



Facultade de Filoloxía

Grao en Lingua e Literatura Inglesas

TRABALLO DE FIN DE GRAO. Curso: 2018-19. Xullo de 2019

**The role of the attraction in agreement mistakes
in English vs Spanish**

AUTORA: María Suárez Álvarez

TITOR: Carlos Acuña Fariña



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SOLICITO a aprobación do seguinte título e resumo:

Título: The role of the attraction in agreement mistakes in English vs Spanish.




Resumo [na lingua en que se vai redactar o TFG; entre 1000 e 2000 caracteres]:

Attraction is a linguistic phenomenon that occurs when a competition between two or more NPs inside of a larger NP cause mistakes in the agreement of relationships, like subject-verb, of the kind: ‘*the label on the bottles are broken’. In the English Language it is estimated that 13% of complex NPs establish incorrect agreement with the verb.

The main object of this study is to analyse agreement (or proximity concord) and mistakes related with it due to attraction from an experimental point of view. Theoretically, agreement can be conceived from two different points of view in linguistics: the formalist and the functional / cognitivist, depending on whether they take syntax as separated from cognition or as a reflection of semantics.

This work will be organised in the following way: a theoretical background about these two visions will be presented, as well as a discussion of agreement from both a linguistic and a psycholinguistic point of view; then my own research on attraction interference in agreement will follow. This research will be based on complete questionnaires answered by English and Spanish speakers in order to study the presence of attraction in agreement mistakes in both languages and to be able to make a comparison between the mistakes in these languages. Finally, I will summarise my main findings and provide a general discussion of the topic in the light of these.

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LIST OF KEY WORDS

agreement, agreement mistake, attraction, feature.

1 | INTRODUCTION

This piece of work deals with the role of attraction mistakes in agreement procedures. In this chapter I will give a brief overview on agreement, how it is studied, and some problems that this process poses, which will lead us to attraction and the methodology used in order to investigate this phenomenon. I will also briefly comment on agreement from a linguistic and a psycholinguistic point of view, topics that will be later on developed in chapters 2 and 3, respectively. In the last chapter I will present my study on agreement concerning the semantic constraint of concreteness and whether it does or does not have any effect on agreement mistakes.

But why agreement? Is this a linguistic phenomenon worth studying? To begin with, agreement is a linguistic phenomenon that is present in approximately 3/4 of the world's languages (Bock et al. 2001). According to different definitions given by both linguists and psycholinguists (Miyagawa 2010; Vigliocco 1996; Acuña Fariña 2012; Steele 1978) agreement consists in the reproduction of information –normally morphological information consisting in features such as gender, number or person¹- contained in a nominal, also known as a *controller*, in a different position –a *target*, like a determiner, an adjective or a verb. Therefore, agreement can be considered a rule according to which, in the context of subject-verb agreement, a singular subject requires a singular verb, and a plural subject requires a plural verb. As Steele (in Steele 1978:610) summarizes it, agreement consists in “a systematic covariance between a semantic or formal property of one element and a formal property of another” that allows speakers to “flag the parts of sentences that belong together regardless of whether the parts appear together” (Bock et al. 2005:1) and that is useful to “unify constituents and [...] help decoders identify phrasal packages” (Acuña Fariña 2018:5). According to these definitions agreement is “not only redundant, but sometimes entirely arbitrary in its contents as well” (Miyagawa 2010:8). Of this arbitrary and redundant nature of agreement we find an example in the Spanish noun phrase *Todas esas otras mesas altas y amarillas* (all of those other tall and yellow tables). Here *mesa* (table) has feminine gender, but not like *chica* (girl), which has a semantically motivated feminine gender, so the fact that the whole phrase agrees in the feminine gender is arbitrary, as the gender of *mesa* is arbitrary².

Now that we know what is meant when authors consider agreement arbitrary we will explain the redun-

¹See chapter 2: “Agreement in Linguistics”.

