizando otros valores (2, 4, 6, 8) situados entre las figuras.



- **ACTIVACIÓN:** Si la palabra te hace sentir completamente calmado (es decir, muy desactivado o muy relajado) lo indicarás mediante un 1. Cuando la palabra te haga sentir completamente excitado (es decir, muy activado o muy despierto), lo indicarás con un 9. Utiliza un 5 si la palabra no te calma ni te excita, es decir, si la evalúas como neutral en esta dimensión. Como antes, dispones de otros valores para indicar distintos niveles de calma o excitación.



Por tanto, tu MISIÓN consistirá en evaluar cada palabra en cada una de las 2 dimensiones del MAE. Escribe tu evaluación (de 1 a 9) en las casillas que se muestran al lado de cada palabra en la Hoja de respuestas: Agrado y Activación.

A continuación vas a practicar con unas palabras de ejemplo:

PALABRA AGRADO ACTIVACIÓN

DAÑO

DESEO

TRAGEDIA

EDIFICIO

REUNIÓN

BESO

¿Tienes alguna duda?

Por favor, realiza tus evaluaciones **RÁPIDAMENTE**. No pases demasiado tiempo pensando en cada palabra. Lo mejor es que evalúes cada palabra guiándote por tu primera impresión. Si desconoces el significado de una palabra, simplemente no la evalúes y pasa a la siguiente.

MUCHAS GRACIAS POR TU COLABORACIÓN

Word-evaluation test for the emotionality questionnaire in Spanish (corresponding to “order 1”):

PALABRA	VALENCIA	ACTIVACIÓN
zapatos		
glaciares		
menú		
regalos		
margaritas		
material		
orgasmos		
cuadro		
milagros		
secreto		
camisetas		
vacaciones		
comisiones		
relato		
armario		
sábanas		
victorias		
aspecto		
muñecas		
besos		
fantasías		
cafeterías		
ascensor		
historia		
aventuras		
significado		
tamaño		
velas		
estofados		

amigos		
dibujo		
frecuencia		
peso		
noche		
duración		
deseos		
juguetes		
caricias		
confeti		
resumen		
fiestas		
importancia		
estufas		
causa		
libro		
romances		
objeto		
informe		
chistes		
forma		
ganancias		
narración		
uvas		
emociones		
radiadores		



APPENDIX C

Questionnaire used in the emotional words' study in Spanish (corresponding to "order 1"):

El mantel de la mesa...

Las llaves de los armarios...

Los vestidos de las bailarinas...

La duración de las vacaciones...

El mecánico del taller...

Los actores de las películas...

Los uniformes de los soldados...

El material de los radiadores...

El balcón del piso...

Los estuches para los lápices...

El dibujo de las camisetas...

Los marineros de los barcos...

Los resultados de los análisis...

Los instrumentos de los músicos...

La importancia de los amigos...

El aspecto de las uvas...

El tamaño de las margaritas...

La historia de los milagros...

La opinión del experto...

El informe de las comisiones...

El jefe del trabajador...

El alcalde del ayuntamiento...

El puente hacia la isla...
La narración de sus fantasías...
El dueño del gato...
El director del colegio...
El productor de la película...
La frecuencia de los orgasmos...
Los alumnos de los colegios...
Los hijos de los empleados...
La historia de los romances...
El abogado del acusado...
La trampa para el ratón...
El menú de las cafeterías...
El armario de los zapatos...
El confeti de las fiestas...
El informe sobre los glaciares...
El secreto de sus estofados...
Los pájaros de los arbustos...
El bienestar de su hijo...
El significado de los besos...
Los familiares de las víctimas...
La carretera hacia la autovía...
La portada del libro...
El relato de sus emociones...
Los jinetes de los caballos...
Los osos con las crías...
El objeto de sus deseos...
La oficina de la secretaria...
Los jugadores de los equipos...

El libro de los chistes...
El cuadro de las velas...
El ascensor para los juguetes...
La actuación del cantante...
El cristal de la ventana...
El tamaño de los regalos...
Los profesores de las chicas...
Las palabras de sus madres...
El peso de las estufas...
El botón de la camisa...
La forma de las muñecas...
El material de las sábanas...
La importancia de sus caricias...
El dueño de la furgoneta...
El abogado de la familia...
La noche de las aventuras...
El olor del perfume...
El nieto de la señora...
El resumen de las ganancias...
Las entrevistas de los candidatos...
El lápiz de la mesa...
Las notas de los estudiantes...
Los derechos de los trabajadores...
La causa de las victorias...
Las noticias de los periodistas...

Items in the N-N (neutral-neutral) condition:

El material de los radiadores...

El dibujo de las camisetas...

El aspecto de las uvas...

El tamaño de las margaritas...

La historia de los milagros...

El informe de las comisiones...

El menú de las cafeterías...

El armario de los zapatos...

El informe sobre los glaciares...

El secreto de sus estofados...

El cuadro de las velas...

El ascensor para los juguetes...

El peso de las estufas...

La forma de las muñecas...

El material de las sábanas...

Items in the N-Emo (neutral-emotional) condition:

La duración de las vacaciones...

La importancia de los amigos...

La narración de sus fantasías...

La frecuencia de los orgasmos...

La historia de los romances...

El confeti de las fiestas...

El significado de los besos...

El relato de sus emociones...

El objeto de sus deseos...

El libro de los chistes...

El tamaño de los regalos...

La importancia de sus caricias...

La noche de las aventuras...

El resumen de las ganancias...

La causa de las victorias...





APPENDIX D

Instructions given for the evaluation of the English words:

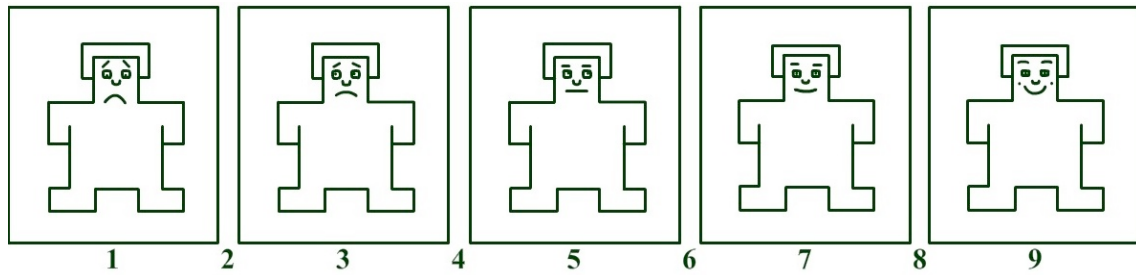
INSTRUCTIONS

Thank you for your participation in this emotionality test. For this test, you will have to evaluate a group of words using the 'Self-Assessment Manikin' (SAM) that you will find right below. The SAM has two different dimensions:

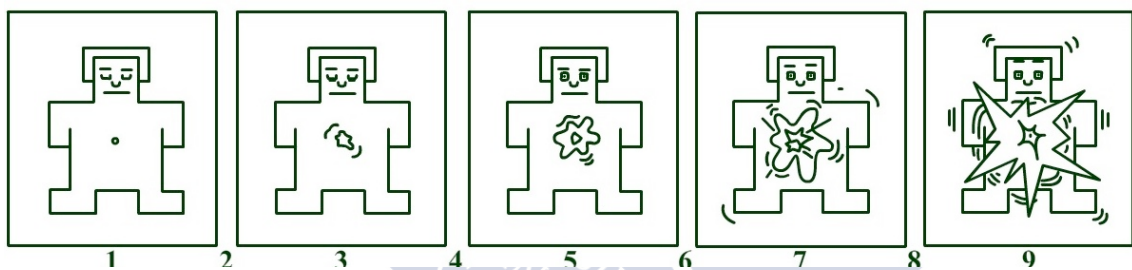
1. VALENCE: from sadness to happiness
2. AROUSAL: from complete calm to excitation

Please, notice that each of the two dimensions has a scale going from 1 to 9. Use these range of numbers to evaluate each of the words in these two dimensions and according to the following criteria:

VALENCE: if the word makes you feel completely sad, you'll have to evaluate this word with 1. If, on the contrary, it makes you feel completely happy, you'll give this word a 9. If it does not make you feel sad, nor happy (if you just have a completely neutral attitude towards that word), you'll evaluate it with a 5. You can use the rest of the numbers if the word in question makes you feel either a bit sad (3, for example) or a bit happy (7, for example). Notice that you can also judge your level of happiness or sadness towards that word by using other values (2, 4, 6, 8):



AROUSAL: If the word in question makes you feel completely calm (that is, completely relaxed), you'll indicate it with 1. If the word makes you feel very excited (that is, very activated), you'll indicate this with a 9. Use number 5 to indicate that the word does not excite or calm you, that you feel neutral towards that word's meaning. Again, you have other values to indicate different levels of calm or excitation towards a particular word.



In brief, your mission would be that of evaluating each word on each of the two dimensions explained above. Write your evaluation numbers in the cells at the right of each word in the answer sheet.

Let's practice with some examples:

WORD	VALENCE	AROUSAL
harm		
sofa		
meeting		
tragedy		
smile		
couple		

Do you have any doubt?

Please, do your evaluation test **as quickly as possible**. Do not spend much time thinking about each of the words. The best thing to do is to evaluate each word based on your first impression. If you do not the meaning of a word just leave its cells in blank and continue with the rest.

THANK YOU FOR YOUR COLLABORATION!!

Word-evaluation test for the emotionality questionnaire in English (corresponding to “order 1”):

WORD	VALENCE	AROUSAL
shoes		
glaciers		
menu		
presents		
lilies		
material		
orgasms		
picture		
miracles		
secret		
t-shirts		
holidays		
commission		
account		
wardrobe		
sheets		
victories		
appearance		
dolls		
kisses		
fantasies		
cafeterias		
elevator		
story		
adventures		
meaning		
size		
candles		
stews		
friends		
design		

frequency		
weight		
night		
duration		
desires		
toys		
caresses		
confetti		
summary		
parties		
importance		
stoves		
cause		
book		
affairs		
object		
report		
jokes		
shape		
profits		
narration		
grapes		
emotions		
radiators		



APPENDIX E

Questionnaire used in the emotional words' study in English (corresponding to "order 1"):

The tablecloth on the table...

The keys to the cabinets...

The dresses of the dancers...

The duration of the holidays...

The mechanic of the garage...

The actors in the films...

The uniforms of the soldiers...

The material of the radiators...

The balcony of the flat...

The cases for the pencils...

The design of the T-shirts...

The sailors in the boats...

The results of the analyses...

The instruments of the musicians...

The importance of their friends...

The appearance of the grapes...

The size of the lilies...

The story of the miracles...

The opinion of the expert...

The report of the commissions...

The boss of the worker...

The mayor of the council...

The bridge to the island...
The narration of their fantasies...
The owner of the cat...
The headmaster of the school...
The producer of the film...
The frequency of the orgasms...
The pupils at the schools...
The sons of the employees...
The story of the affairs...
The lawyer of the accused...
The trap for the rat...
The menu in the cafeterias...
The wardrobe for the shoes...
The confetti at the parties...
The report from the glaciers...
The secret of their stews...
The birds in the bushes...
The welfare of his son...
The meaning of the kisses...
The relatives of the victims...
The road on to the motorway...
The cover of the book...
The account of their emotions...
The jockeys of the horses...
The cubs with the bears...
The object of their desires...
The office of the secretary...
The players in the teams...

The book of jokes...

The picture of the candles...

The elevator for the toys...

The performance of the singer...

The glass in the window...

The size of the presents...

The teachers of the girls...

The words of their mothers...

The weight of the stoves...

The button of the shirt...

The shape of the dolls...

The material of the sheets...

The importance of their caresses...

The owner of the van...

The lawyer of the family...

The night of the adventures...

The fragrance of the perfume...

The grandson of the lady...

The summary of the profits...

The interviews of the candidates...

The pencil on the table...

The qualifications of the students...

The rights of the workers...

The cause of the victories...

The news from the journalists...

Items in the N-N (Neutral-Neutral) condition:

The material of the radiators...

The design of the T-shirts...

The appearance of the grapes...

The size of the lilies...

The story of the miracles...

The report of the commissions...

The menu in the cafeterias...

The wardrobe for the shoes...

The report from the glaciers...

The secret of their stews...

The picture of the candles...

The elevator for the toys...

The weight of the stoves...

The shape of the dolls...

The material of the sheets...

Items in the N-Emo (neutral-emotional) condition:

The importance of their friends...

The narration of their fantasies...

The frequency of the orgasms...

The story of the affairs...

The confetti at the parties...

The meaning of the kisses...

The account of their emotions...

The object of their desires...

The book of jokes...

The size of the presents...

The importance of their caresses...

The night of the adventures...

The summary of the profits...

The cause of the victories...





APPENDIX F

Instructions for the distributivity test:

TEST DE DISTRIBUTIVIDAD

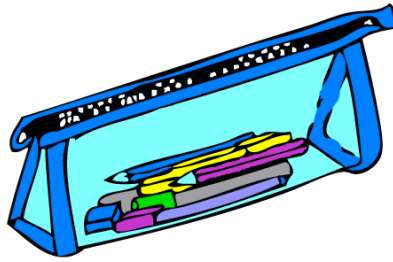
En este test debéis evaluar el nivel de distributividad (en una escala del 1 al 7) de los comienzos de frases que se os muestran a continuación. Aquí tenéis una explicación de qué es y cómo se mide la distributividad:

Una oración (o comienzo de oración) se considera distributiva cuando los dos nombres que la componen son capaces de crear una imagen mental con un referente múltiple (es decir, un referente formado por dos imágenes mentales superpuestas). Por ejemplo: en **‘LA FLECHA DE LAS SEÑALES’**, nosotros podemos crear de forma fácil una imagen mental de un referente plural (nos imaginamos muchas flechas cada una contenida en su correspondiente señal), como en el dibujo:



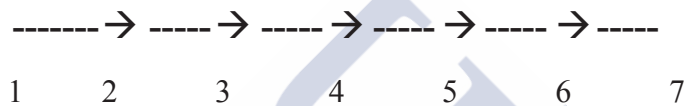
Por tanto, este comienzo de oración sería **altamente distributivo**.

Por el contrario, en una oración como **‘EL ESTUCHE DE LOS LÁPICES’**, no nos resulta tan sencillo crear dicho referente plural, ya que sólo nos podemos imaginar un único estuche que contiene lápices, como en el dibujo:



Por tanto, este comienzo de oración **no sería distributivo**.

Para evaluar los comienzos de oraciones se os da una escala de 1 a 7 como esta, donde 1 indica una baja distributividad y 7 una alta distributividad:

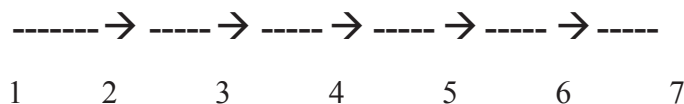


Debéis marcar con un círculo el valor que creáis oportuno para cada una de las frases en función del valor de distributividad que os parezca que tiene dicha frase. Así, si os es muy fácil crear un referente visual múltiple como el que se os mostraba para **‘LA FLECHA DE LAS SEÑALES’**, entonces marcaréis valores en torno al **7**. Si vuestro referente mental es más bien singular como en **‘EL ESTUCHE DE LOS LÁPICES’**, marcaréis valores cercanos a **1**. Deberéis utilizar los valores intermedios (2, 3, 4, 5, 6) para indicar distintos grados de dificultad al crear una imagen múltiple para la frase. Acordaos: 1 indica un muy bajo nivel de distributividad y 7 un muy alto nivel de distributividad.

¡Muchas gracias por vuestra colaboración!