²See chapter 2: “Agreement on Linguistics” for further information on biological and arbitrary gender.

dant aspect of agreement. In the same example that was presented above: *Tod**as** es**as** otr**as** mes**as** alt**as** y amarill**as*** the plural number and the feminine gender features are repeated all across the sentence, as we can see in the morphemes in bold. This redundancy, as appointed by (Levin 2001), “helps the addressee [to] accurately comprehend the information by repeating it across the expression”, however, the degree of redundancy of agreement varies depending on the language. For instance, if we take the same nominal phrase as an example, but in another language like English: *All of **those** other tall and yellow tables*, the elements of the sentence that show agreement are only two, while in the Spanish sentence there were twelve; moreover, in the English sentence only number agreement is expressed, there is no sign of gender agreement as it happens in the Spanish example. This shows that, even though agreement is present in most of the world’s languages, it is not present in the same way.

Following with the differences among languages regarding agreement, it is worth mentioning some examples of agreement in languages that will illustrate agreement variations all over the world. They have been called “non-canonical” (Corbett 2006) or exotic examples³, because they are not found in the majority of the world’s languages. These characteristics that make languages present exotic types of agreement go from showing an unusual way of marking plural, as it happens in the Philippine language Ilocano, in which plural is marked through the duplication of part of the lexical item⁴; to elements of a phrase establishing agreement with other elements with which they normally do not agree, as it is the case of Upper Sorbian, where in a phrase like *our father’s house*, *father* can control agreement on the possessive *our*. There are other examples of agreement systems that attract our attention due to their complexity, like the Bengali language, which has a pronoun system with twelve different categories for features such as person and number; or a closer example to us: Basque, an ergative language with an agreement system that is quite different from the English or Spanish system. These latter systems will be explained more deeply in the following chapter⁵.

Going back to agreement in general it is worth bringing back the definition of agreement as a rule that states that, when we are dealing with subject-verb agreement -which is the main topic of this piece of work- a singular subject needs a singular verb, and a plural subject needs a plural verb. Thus, according to this rule, in an example such as *the book with the stories*, if we added a verb, the correct outcome would be *the book with the stories is on the shelf*, or, in plural *the books with the stories are on the shelf*. However, this is not the outcome that results in every case. In some cases, the result is an “aberrant outcome” (Bock et al. 2001:85) consisting in a mismatch between the number of the subject and the number of the verb, as in **the book with*

³See chapter 2: “Agreement on Linguistics”.

⁴See 2.1.2: “Number”.

⁵See chapter 2: “Agreement on Linguistics”.

the stories are on the shelf. In this case, the noun phrase is a complex noun phrase, that is, it is formed by two noun phrases, with a *head noun*, the nucleus of the noun phrase (here *book*), and a *local noun*, the nucleus of the modifier (here *stories*). In the cases where there is a mismatch between the number of the subject and the number of the verb this happens because the verb agrees with the number of the local noun instead of with the number of the head noun: **the book with the stories are on the shelf vs the book with the stories is on the shelf*. This phenomenon is called *proximity concord* or *attraction*. Studying this type of mistake is relevant for linguistics because, as it happens with any other speech error, it may provide information regarding “the normal components of language production” (Bock et al. 1991:46), especially in this case, as regards syntactic mechanisms. The English language is particularly famous for this type of mistakes, as “English language-users make as many as 13% of agreement mistakes on average” (Acuña Fariña 2018:4). However, other languages that present a more complex morphological system, such as Spanish, Italian, or Russian, show fewer mistakes. This crosslinguistic difference has led some authors to the conclusion that the complexity of the morphological system of the languages has a role as regards agreement mistakes⁶. These mismatches that make English especially famous, as we will see in further detail in chapter 2 in the examples of agreement *ad sensum*, are cases like distributive noun phrases, as *the picture on the postcards*, since the head noun is singular, but there is one picture for each postcard, thus, several pictures (**the picture on the postcards are blue*); or collective nouns like *committee*, which admit both singular and plural agreement (*the committee are deciding vs the committee is deciding*). These mismatches raised the interest of several authors that decided to investigate and try to find out whether agreement processes were affected by semantic interference, as the distributivity examples seem to imply, or whether they were “blindly driven by morphosyntactic information” (Acuña Fariña 2012:9).