Questionnaire used in the distributivity test:

La flecha de las señales



El estuche de los lápices

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El jardín de las flores

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El barco de los piratas

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El camino a las montañas

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El campo de los elefantes

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El canto de los ruiseñores

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El coche de los vecinos

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El comedor para los niños

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El contenido de los libros

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El diseño de las camisetas

-----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

El significado de los besos

-----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

El familiar de los fallecidos

-----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

El final de las discusiones

-----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

El letrero en los hoteles

-----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

El hielo de los icebergs

-----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

El informe de las comisiones

-----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

El aspecto de las uvas

-----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

El laboratorio de los investigadores

-----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

El llavero para las llaves

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El marco de las ventanas

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El motivo de los atentados

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El nombre en las cartas

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El número en las pantallas

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El parque para los niños

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El peso de las estufas

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El patio de los niños

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El picnic de los domingos

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El plato para las manzanas

-----> -----> -----> -----> -----> -----> -----

1 2 3 4 5 6 7

El portal de los edificios

-----> -----> -----> -----> -----> -----> -----

1 2 3 4 5 6 7

El premio de los investigadores

-----> -----> -----> -----> -----> -----> -----

1 2 3 4 5 6 7

El principio de los meses

-----> -----> -----> -----> -----> -----> -----

1 2 3 4 5 6 7

El productor de las películas

-----> -----> -----> -----> -----> -----> -----

1 2 3 4 5 6 7

El programa de los ordenadores

-----> -----> -----> -----> -----> -----> -----

1 2 3 4 5 6 7

El protagonista de las películas

-----> -----> -----> -----> -----> -----> -----

1 2 3 4 5 6 7

El resumen de las ganancias

-----> -----> -----> -----> -----> -----> -----

1 2 3 4 5 6 7

El sello en los sobres

-----> -----> -----> -----> -----> -----> -----

1 2 3 4 5 6 7

El sonido de las sirenas

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El sueldo de los trabajadores

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El tamaño de las margaritas

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El teclado de los ordenadores

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El tren a los castillos

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El uniforme de los trabajadores

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El volante de los coches

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

La cabaña de los exploradores

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

La caja de los anillos

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El material de los radiadores

----- → ----- → ----- → ----- → ----- → -----
1 2 3 4 5 6 7

La casa de los políticos

----- → ----- → ----- → ----- → ----- → -----
1 2 3 4 5 6 7

La causa de las victorias

----- → ----- → ----- → ----- → ----- → -----
1 2 3 4 5 6 7

La cúpula de los edificios

----- → ----- → ----- → ----- → ----- → -----
1 2 3 4 5 6 7

La duración de las vacaciones

----- → ----- → ----- → ----- → ----- → -----
1 2 3 4 5 6 7

La estatua al lado de los árboles

----- → ----- → ----- → ----- → ----- → -----
1 2 3 4 5 6 7

La etiqueta de las botellas

----- → ----- → ----- → ----- → ----- → -----
1 2 3 4 5 6 7

La fecha en los papeles

----- → ----- → ----- → ----- → ----- → -----
1 2 3 4 5 6 7

El aire de los secadores

----- → ----- → ----- → ----- → ----- → -----
1 2 3 4 5 6 7

La forma de las muñecas

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

La frecuencia de los orgasmos

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

La funda para las gafas

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

La habitación de los chicos

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

La habitación de sus hijos

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

La historia de los romances

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

La importancia de sus caricias

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

La longitud de las carreteras

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

La luz de los flexos

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

La narración de sus fantasías

-----→ -----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

La oficina de las chicas

-----→ -----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

La partitura de los compositores

-----→ -----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

La puerta de las casas

-----→ -----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

La oficina de los investigadores

-----→ -----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

La puerta de las habitaciones

-----→ -----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

La portada de los libros

-----→ -----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

La ropa de los chicos

-----→ -----→ -----→ -----→ -----→ -----→ -----
1 2 3 4 5 6 7

La sinfonía de los violines

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

El tamaño de los regalos

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

La trampa para los ratones

-----→ -----→ -----→ -----→ -----→ -----→ -----
 1 2 3 4 5 6 7

Highly distributive preambles:

La flecha de las señales

El nombre en las cartas

El letrero en los hoteles

La puerta de las habitaciones

El sello en los sobres

La puerta de las casas

El portal de los edificios

La fecha en los papeles

El número en las pantallas

El marco de las ventanas

La cúpula de los edificios

La etiqueta de las botellas

El teclado de los ordenadores

La portada de los libros

El volante de los coches

Low-in-distributivity preambles:

El familiar de los fallecidos
El tren a los castillos
El coche de los vecinos
El estuche de los lápices
El barco de los piratas
El llavero para las llaves
La estatua al lado de los árboles
El camino a las montañas
El plato para las manzanas
El comedor para los niños
El productor de las películas
La caja de los anillos
La trampa para los ratones
El jardín de las flores
La funda para las gafas

Medium-in-distributivity preambles:

El motivo de los atentados
El programa de los ordenadores
El protagonista de las películas
El material de los radiadores
La sinfonía de los violines
El picnic de los domingos
El canto de los ruiseñores
La luz de los flexos
El contenido de los libros

El principio de los meses

El aire de los secadores

El hielo de los icebergs

El sonido de las sirenas

La longitud de las carreteras

El final de las discusiones





APPENDIX G

Questionnaire used in the concreteness study in 1 Spanish (corresponding to “order 1”):

Los familiares de las víctimas...

El lápiz de la mesa...

El jefe del trabajador...

El campo de los elefantes...

El significado de los besos...

El bienestar de su hijo...

El sueldo de los trabajadores...

Los jugadores de los equipos...

El mecánico del taller...

El tamaño de las margaritas...

El laboratorio de los investigadores...

Los estuches de los lápices...

El director del colegio...

La narración de sus fantasías...

Los resultados de los análisis...

El nieto de la señora...

Los instrumentos de los músicos...

Los uniformes de los soldados...

La causa de las victorias...

El alcalde del ayuntamiento...

La oficina de los investigadores...

La oficina de la secretaria...

El uniforme de los trabajadores...

La actuación del cantante...

Las notas de los estudiantes...

La frecuencia de los orgasmos...

Los marineros de los barcos...

El abogado del acusado...

La ropa de los chicos...

El productor de la película...

La forma de las muñecas...

Los jinetes de los caballos...

Los actores de las películas...

El aspecto de las uvas...

El botón de la camisa...

El abogado de la familia...

La oficina de las chicas...

El peso de las estufas...

Los profesores de las chicas...

La partitura de los compositores...

Los vestidos de las bailarinas...

El dueño del gato...

La carretera hacia la autovía...

El diseño de las camisetas...

La habitación de sus hijos...

Los alumnos de los colegios...

Las palabras de sus madres...

Los hijos de los empleados...

El patio de los niños...

El cristal de la ventana...

El dueño de la furgoneta...

La importancia de sus caricias...

El olor del perfume...

Los pájaros de los arbustos...

La cabaña de los exploradores...

Los osos con las crías...

El balcón del piso...

La duración de las vacaciones...

La portada del libro...

La casa de los políticos...

La opinión del experto...

El puente hacia la isla...

El resumen de las ganancias...

El mantel de la mesa...

El parque para los niños...

El coche del periodista...

La historia de los romances...

El premio de los investigadores...

Los derechos de los trabajadores...

El informe de las comisiones...

La trampa para el ratón...

La habitación de los chicos...

El tamaño de los regalos...

Las llaves de los armarios...

Las entrevistas de los candidatos...

Items in the C-C (concrete-concrete) condition:

El campo de los elefantes...
El sueldo de los trabajadores...
El laboratorio de los investigadores...
La oficina de los investigadores...
El uniforme de los trabajadores...
La ropa de los chicos...
La oficina de las chicas...
La partitura de los compositores...
La habitación de sus hijos
El patio de los niños
La cabaña de los exploradores
La casa de los políticos
El parque para los niños
El premio de los investigadores...
La habitación de los chicos

Items in the A-C (abstract-concrete) condition:

El significado de los besos...
El tamaño de las margaritas
La narración de sus fantasías
La causa de las victorias...
La frecuencia de los orgasmos...
La forma de las muñecas
El aspecto de las uvas...
El peso de las estufas...
El diseño de las camisetas

La importancia de sus caricias...

La duración de las vacaciones

El resumen de las ganancias...

La historia de los romances...

El informe de las comisiones...

El tamaño de los regalos





APPENDIX H

Questionnaire used in the concreteness study in English (corresponding to “order 1”):

The pencil on the table...

The boss of the worker...

The field of the elephants...

The meaning of the kisses...

The welfare of his son...

The salary of the workers...

The players in the teams...

The mechanic of the garage...

The size of the lilies...

The laboratory of the researchers...

The cases for the pencils...

The headmaster of the school...