Before getting deeper into the study of agreement and attraction, there are some terms that will be mentioned several times along this piece of work and that should be clarified for a better understanding of the following information. These terms are *controller*, *domain*, *target* and *feature*. In the noun phrase *las mesas altas y amarillas*, the controller is *mesas*; *las*, *altas* and *amarillas* are the targets; agreement operates in the domain of the *phrase*; and the agreement features that are present are *gender* and *number*. As the term *feature* will be explained in detail in chapter 2, I will now focus on the definitions of the other terms. Corbett (2006) here makes a differentiation between what he calls “canonical” and “non-canonical” controllers, domains and targets.

I will begin with the controllers, which are “typically nominal in nature” (Corbett 2006:35), that is, in a noun phrase the element that normally controls agreement is the noun, as in *las mesas altas y amarillas*, it is

⁶See chapter 3: “Agreement on Psycholinguistics”.

mesas what sets the overall number and gender of the noun phrase. This is an example of a straightforward noun phrase, however, there are other types of noun phrases (conjoined, quantified, etc.) that, as we will see later, can pose problems for agreement. Moreover, there exist the so called “non-canonical” controllers that Corbett (2006) divides into *defective controllers* (non-canonical noun phrases that lack agreement features, such as clauses or infinitive phrases: *To err is human*), *absent controllers* (as it happens in Spanish with *weather verbs*: *Llueve*, “where there is no possible controller, but the target must still show agreement features” (Corbett 2006:37), in this case, 3rd person singular), *possessive adjectives as controllers*, as in Upper Sorbian (a Slavonic language spoken in eastern Germany), or *qualitative adjectives as controllers*, in languages like Basaá, Bantu language of southern Cameroon.

Moving on to targets, Corbett (2006) identifies “canonical targets” with adjectives, verbs, articles, demonstratives and some types of pronouns that show agreement. Going back to our example, in *las mesas altas y amarillas*, *las*, *altas* and *amarillas* would be targets. In other languages different from English or Spanish Corbett (2006) finds targets that are not so typical, e.g. in Archi, a Daghestanian language, adverbs show agreement; in Tsakhur two of their thirty prepositions are agreement targets; nouns may also behave as targets, as it happens in another Daghestanian language, Bagwalal; or complementizers, coordinating conjunctions and particles as targets.

Regarding domains, this notion is the most complicated of the four terms that we mentioned early to explain, as “new agreement domains are still being found” (Corbett 2006:55). Recovering our example *las mesas altas y amarillas*, the domain is the *phrase*, thus, domain makes reference to “the syntactic environment in which agreement occurs” (Riveiro Outeiral 2014:39). Corbett (in Corbett 2006:54) distinguishes four broad domains: (1) within the noun phrase (*las mesas altas y amarillas*), (2) beyond the noun phrase (*las mesas altas y amarillas están brillando*), (3) beyond the clause but within the sentence (*las mesas altas y amarillas, que fueron un regalo...*), and (4) beyond the sentence (*las mesas altas y amarillas brillan porque les da el sol*). As these domains are increasingly less local, they are also less canonical, in the sense of automatic feature copying. As we have seen while talking about controllers, targets and, now, domains, the “non-canonical” cases provide us with more examples of exotic cases of agreement. For instance, in the case of “non-canonical” domains, Corbett (in Corbett 2006:60) distinguishes up to eight different types throughout the world’s languages. Some of these types are: (1) *verb agreement with possessives*, in these cases agreement occurs between the verb and a part of the complex noun-phrase that is not the lexical head, as it happens in Maithili. (2) *Distant first conjunct agreement*, which occurs in agreement with conjoined noun phrases where the verb agrees with the first conjunct, thus, in cases of subject-verb word order, not the nearest option, as in Slovene. (3) *‘Back’ agreement*, present in languages like Czech, where in clauses following the structure [subject noun phrase+copula+nominal predicate] the agreement takes place between the copula and the noun

phrase in the predicate instead of between the subject and the copula. (4) *Brother-in-law agreement*, present in constructions with a dummy element in the so called term position, but this is not the agreement controller, as it happens in the English example *there are cows over there*.

Now that these terms are clear, the content of this piece of work is structured as follows. In chapter 2 I will explain in detail the term *feature*, the only one that has not been explained in this introduction. Later on, I will provide an overview of the main linguistic theories of agreement, divided into a formal view of agreement and a unification-based proposal. The formal view conceives agreement as an encapsulated process divided into impenetrable phases (*Merge*, *Agree* and *Move*) and has led authors to turn to attraction so as to test this theory. The unification theories, presented by authors like Pollard & Sag (1994) and Barlow (1992), propose, on the other hand, that agreement is an accumulation of information that takes place all over the clause. This last theory is a result of the agreement mistakes that we have previously commented, such as collective nouns being treated as either singular or plural (*the team plays good vs the team play good*), the number transparent nouns (*a (sg) series of events are (pl) taking place*), etc., as in these examples, semantics overcomes formal agreement, authors conclude that this phenomenon implies that agreement is a semantic operation. Other authors, Wechsler and Zlatic (2000), have proposed a mixed model of agreement in which they divide agreement into *Pragmatic* and *Grammatical Agreement*, which is also divided into *Index* and *Concord features*, which are related to the notion of domain that we have previously explained. This model of agreement makes reference to the cases in which the Concord and Index features for a noun do not match, as it happens with the Spanish noun *majestad*: *Su majestad suprema (fem) está contento (masc)*. Furthermore, Corbett (1979) presented the *Agreement Hierarchy* as a proposal to explain when and how grammar makes a choice between semantic or syntactic agreement in the case of a mismatch between the formal and semantic properties of an item.

In chapter 3, after focusing on agreement in linguistics, I move on to agreement in psycholinguistics. The research on agreement and attraction from a psycholinguistic perspective is done within the realm of production studies. These studies consisted of complex noun phrases (*the label on the bottles. . .*) that participants had to complete with a verb and an adjective (*the label on the bottles. . . is broken*). On some occasions, participants made agreement mistakes when the verb agreed with the local noun instead of the head noun (**the label on the bottles. . . are broken*). The first time that this type of experiment was conducted was 1991, by Bock & Miller. Some of the characteristics of agreement they found out were that agreement mistakes were more numerous when the NPs presented a different number, as in *the key to the cabinets*, specifically, if the number mismatch followed the structure [singular NP+ plural NP] and if they were referring to multiple-token preambles, that is, NPs that make reference to a multiple entity, as in *the label on the bottles*. They also concluded that semantic manipulations had null effects on agreement mistakes, however, this last conclusion would have to be modified after the results of later studies. Vigliocco (1995; 1996) continued with this line of work in other languages

such as Italian and Spanish, where she found distributivity effects, thus, semantic interference in agreement processes. When she tried to find these same effects on English, her studies reflected the data provided by Bock & Miller (1991), which led authors to the conclusion that languages have different sensitivities to distributivity forces. Later on, Eberhard (1997) proved that if the preambles were correctly manipulated, every language showed effects of distributivity in their agreement processes. These findings and perspectives are reflected in two main models: the hybrid model of *Marking and Morphing*, presented by Bock, Eberhard, Cutting et al in 2001, where agreement is considered an encapsulated process divided into phases; and Vigliocco's (2001) functionalist model, *Maximal Input*, with an opposite perspective to the one formulated in *Marking and Morphing*, that is, that agreement phases can affect each other if convenient for the creation of an interpretation.

After introducing the theoretical framework on which I have based my study, I introduce my own experiment that has the aim of finding some evidence of semantic interference on agreement. Since it is inspired on the experiment conducted by Riveiro Outeiral (2014) and she did find some evidence that points towards the presence of semantic interference, we expect to find something similar. Apart from testing agreement mistakes we also explore the semantic constraint of concreteness, that is, whether there is any difference on the agreement mistakes when the head noun is abstract or concrete, as abstract nouns are more difficult to process, this advantage presented by concrete nouns should be present in the process of agreement. The study of the semantic constraint of concreteness is complex due to the fact that making a differentiation between concrete and abstract nouns is not as clear as we could think, words like music, which are traditionally considered abstract can, on the other hand, be perceived by senses such as the hearing. However, concreteness has been studied by some authors who presented different theories that intend to explain these differences regarding the processing of abstract and concrete words. These theories are *The dual coding theory* (Pavio, 1971, 1991) and *The context availability hypothesis* (Bransford & McCarrel, 1974; Schwanenflugel & Shoben, 1983). Both of them propose different reasons for the differences in the processing of the two types of words, but they agree on the existence of this difference. After presenting some information on what concreteness is and previous studies on the topic, I continue with my study, which will try to test the hypothesis that concrete nouns are more easily processed than abstract nouns and, therefore, will produce less agreement mistakes. In order to do this, we conduct an experiment similar to the one conducted by Riveiro Outeiral (2014), that is, following the same method used by Bock & Miller (1991) consisting in completion tests, but making some corrections in order to avoid problems that Bock & Miller faced when analysing their results.