The narration of their fantasies...

The results of the analyses...

The grandson of the lady...

The instruments of the musicians...

The uniforms of the soldiers...

The cause of the victories...

The mayor of the council...

The office of the investigators...

The uniform of the workers...

The office of the secretary...

The performance of the singer...

The qualifications of the students...

The frequency of the orgasms...

The sailors in the boats...

The lawyer of the accused...

The clothing of the guys...

The producer of the film...

The shape of the dolls...

The jockeys of the horses...

The actors in the films...

The appearance of the grapes...

The button of the shirt...

The lawyer of the family...

The office of the girls...

The weight of the stoves...

The teachers of the girls...

The stave of the composers...

The dresses of the dancers...

The owner of the cat...

The road on to the motorway...

The design of the T-shirts...

The bedroom of his sons...

The pupils at the schools...

The words of their mothers...

The sons of the employees...

The playground of the boys...

The glass in the window...

The owner of the van...

The importance of their caresses...

The fragrance of the perfume...

The birds in the bushes...
The cabin of the explorers...
The cubs with the bears...
The balcony of the flat...
The duration of the holidays...
The cover of the book...
The house of the politicians...
The opinion of the expert...
The bridge to the island...
The summary of the profits...
The tablecloth on the table...
The park for the little boys...
The car of the journalist...
The story of the affairs...
The relatives of the victims...
The award of the researchers...
The rights of the workers...
The report of the commissions...
The trap for the rat...
The bedroom of the guys...
The size of the presents...
The keys to the cabinets...
The interviews of the candidates...

Items in the C-C (concrete-concrete) condition:

The field of the elephants...
The salary of the workers...
The laboratory of the researchers...

The office of the investigators...

The uniform of the workers...

The clothing of the guys...

The office of the girls...

The stave of the composers...

The bedroom of his sons...

The playground of the boys...

The cabin of the explorers...

The house of the politicians...

The park for the little boys...

The award of the researchers...

The bedroom of the guys...

Items in the A-C (abstract-concrete) condition:

The meaning of the kisses...

The size of the lilies...

The narration of their fantasies...

The cause of the victories...

The frequency of the orgasms...

The shape of the dolls...

The appearance of the grapes...

The weight of the stoves...

The design of the T-shirts...

The importance of their caresses...

The duration of the holidays...

The summary of the profits...

The story of the affairs...

The report of the commissions...

The size of the presents...

SUMMARY

Agreement is considered in the literature as a very important device in language since it contributes to coherence in it (Bock, Nicol & Cutting, 1999). However, it is far from being an easy-to-understand phenomenon. On the contrary, it seems to be sensitive to various influences (semantics, syntax, morphology, etc.) and they are likely to influence the process to different extents depending on numerous causes. Such influences have been analysed in the present thesis in order to ascertain to what extent agreement is a formal and automatic process or rather one which is porous to meaning. Importantly, we have focused on a particular type of agreement, namely number agreement, and we have analysed it in the *NP-of-NP + verb + complements* structure. In this respect, the phenomenon of “attraction” (whenever a plural local noun that differs in number from the head noun leads to agreement errors of the kind **the key to the cabinets ARE...*) was studied via some experimental research. This research is the focus of chapters 4 and 5 mainly. In addition, agreement complexities have been analysed in two morphosyntactically antagonistic languages (Spanish and English). Agreement mechanisms are likely to vary depending on the characteristics of each language, so these variations were observed in order to reach certain conclusions. Finally, it is worth mentioning that this linguistic mechanism has been studied from the point of view of two different disciplines, which are linguistics and psycholinguistics. Therefore, this thesis evolves from a purely theoretical and descriptive analysis of number agreement (as that collected in grammar books, for instance) to a more experimental approach in which the data obtained have been subjected to statistical analysis in order to elaborate some theoretical conclusions based on the results. Moreover, the focus of the aforementioned experimental research was put on production, although a certain degree of comprehension is always implicit in the type of research here presented.

Chapter 1 provides a general perspective of what agreement is for the traditional linguistics literature (including descriptive grammars). First, the Generative Grammar's view has been mentioned (Chomsky, 1981). According to traditional grammars, agreement is formed by four basic elements, which are: controllers, targets, features and domains (Corbett, 2006). Controllers represent the starting point for the process. The features on the controller (namely gender, number and case features (among others)) are copied onto the target, which in this case is the recipient of this information. All this happens within a specific domain. By domain, Corbett (2006) refers to the syntactic environment in which agreement takes place, that is, within the noun phrase, within the verb phrase, within the clause, etc. Generative Grammar assumes that the aforementioned copy of features from the controller to the target is always unidirectional, that is, that it is always the controller that imposes its inner features via a copy-percolation operation. The opposite case (that the features come from the target or that they are simply shared by both controller and target, as lexicalist theories propose (Wechsler & Zlatić, 2003)) is not considered as a possible option on their view. In addition, the process is considered as an encapsulated one, since once the features have been copied there is no turning back. These theories have been the basis of the literature on agreement through many years. However, there is evidence in every-day speech, and even in grammars (Huddleston & Pullum, 2002 and Quirk, Greenbaum, Leech & Svartvik, 1985, for instance) that semantics plays an important role in agreement decisions. If meaning is able to lead the process on some occasions, then it cannot be unidirectional and encapsulated, but rather dependent on various sources of information which can lead the process to different extents. The structures that demonstrate this fact are enumerated in chapter 1, these are: collective subjects (e.g. *the committee have* not yet come to a decision), reference transfer (e.g. *the ham sandwich at table six is getting restless*), coordinated subjects (e.g. Tom and Alice *are* now ready), indefinite expressions (e.g. either/neither of them *are* welcome), measure phrases (e.g. fifteen years *represents* a long period of his life), proportional constructions (e.g. [one in a hundred students] takes/take drugs), interrogatives (e.g. who *haven't* yet

handed in their assignments?), existential constructions (e.g. *there's some boys at the door*), singular plurals (e.g. *unleashed dogs on city sidewalks threatens the health and welfare of law-abiding citizens*), distributive sentences (e.g. *students were asked to name their favourite sport*), and the use of the third person in cleft relatives (e.g. *it is me [who is at fault]*). These are only a small number of the many structures where semantics is present in the final resolution of agreement marks. At the same time, they are indicative of the important role that meaning plays in relation to agreement and, as a consequence, they contradict purely formal models.

At the end of the first chapter, the notion of “attraction” or “proximity concord” was introduced. By the term “attraction” it is understood the wrong copy of features from an intervening word bursting in between the controller and the target. This may be due to either a morphosyntactic interference (therefore including morphology as a potential source of information which influences agreement processing) or to semantic issues related to the meaning of an intervening morphologically marked (plural) noun, which forces the verb to agree with it.

This first chapter constitutes the starting point in order to study agreement. It has a purely descriptive nature which helps to understand the topic of the present thesis.

The aim of chapter 2 is that of providing more data about similar structures to those enumerated in chapter 1, as well as to compare the behaviour of such sentences in two different languages (Spanish and English), thus giving a crosslinguistic perspective to this thesis. To this purpose, we selected a series of sentences which were related to different semantic constraints. The ultimate purpose was that of creating a collection of materials where the participants' responses to a series of sentences were compiled in order to reach some conclusions. The starting point for this descriptive research is a study by Berg (1998) in which he compared German and English sentences. It was further replicated by Acuña Fariña (2009) and more recently by Riveiro Outeiral & Acuña Fariña (2012), comparing on these two occasions Spanish and English, which are genealogically more distant languages. In addition, Spanish and German share a rich morphological

system that English lacks. It is important to bear in mind that the analysis of the structures chosen is a standard grammatical analysis along the lines of that by Berg (1998) on a similar range of structures.

The structures that were subjected to experimental research and further analysis were the following:

1. Postmodified NPs of the kind: “ART (+ADJ) + N(sg) + of (+ADJ) + N(pl)”

E.g. a gang of thugs or a number of children + copula (to be) // una banda de matones o un número de niños + copula (estar).

2. a) NPsg -copula- NPpl structures with nominal predicates. E.g. the cause of the accident + copula (to be) + bad brakes // la causa del accidente + copula (ser) + los frenos.

b) NPpl -copula- NPsg structures with nominal predicates. E.g. bad brakes + copula (to be) + the cause of the accident // los frenos + copula (ser) + la causa del accidente.