I proceed now to discuss agreement and attraction, beginning with agreement in linguistics.

2 | AGREEMENT IN LINGUISTICS

As we have previously pointed out in the introduction, agreement consists in a rule according to which a singular controller requires a target with singular features, and a plural controller requires a target with plural features. This definition, together with the fact that agreement is more or less present in more than half of the known languages of the world, makes it seem like something simple, common and even straightforward. Nevertheless, I will now introduce some varieties that present cases of agreement that we could consider “exotic” and will prove that agreement is a more fascinating phenomenon than it may seem. For instance, the Bengali language, spoken in Southern Asia, presents a rather complete and complex system:

Bengali’s pronouns have forms for 12 different categories of person, number and aspect, and its verbs have syncretized tense/mode/aspect and person suffixes with widespread homophony, but for each tense/mode/aspect set of forms, there is independent marking of five person/number/respect classes. The number of combinations is explosive. For instance, -i is the first person ending in the present, but the second person inferior in the future, while -o is the second person ordinary in the present and first person in the future. (Acuña Fariña 2009:390)

Another variety that presents an “exotic” agreement system is Basque, or Euskera, the language spoken in the Basque Country and in some areas in the South West of France. This language, unlike Spanish or English is an *ergative language* (vs *active language*). This means that in this type of language, the only participant of an intransitive construction (normally what we, in Spanish or English, would call a *subject*) has the semantic role of *patient*, while in Spanish or English would have the role of *agent*. Regarding Basque from the point of view of agreement, which is the interesting aspect for the present piece of work, it stands out the fact that in this language the verb has to agree, not only with the subject, as it happens in English and Spanish, but also with the Direct and Indirect Object: *Aitak librua ekarri dio semeari* (‘The father brought the book to the son’); *Aitak libruak ekarri dizkio semeari* (‘The father brought the books to the son’); *Aitak libruak ekarri dizkie semeei* (‘The father brought the books to the sons’) (Villasante Kortabitarte 1978:12).

2.1 Main features of agreement

Despite the different ways in which languages show agreement, some of the most traditional literature that deals with this topic has called our attention to the fact that there are some elements that are present in every agreement operation. These elements are *controllers*, *targets*, *features* and *domains*. After the introduction of the other terms in the previous chapter, I will now pay especial attention to the different features of agreement, which have the function of indicating in what respect there is agreement. There are features that are present in languages in a more frequent way, like *number* and *gender*, but these are not the only features affected by agreement, there are others such as *person*, *case*, *aspect*, *mood*, *polarity*, etc. I will now present each of them separately and provide examples.

2.1.1 Gender

Starting with **gender**, which is a feature that is “mainly reflected in the adjectives that acquire the noun’s gender marks” (Riveiro Outeiral 2014:29). First of all, in order to understand the different systems of gender agreement present in the world’s languages, we should distinguish between *biological* (or natural) and *arbitrary* (or grammatical) gender. In his *Dictionary of Linguistics and Phonetics*, David Crystal (in Crystal 2008:206) defined biological gender as the grammatical category “where items refer to the sex of real-world entities”, and grammatical gender as something “which has nothing to do with sex, but which has an important role in signalling grammatical relationships between words in a sentence”. Now that we have made this distinction clear, we can move on with the explanation of this feature. Since the value of the arbitrary gender has to be available in a language’s lexicon, it is a lexical feature for the majority of the languages. Speakers have to learn the gender of every noun in order to make the appropriate agreement ties. Depending on the parameters used to assign nouns to a particular gender class, there are different systems of agreement: *semantic* and *formal agreement*. In the case of semantic agreement, “nouns are assigned to a gender class following a purely semantic criterion” (Riveiro Outeiral 2014:29). In other words: nouns’ gender depend on the sex of the notion that this noun represents. Male entities will present a masculine gender (*gato*), female entities will present a feminine gender (*gata*) and all other words will be assigned to a neutral category (*pez*). In the case of formal agreement systems, “the noun’s form is responsible for gender” (Riveiro Outeiral 2014:30). Since the majority of the words do not have biological sex (*mesa*), the first system is not enough to assign these words to a gender class, so they fall into a phonological or morphological classification. This is the case of Spanish, in which words ending in –o are usually masculine, and words ending in –a are normally feminine, as previously illustrated with the *gato/a* example. However, this is not the case in every word, as there are examples such

as *mano* (feminine) and *mapa* (masculine), or words that do not end in –o or –a, such as *análisis* (masculine) or *pared* (feminine). Summarizing, the allocation of a word to a particular gender class can follow either of the criteria or a combination of both.

2.1.2 Number

Number is a feature strongly based on meaning. Normally, the singular denotes one entity while the plural denotes more than one. In this sense, number is difficult to conceptualise in an arbitrary fashion, like gender. This does not mean that number is something monolithic crosslinguistically, since not all languages present a distinction of singular vs plural (*cat* vs *cats*). Some languages have other values such as *dual* for two entities, present in Irish; *trial* for three, as in Larike; or *paucal* for a small number of entities, as in Bayso (Corbett 2006:130). Other languages might not have any number marking at all. Even in languages that present what for us is the most common system (only singular and plural) there are some special cases like nouns that are only present in either singular or plural form, the so called *singulare tantum* (*love*) and *plurale tantum* (*pants*).

The usual way of marking number in many languages is through the addition of a morphological ending (in Spanish and English a –s: *mesa* vs *mesas* or *table* vs *tables*). However, this is not the only way of marking the plural. Some languages, like Russian, mark the plural form through prosodic differences, depending on the part of the word on which stress is placed; other languages mark number through alternations that depend on the morphological environment, like the case of Macedonian¹; other varieties may use augments in the singular, plural or both, like the case of some words in Russian²; languages like Ilocano, variety spoken in some parts of the Philippines use reduplication, that is, the repetition of some part of the lexical item³; other languages present internal modifications of the plural forms with respect to the singular, like the case of *goose* in English (*geese* in plural); other varieties remove material instead of adding it to the word, as is the case of Hessian German⁴. As we have seen, the systems to mark plural forms presented in languages go from adding phonemes to the stem to more complex strategies.

¹E.g. *koren* (root) plural *koreni* (roots). However, other endings may imply a change in some of the letters.

²E.g. *bolgar-in* (Bulgarian) plural *bolgar-y* (Bulgarians).

³E.g. *púsa* (cat) plural *pus-púsa* (cats).

⁴E.g. *hond* (dog) plural *hon* (dogs).

2.1.3 Person

Another frequent feature of agreement in the world's languages is **person**. "Person makes reference to participants in the speech act" (Riveiro Outeiral 2014:36). This feature is typically present in pronouns and verbs. For pronouns person is an inherent feature, meaning that it is an inherent part of its meaning; while for verbs it is contextual, that is, they acquire person by agreement. Languages tend to have three persons for the singular and three persons for the plural -first person makes reference to the speaker, second to the addressee(s) and third to people different from the speaker and the addressee-. However, some languages make a subdivision in any of its persons, splitting, as is the case of some Algonquian languages, the third person into more and less central participants in the situation.

2.1.4 Case

Case is not considered by Corbett (2006) a canonical feature of agreement. This is due to the fact that case "does not reflect an asymmetric relation similar to the case of gender or number" (Riveiro Outeiral 2014:36). While in gender and number there are controllers with certain features that are expressed in targets, case depends on the syntactic environment and therefore it is not an inherent feature of the controller.

2.1.5 Other main features of agreement

Finally, **tense**, **aspect**, **mood** and **polarity** present, with respect to the verb, a similar example to that of case with respect to the noun. They 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" (Riveiro Outeiral 2014:37). As this symmetry goes against the nature of agreement as posited by formalist accounts, case, tense, aspect and polarity present some trouble to be considered canonical features of agreement. Corbett (2006) makes further distinctions between features and adds some more, such as definiteness and respect, however, they are more problematic than and not as common as the ones mentioned above, so I will not be commenting on them.