3. a) Pseudoclefts. E.g. what I actually adore + copula (to be) + N (pl) // lo que a mí realmente me gusta + copula (ser) + N(pl) or all you can see there + copula (to be) + N(pl) // todo lo que puedes ver allí + copula (ser) + N(pl).

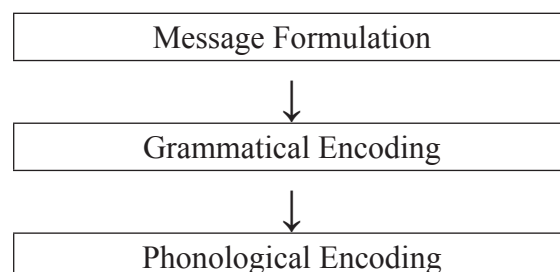
b) Pseudoclefts. E.g. N(pl) + copula (to be) what I actually adore // N(pl) + copula (ser) + lo que a mí realmente me gusta or N(pl) + copula (to be) + all you can see there // N(pl) + copula + todo lo que puedes ver allí.

After the analysis of the completions that the participants in the experiment provided for these types of sentences, we could conclude that Spanish and German behave in a quite similar manner whereas English seems to use a different mechanism, that is, morphologically rich languages such as the former two ones seem to allow a lesser

degree of semantic interference when dealing with number agreement. On the contrary, a morphologically poor language like English allows semantic interference to a higher extent. The results also suggest that formal and semantic regulation of agreement operations cannot be set *a priori* as a fixed Chomskyan cycle of encapsulated computation, as in current phase-based forms of generative grammar (Chomsky, 2001: 46; 2005: 13). Instead they depend on the particulars of each language, as these have varying degrees of morphological strength and more or less flexibility as regards word order.

Chapter 3 represents a change in the perspective from which agreement is studied. After having analysed how the linguistics literature had contributed to the understanding of the phenomenon of agreement, we turned our view to a closely related discipline, which is psycholinguistics. Psycholinguistics bases its theories on experimental research which is subjected to statistical analysis. This type of research work provides clues that allow researchers to elaborate theories which try to shed light on how our mind works when a certain structure is computed. Therefore, in chapter 3, the most recent theories on agreement provided in the psycholinguistics literature were introduced and the experimental research they are based on were described.

The first theory mentioned corresponds to that supporting the notion of syntactic encapsulation. In this respect, the model by Bock & Levelt (1994) has been presented. In this model, as the figure below suggests, the steps followed in processing always take place in the same order, that is, the model is unidirectional, and therefore information always passes from the upper stage to the lower one but not viceversa.



Research carried out in the 90's on the psycholinguistic characteristics of agreement was not able to contradict this general model for speech production according to which agreement takes place during grammatical encoding (with no influence of its previous stage). However, in 1995-1996, Vigliocco and her collaborators (Vigliocco, Butterworth & Semenza (1995); Vigliocco, Butterworth & Garrett (1996a); Vigliocco, Hartsuiker, Jarema & Kolk (1996b)) could experimentally demonstrate that the semantic variable "distributivity" was able to influence agreement decisions (at least in Romance languages). For this reason, the idea that agreement could only take place during grammatical encoding and that it was independent of meaning was challenged. Vigliocco et al. (1996a) reasoned that a copy-percolation model of processing would never be able to account for their results, since in such models, semantic agreement is the result of the incorrect transmission of features, but this incorrect transmission should equally occur in structurally different languages. They interpreted these results in the light of unification theories. Unification maintains that agreement is not an issue of copying features from one sentence element to another. Contrarily, it shares the linguistic philosophy that every form of language has an associated meaning (Langacker, 1991), and assumes that words contain information about the structures they can be combined with, agreement being simply a matter of making features match. Agreement is not then directional in essence, since features are just checked in various words and only those features that match in all of them are unified. This conception of agreement as a "long component" or "discontinuous morpheme" (Ferguson & Barlow, 1988: 13) became the most likely option and helped to challenge the psychological validity of encapsulated theories.

Interestingly, some years later Eberhard (1999) did find effects of a semantic variable in English as well. This author attributed the lack of results in previous experiments to methodological errors in the design of the experimental material previously used in the literature. As a consequence, semantic interference was no longer only a matter of the type of language tested, but of language processing in general. Therefore, after 1999 the inherent influence of semantics at early processing stages of processing started to be

considered. After these findings, the theory of Marking and Morphing was elaborated by Bock, Eberhard, Cutting, Meyers & Schriefers (2001). According to them:

Number marking occurs during the mapping between messages and lexical-grammatical representations, while number morphing occurs during constituent assembly.

Bock et al. (2001: 89)

According to this theory, only the features of the subject phrase are responsible for marking. They base this assumption on the fact that in English verbs do not usually carry any sense of singularity or plurality. English verbs were likely to have pronominal traces that could add a certain sense of number in past periods in the history of the language (Givón, 1976), but these number traces are completely eliminated in Present-day English, so present day native speakers cannot process any trace of singularity in verbs. After the *Marking* phase comes the *Morphing* operation. During Morphing “[...] the specifications of number in the lexicon are morphologically instantiated and, if necessary, reconciled with the number features on the subject” (Bock et al., 2001: 91). So Marking and morphing constitutes a “hybrid” theory in which notionality in the subject is taken into account but only up to a certain step in processing, after which pure morphosyntactic copying only is at work.

Both pure syntactic theories as well as hybrid models were questioned by Thornton & MacDonald (2003) when they attested the effect of another semantic variable (plausibility). The positive results that they achieved as regards this semantic constraint were interpreted in the light of the so-called “constraint satisfaction models”, which share the idea that all possible sources of information can be active during the whole process, that is, that semantics, morphology and syntax are active during the processing of a sentence and the processor takes advantage of them in an opportunistic way depending on the particularities of each sentence.

Purely semantic theories have also been elaborated. Such is the case of Solomon & Pearlmuter, 2004 and Gillespie & Pearlmuter, 2011's "semantic integration account". The idea initially expressed in Solomon & Pearlmuter (2004) was that semantically integrated nouns within the same sentence lead to simultaneous planning, thus increasing the chance of producing attraction errors. So the more integrated two nouns are, the easier it would be to make an error. This theory is somehow also connected with memory issues, as it is Badecker & Kuminiak's (2007) theory, according to which subjects are linked to representational elements that encode subjecthood; being in the nominative case, occupying a certain position within the sentence, etc. (Badecker & Kuminiak, 2007: 69). Consequently, when subjects are recovered from working memory, these subject features are used as retrieval cues. When more than one element in the vicinity of the subject share any of the cues of the actual subject, then multiple candidate controllers are activated in our working memory, leading to a potential failure in the retrieval of the right subject features. Thus, mis-selection due to the proximity of two nouns with the same retrieval cues is quite likely to happen due to memory misguidance.

All the above mentioned theories are part of the psycholinguistics literature and all of them have been attested through experimental work. Therefore, in chapters 4 and 5, we carried out some experimental work in order to study the influence of two (potentially) semantic variables: emotionality and concreteness. Due to this research we were able to elaborate our own theory about agreement production in general.

Chapter 4 deals with the study of the variable "emotionality" in relation to number agreement processing. In the first sections, the term "emotion" was defined and what we understand by "emotional words" has been cleared up. The precedents in the study of this variable are both Fraga, Piñeiro, Acuña Fariña, Redondo & García Orza (2012) and Piñeiro (2011). These two works deal with the study of relative clause disambiguation, but they take into account the emotional nature of the words used in the experimental preambles that were presented. Since positive results were achieved, we decided to test this variable in relation to agreement processes in the Np-of-Np + verb construction.

For the purpose of this investigation, we elaborated a test in which we manipulated the valence and arousal levels of both the head noun and the local noun inserted in Np-of-Np subjects. These preambles were presented to a series of participants in an off-line completion test. Moreover, we created the same test in both Spanish and English in order to compare the agreement mechanisms that the participants of each language used. What the results achieved suggested was that agreement seems not to be highly influenced by the emotional status of words. The reasoning behind this lack of positive results was that “emotionality” cannot be compared to other semantic variables, since emotionality came to be something different from semantics, that is, emotionality and semantics do not seem to be the same type of processing but different processes which run in parallel (Díaz Lago, Fraga & Acuña Fariña (submitted)). However, a high number of mistakes were made by the participants in both tests (noting that English speakers made a much higher number of them). Therefore, once the emotionality was discarded as a potential source for agreement mistakes, alternative sources were investigated. In this respect, we turned our attention to the variable “concreteness”, which represents the focus of chapter 5.

Chapter 5 studied the influence of concreteness on subject-verb number agreement in Spanish and English. Previous studies had not reported any remarkable effect of concreteness in the production of subject-verb agreement (Bock & Miller, 1991, for instance). However, the analysis of the previous results in the emotionality test made us suspect that concreteness might be meddling in agreement processes in the sentences presented to the participants. Moreover, we observed that the experiments by Bock & Miller (1991), which were taken as the main reference in the study of concreteness and agreement relations, had some methodological problems. For this precise reason, we tried to improve Bock & Miller’s experimental sentences in order to solve such problems and provide new results about the influence of concreteness on agreement processing. What our results suggested was that concreteness was quite an influential factor that could alter the election of number agreement marks, that is, that whenever an abstract and singular head noun was combined with a plural and concrete local noun, the possibilities that

number agreement would be wrongly established with the local noun instead of with the head noun dramatically increased (e.g. **the appearance of the grapes WERE...* is a much more frequent an error than **the cabin of the explorers WERE...*). In addition, this seemed to happen more frequently in English than in Spanish. These language differences coincided with those found in chapter 2, so it seems that semantics can influence agreement processes both when the grammaticality of the sentence is not put at risk and interestingly, also when it is, and that this seems to happen more frequently in morphologically poor languages than in morphologically rich ones.

From all the facts and results previously summarised, it was concluded that purely formal theories cannot be sustained in view of the data here reported. Agreement is not likely to be just a formal co-occurrence of features but the combination of both semantic and syntactic information at all levels in processing. Our processor seems to take advantage of the most valuable type of information at all times and it seems to be also dependent on the language used and on the characteristics that define it (namely its syntactic rigidity or the number of morphological cues present in a particular language).

The thesis concludes with some suggestions for further research which will be the objective of future investigations on the topic.

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RESUMEN EN ESPAÑOL

La concordancia siempre se ha considerado en la literatura como un mecanismo fundamental para el lenguaje, ya que contribuye a crear coherencia (Bock, Nicol y Cutting, 1999). Sin embargo, nos hallamos ante un fenómeno de naturaleza complicada. La concordancia parece ser susceptible a varias influencias (semántica, sintaxis, morfología, etc.), las cuales pueden influir en el proceso en distintos grados y en función de diferentes causas. Precisamente estas influencias han sido analizadas en la presente tesis con el objeto de aclarar hasta qué punto la concordancia se puede entender como un proceso formal y automático o más bien como un proceso dependiente del significado de las palabras. Un dato aclaratorio e importante para esta investigación es que hemos centrado este trabajo en un tipo particular de concordancia: la concordancia de número, la cual hemos analizado dentro de la estructura *frase nominal(FN)- de- frase nominal(FN) + verbo + complementos*. En relación a esta estructura el fenómeno conocido como “atracción” ha sido analizado mediante investigación experimental. Por “atracción” nos referimos al hecho de que la presencia de un modificador plural, que difiere en número con el núcleo, sea capaz de inducir errores gramaticales del tipo **la llave de los armarios SON...* Estas investigaciones constituyen el principal foco de los capítulos 4 y 5. Además, las complejidades derivadas de la concordancia han sido analizadas en dos lenguas consideradas morfosintácticamente “antagonistas” (español e inglés). Los mecanismos de la concordancia son susceptibles de variar dependiendo de las características de cada lengua, y por ello, estas variaciones han sido objeto de nuestro estudio. Finalmente, este fenómeno ha sido estudiado desde el punto de vista de dos disciplinas diferentes que son la lingüística y la psicolingüística. Por tanto, este trabajo parte de un análisis puramente teórico y descriptivo de la concordancia (como el que se recogen en las gramáticas tradicionales) que se complementa con una perspectiva más experimental donde se recogen datos que son expuestos a análisis estadísticos y de cuyos resultados se

extraen conclusiones teóricas. Por último, hemos centrado nuestra atención en el campo de la producción, aunque siempre existe un cierto nivel de comprensión en este tipo de investigación experimental.

El capítulo 1 ofrece una perspectiva general de qué es la concordancia para la literatura tradicional en lingüística (incluyendo lo que se recoge en las gramáticas descriptivas). En primer lugar se presenta la visión de la Gramática Generativa (Chomsky, 1981). Según las gramáticas tradicionales, la concordancia depende de cuatro elementos básicos que son: “controladores”, “elementos diana”, “rasgos” y “dominios” (Corbett, 2006). Los controladores son el punto de inicio del proceso. Los rasgos presentes en ellos (rasgos de género, número o caso, entre otros) son copiados en el elemento diana, que es en este caso el receptor de dicha información. Todo esto ocurre dentro de un dominio específico. Por dominio Corbett (2006) se refiere al contexto sintáctico en el que tiene lugar la concordancia, es decir, dentro de la frase nominal, de la frase verbal, de la cláusula, etc. La Gramática Generativa nombrada anteriormente como primera teoría explicada en la presente tesis asume que la copia de rasgos del controlador al elemento diana siempre es unidireccional, esto es, que es siempre el controlador quien impone sus rasgos propios a través de una operación de “copia-percolación”. El caso opuesto (que los rasgos procedan del elemento diana, o que simplemente sean compartidos por el controlador y el elemento diana, como proponen las teorías lexicalistas (Wechsler y Zlatić, 2003)) no se consideran opciones válidas para la Gramática Generativa. Así mismo, el proceso se describe desde el generativismo como “encapsulado”, ya que una vez que los rasgos han sido copiados no existe una posible vuelta a la etapa anterior. Esta teoría ha sido la base de la literatura relativa a la concordancia a lo largo de muchos años. Sin embargo, existen múltiples evidencias (basadas en producciones de habla diarias e incluso en ejemplos recogidos en gramáticas como las de Huddleston y Pullum, 2002 o Quirk y colaboradores, 1985) de que la semántica desempeña un papel importante en las decisiones relativas a la concordancia. Si el significado por sí mismo es capaz de liderar el proceso en determinadas ocasiones, entonces éste no puede ser ni unidireccional ni

encapsulado, sino que ha de depender de varias fuentes de información que son capaces de liderar el proceso a diferentes niveles. Las estructuras que demuestran esto se encuentran enumeradas en el capítulo 1. Éstas son: sujetos colectivos (p. ej. **el comité todavía no han llegado a una decisión*), transferencia referencial (p. ej. *el sándwich de jamón de la mesa seis se está impacientando*), sujetos coordinados (p. ej. *Tom y Alice están listos*), expresiones indefinidas (*Alguno/Ninguno de ellos son bienvenidos*), frases que expresan medidas (p. ej. *quince años representa un periodo muy largo de su vida*), construcciones de sentido proporcional (p. ej. *[uno de cada cien estudiantes] consume/consumen drogas*), interrogativas (p. ej. *who haven't yet handed in their assignments?*- **¿quién no han entregado todavía sus tareas?*), construcciones existenciales (p. ej. *there's some boys at the door* –*hay (singular) algunos chicos en la puerta*), singulares plurales (p. ej. *unleashed dogs on city sidewalks threatens the health and welfare of law-abiding citizens*- **los perros sueltos en las aceras de la ciudad amenaza la salud y bienestar de los ciudadanos que son respetuosos con las leyes*), oraciones distributivas (p. ej. *students were asked to name their favourite sport* –**se le pidió a los estudiantes que nombrasen sus deporte favorito*) y el uso de la tercera persona en estructuras enfáticas de relativo (p. ej. *it is me who is at fault* – *soy yo quien tiene la culpa*). Estos ejemplos representan tan sólo un pequeño número de las muchas estructuras donde la semántica interfiere en la resolución final de las marcas de concordancia. Al mismo tiempo, se evidencia el importante papel que juega el significado en la concordancia y como consecuencia, sirven como evidencia para contradecir a los modelos formales.

Al final del primer capítulo se introduce la noción de “atracción” o “concordancia por proximidad”. Estos términos definen la copia errónea de rasgos en el verbo a causa de un elemento que interfiere entre el controlador y el elemento diana. Este fenómeno puede ocurrir a causa de una interferencia morfosintáctica o bien por motivos semánticos relacionados con el significado de un sustantivo en plural (número marcado morfológicamente) que fuerza al verbo a concordar con él en lugar de con el núcleo de la oración.

Este primer capítulo constituye el punto de inicio en nuestro estudio de la concordancia, ya que tiene un corte puramente teórico y descriptivo que sentará las bases para la comprensión del tema de la presente tesis.

El objetivo del capítulo 2 es aquel de proporcionar más datos sobre una serie de estructuras similares a las enumeradas en el capítulo 1 donde la fuerza de la semántica en determinadas estructuras sintácticas se hace evidente. También se intenta comparar el comportamiento de estas estructuras en dos lenguas diferentes (español e inglés). Para ello, seleccionamos una serie de estructuras paralelas en inglés y español con el motivo de sacar conclusiones acerca del modo en que se realizó la concordancia en ellas por parte de determinados participantes que colaboraron en un ejercicio escrito. El punto de partida de este estudio es un trabajo de Berg (1998) en el cual este autor compara algunas estructuras en alemán e inglés. Posteriormente este estudio fue replicado por Acuña Fariña (2009) y más tarde por Riveiro Outeiral y Acuña Fariña (2012), comparando en los dos últimos casos el español y el inglés, que son lenguas con una cierta distancia genealógica. Un dato a tener en cuenta es que el español y el alemán poseen una morfología muy rica de la cual el inglés carece. Por último, cabe aclarar este estudio se corresponde con un análisis gramatical standard, siguiendo las líneas del estudio de Berg (1998) donde utiliza estructuras similares.

Las estructuras que han sido sujetas a una investigación experimental han sido las siguientes:

1. Frases nominales con postmodificador del tipo: “ART (+ADJ) + N(sg) + de (+ADJ) + N(pl)” p. ej. a gang of thugs o a number of children + cópula (to be) // una banda de matones o un número de niños + cópula (estar).

2. a) estructuras del tipo: FNsg -cópula- FNpl con predicados nominales. P. ej. the cause of the accident + cópula (to be) + bad brakes // la causa del accidente + cópula (ser) + los frenos.

b) estructuras del tipo: FNpl –cópula- FNsg con predicados nominales. P. ej. bad brakes + cópula (to be) + the cause of the accident // los frenos + cópula (ser) + la causa del accidente.

3. a) estructuras pseudoenfáticas de relativo. P. ej. what I actually adore + cópula (to be) + N(pl) // lo que a mí realmente me gusta + cópula (ser) + N(pl) o all you can see there + cópula (to be) + N(pl) // todo lo que puedes ver allí + cópula (ser) + N(pl).

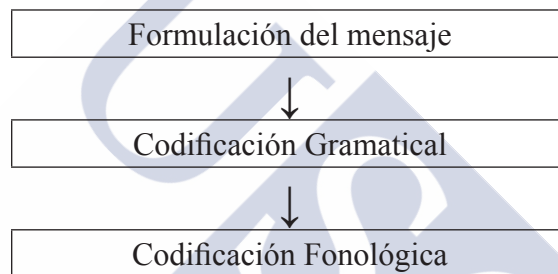
b) estructuras pseudoenfáticas de relativo. P. ej. N(pl) + cópula (to be) what I actually adore // N(pl) + cópula (ser) + lo que a mí realmente me gusta o N(pl) + cópula (to be) + all you can see there // N(pl) + cópula + todo lo que puedes ver allí.

Tras el análisis de las compleciones de los participantes para este tipo de frases, hemos concluido que el español y el alemán siguen patrones similares mientras que el inglés parece utilizar mecanismos diferentes, esto es, las lenguas morfológicamente ricas (español y alemán) parecen permitir un menor nivel de intervención semántica en los mecanismos de concordancia de número. Por el contrario, una lengua con una morfología escasa como el inglés acepta una mayor influencia proveniente de la información semántica de las palabras. Los resultados también parecen sugerir que la regulación formal o semántica de la concordancia no puede ocurrir *a priori*, como un ciclo encapsulado en el sentido chomskiano (Chomsky, 2001: 46; 2005: 13). Por el contrario, parecen depender de las particularidades de cada lengua; de su fuerza morfológica y su rigidez en el orden de las palabras.

El capítulo 3 supone un cambio en la perspectiva desde la que se estudia la concordancia. Tras haber analizado la contribución de la literatura en lingüística a la comprensión del fenómeno de la concordancia, hemos cambiado nuestro enfoque a la psicolingüística. La psicolingüística se caracteriza por basar sus teorías en investigaciones experimentales que son posteriormente sujetas a un análisis de tipo estadístico. Este tipo de

investigación trata de buscar datos que aporten información sobre cómo funciona nuestra mente cuando procesamos una determinada estructura, con el fin de elaborar teorías generales sobre el procesamiento. A este respecto, el capítulo 3 ofrece una recopilación de las teorías psicolingüísticas más recientes sobre este tema.

La primera teoría mencionada corresponde a los modelos de encapsulamiento sintáctico. Se nombra en primer lugar al modelo de Bock y Levelt (1994) según el cual (y como refleja la figura de abajo), los pasos que sigue el procesamiento de la concordancia siempre siguen el mismo orden, esto es, el modelo es unidireccional, y la información fluye de los niveles superiores a los inferiores, pero no al revés.



En la investigación llevada a cabo en la década de los noventa sobre las características psicolingüísticas de la concordancia no se pudo encontrar evidencia que contradijese que la concordancia ocurra durante la fase de codificación gramatical (ajena a la influencia de otros niveles), como el modelo de Bock y Levelt sugiere. Sin embargo, en 1995-1996, Vigliocco y colaboradores (Vigliocco, Butterworth y Semenza (1995); Vigliocco, Butterworth y Garrett (1996a); Vigliocco, Hartsuiker, Jarema y Kolk (1996b)) pudieron demostrar de forma experimental que la variable semántica “distributividad” era capaz de influir en las decisiones relativas a la concordancia (al menos en las lenguas romances). Por este motivo, la idea de que la concordancia sólo pueda tener lugar durante la etapa de codificación gramatical y que ésta sea independiente del significado fue puesta en entredicho. Vigliocco y colaboradores (1996a) concluyeron que un modelo de procesamiento basado en la copia-percolación no podía explicar estos resultados, ya que para estos modelos la concordancia semántica es simplemente el resultado de una

transmisión incorrecta de rasgos, pero esta transmisión errónea debería entonces ocurrir del mismo modo en lenguas estructuralmente diferentes. Estos autores interpretaron estos resultados en el marco de las teorías de unificación. La unificación mantiene que la concordancia no es un mecanismo que consiste en copiar rasgos de un elemento de la frase a otro, sino que sigue la filosofía lingüística de que cada forma en la lengua lleva un significado asociado (Langacker, 1991), y asume que las palabras contienen información sobre las estructuras con las que éstas pueden ser combinadas, siendo por consiguiente la concordancia un mecanismo para hacer coincidir rasgos. Por tanto, la concordancia no se asume como direccional, sino que los rasgos simplemente se contrastan en varias palabras y sólo aquellos que coincidan para todas ellas se unifican. Esta concepción de la concordancia como un “componente largo” o “morfema discontinuo” (Ferguson y Barlow, 1988: 13) se convirtió en la opción más probable, desafiando así la validez psicológica de las teorías de encapsulamiento.

Posteriormente, Eberhard (1999) encontró efectos de una variable semántica (distributividad) en inglés también. Este autor atribuyó la falta de resultados positivos de investigaciones previas al hallazgo de problemas metodológicos en el diseño de los materiales experimentales utilizados en la literatura previa. Como consecuencia de esto, la interferencia semántica dejó de ser un problema relacionado con el tipo de lengua utilizada para convertirse en un problema del procesamiento en general. Por tanto, después de los datos encontrados en 1999, la influencia de lo semántico en etapas tempranas del procesamiento comenzó a tenerse en consideración. A este respecto, aparece la teoría de “Marking and Morphing” (Bock, Eberhard, Cutting, Meyers y Schriefers, 2001) según la cual:

Number marking occurs during the mapping between messages and lexical-grammatical representations, while number morphing occurs during constituent assembly.

Bock y colaboradores (2001: 89)

[El número se marca durante la estructuración entre el mensaje y las representaciones léxico-gramaticales, mientras que la atribución morfológica tiene lugar durante el ensamblaje de los constituyentes.]

De acuerdo con esta teoría, sólo los rasgos del sujeto son responsables de marcar el número (etapa de “Marking”). Esta suposición está basada en que en inglés los verbos normalmente no contienen ningún trazo de singularidad o pluralidad. En etapas anteriores de la historia de la lengua inglesa los verbos pudieron haber tenido un cierto contenido de número (Givón, 1976), pero ese contenido está totalmente ausente en el inglés actual. En la etapa de asignación morfológica (“Morphing”): “[...] the specifications of number in the lexicon are morphologically instantiated and, if necessary, reconciled with the number features on the subject” [las especificaciones de número en el léxico son instauradas morfológicamente y, si fuese necesario, reconciliadas con los rasgos de número presentes en el sujeto] (Bock y colaboradores, 2001: 91). Por todo ello, el modelo de “Marking y Morphing” representa un modelo “híbrido” en el que la nocionalidad del sujeto es tomada en cuenta pero sólo hasta un cierto punto del proceso, después del cual, únicamente se da una copia de tipo puramente morfosintáctico.

Tanto las teorías puramente sintácticas como las híbridas fueron cuestionadas por Thornton y MacDonald (2003) cuando éstos hallaron efectos de otra variable semántica (la plausibilidad). Los resultados que estos autores encontraron en relación a esta variable semántica fueron interpretados dentro de los llamados “modelos de satisfacción de restricciones”, que apoyan la idea de que todas las fuentes de información posibles podrían mantenerse activas a lo largo de todo el procesamiento, esto es, que la semántica, la morfología y la sintaxis estarían activas durante todo el procesamiento de una frase y de este modo el procesador se aprovecharía de cada una de ellas de una manera “oportunista” dependiendo de las demandas exigidas por cada lengua.

Las teorías puramente semánticas también han tenido su peso en la literatura. Una de ellas es la teoría de la integración semántica defendida por Solomon y Pearlmuter

(2004) y Gillespie y Pearlmutter (2011). La idea expresada inicialmente es que los nombres semánticamente integrados dentro de una misma frase producen una activación simultánea de ambos, aumentando de este modo la probabilidad de producirse errores de atracción. Así, cuanto más integrados estén dos nombres, más probabilidades de error existen. Esta teoría enlaza en cierto modo con factores relativos a la memoria, ya que la coexistencia de varios elementos en la memoria parece inducir a error. También en relación al tema de la memoria está el modelo de Badecker y Kuminiak (2007), de acuerdo con el cual los sujetos de una oración están unidos a elementos representativos tales como que el sujeto vaya en caso nominativo, que ocupe una determinada posición dentro de la cláusula, etc. (Badecker y Kuminiak, 2007: 69). Por ello, cuando los sujetos se recuperan de la memoria operativa, estos rasgos de sujeto se utilizan como trazos de recuperación. Cuando más de un elemento cercano al sujeto real de la oración comparte alguno de estos rasgos se crea una competición entre los posibles candidatos en nuestra memoria operativa, aumentando la posibilidad de error.

Todas estas teorías constituyen una parte importante de la literatura en psicolingüística y todas ellas han sido elaboradas basándose en un trabajo experimental. Por consiguiente, en los capítulos 4 y 5, hemos llevado a cabo un trabajo de investigación con el motivo de estudiar la influencia de dos (potenciales) variables semánticas; la emocionalidad y la concreción. Por medio de estas investigaciones hemos podido elaborar nuestras propias teorías sobre el procesamiento de la concordancia en general.

El capítulo 4 estudia la variable “emocionalidad” en relación al procesamiento de la concordancia de número. En las primeras secciones, el término “emoción” fue definido y el concepto de “palabras emocionales” ha sido explicado. Los precedentes en el estudio de esta variable han sido: Fraga, Piñeiro, Acuña Fariña, Redondo y García Orza (2012) y Piñeiro (2011). Estos dos trabajos giran en torno al estudio de la desambiguación de las cláusulas de relativo con doble antecedente, tomando en cuenta la naturaleza emocional de las palabras utilizadas en las frases experimentales utilizadas. Puesto que en estos

estudios se encontraron resultados positivos, decidimos testar esta variable en el contexto de la concordancia de número en oraciones del tipo FN-de-FN+verbo.

Para esta investigación hemos elaborado un test en el cual manipulamos los niveles de valencia afectiva y arousal (o activación) de los núcleos y modificadores nominales que componen los sujetos del tipo FN-de-FN. Estos inicios de frases fueron presentados a una serie de participantes en el contexto de un test de carácter off-line. Además, creamos exactamente el mismo test en español e inglés con el fin de comparar las estrategias de concordancia utilizadas por los hablantes de cada una de las dos lenguas. Lo que los resultados revelaron fue que la emocionalidad de las palabras no parece ser un factor influyente en la resolución de la concordancia. La explicación para esta ausencia de resultados positivos podría ser que la emocionalidad no sea algo semántico y comparable a otras variables semánticas mencionadas anteriormente, sino que se procese por vías diferentes a las del significado (Díaz Lago, Fraga y Acuña Fariña (enviado)). Sin embargo, ha llamado nuestra atención el hecho de que un número muy grande de errores fueron cometidos por los participantes de los dos test (nótese que los participantes ingleses cometieron un porcentaje mucho mayor de errores que los españoles). Por lo tanto, una vez que la emocionalidad pudo ser descartada como potencial fuente de los errores de concordancia cometidos, nuevas fuentes fueron investigadas. A este respecto, hemos focalizado nuestra atención en la variable “concreción”, la cual representa el tema de investigación del capítulo 5.

Como ya ha sido adelantado, el capítulo 5 tiene por objeto de estudio la influencia de la concreción en la concordancia de número en español e inglés. Estudios anteriores no han encontrado ningún efecto visible de la concreción en la producción de la concordancia de número entre sujeto y verbo (Bock y Miller, 1991). Sin embargo, hemos observado que los experimentos de Bock y Miller (1991), que han sido tomados como la principal referencia en este tema, sufrían algunos problemas metodológicos. Por esta precisa razón, hemos intentado mejorar sus materiales experimentales con el objetivo de solucionar esos problemas y poder obtener así nuevos resultados y conclusiones sobre la influencia de la

concreción en las operaciones de concordancia. Lo que nuestros resultados han sugerido es que la concreción parece ser un factor bastante influyente en estos procesos. Cuando un núcleo de una frase nominal compuesto por un sustantivo abstracto y singular fue combinado con un modificador que contenía un sustantivo concreto en plural, las probabilidades de que la concordancia fuese establecida de forma errónea con el modificador en lugar de con el núcleo incrementaban de forma drástica (p. ej. *la apariencia de las uvas FUERON...* resultó ser un error mucho más frecuente que *la cabaña de los exploradores ERAN...*). Además, esto parece ocurrir mucho más frecuentemente en inglés que en español. Estas diferencias lingüísticas parecen coincidir con las halladas en el capítulo 2, con lo cual podemos concluir que la semántica es capaz de liderar los procesos gramaticales en varias circunstancias, y que esto ocurre más frecuentemente en lenguas de morfología escasa que en las que poseen una morfología más rica.

De todos los resultados anteriormente resumidos hemos concluido que las teorías puramente formales no encuentran sustento en los datos obtenidos. La concordancia no parece ser una mera copia formal de rasgos sino la combinación de información semántica y sintáctica a lo largo del proceso. Nuestro procesador parece tener en consideración la información más provechosa en cada momento y actuar dependiendo de las particularidades de cada lengua (por ejemplo, en función de su riqueza morfológica o de su rigidez sintáctica).

La presente tesis concluye con algunas sugerencias para futuras investigaciones, que serán el objetivo de venideras investigaciones sobre el tema.



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