2.2 Linguistic theories of agreement

Now that the main features of agreement have been explained I will move on to different linguistic theories that contemplate agreement from different points of view. These models of grammar can be divided into those that view agreement as an “essentially encapsulated phenomenon whose range of operation is limited to the first cycles of the building of a clause structure” (Acuña Fariña 2009:390), and other models which maintain that agreement is “either penetrated by semantic forces or, more radically, a semantic process in nature” (Acuña Fariña 2009:390).

2.2.1 Formal view of agreement

The first point of view that I will present is the formal view of agreement, which proposes a division into several encapsulated phases, phases that are psychologically unsupported, at least concerning agreement production. According to (Chomsky 1999:9) “phases are impenetrable [in order] to constrain computational load”. Phonological and semantic operations start once a syntactic phase has been completed, thus, the previous syntactic computations are deleted, becoming no longer available. These models assume that there is no communication between phases at any stage of the computation. These phases, or formal operations, that generation is divided into are: *Merge*, *Agree* and *Move*. *Merge* consists in the “fundamental structure-building operation” (Franck et al. 2006:6). It forms a minimal phrase out of two elements by stringing them together. If *Merge* operations are successively applied, it can “assemble the thematic nucleus of the sentence”- that is, the verb and its arguments- and further applications introduce the “functional structure of the sentence” (Franck et al. 2006:6) -that is, specifications of tense, aspect, mood, etc. Therefore, by these operations a configurational skeleton is created. It can be additionally modified by further applications of *Merge* and by another formal operation: *Move*. This allows speakers to displace elements that have already been introduced in the structure. This proposal implies that, unlike models which tend to assume “a single hierarchical representation over which all syntactic operations are computed [...] several intermediate representations are postulated that reflect the cyclic derivation of the structure” (Franck et al. 2006:6). The other phase of agreement, *Agree*, of particular interest here, works as follows:

The operation *Agree* is posited alongside *Merge* as a central component in the creation of sentential messages. *Agree* works on the premises of isolability, activeness and locality: once the thematic nucleus of the message is assembled, a functional structure AgrS is merged next. It is at that point in the derivation that AgrS enters in an *Agree* relation with the VP internal subject NP. The motivation for this is that AgrS has person

and number features that need to be valued, so these are copied from the subject NP. The NP is turned active by possessing uninterpretable features that need to be checked inside the c-command domain of its goal. (Acuña Fariña et al. 2014:112)

Several generative theoreticians have turned to attraction in order to test this type of theory. This is due to the fact that if attraction occurs as a result of the interference of semantic variables, such as underlying distributivity, that come from out of the hypothesized phase, the very existence of phases is called into question, or at least, in need of revision⁵.

2.2.2 Unification

The second point of view of agreement that will be discussed here is the one presented by authors such as Pollard & Sag (1994) and Barlow (1992): *unification*. Unification theories do not contemplate agreement as a process in which controllers are present where agreement originates and targets receive the agreement features from the controllers, but instead, they see agreement as a matter of “cumulating partial information from the controller and the target” (Acuña Fariña 2009:394), information that is generated –even for the targets, *in situ*. According to these theories, the features of agreement originate where they are “actually spelled out” and carry “potential semantic import” (Acuña Fariña et al. 2014:111). These features are scattered all over the sentence, thus, this constant reduplication of form entails constant access to the meaning. Due to this scattering and reduplication, agreement is seen as a sort of ‘long component’ or a ‘discontinuous morpheme’. This also implies that features are simply shared instead of moved. “In these theories features are not slaves to the seriality of an initial syntactic cycle via strict step-by-step percolation, but can directly connect with the conceptual properties of the message at any time, [so] any semantic effect can be captured straightforwardly” (Acuña Fariña et al. 2014:111).

This conception of agreement as a semantic phenomenon is a result of the many cases of agreement *ad sensum*⁶ present in the world’s languages, especially in English. Normally, the number feature of the verb agrees with the number of the mentally identified referent of the subject. However, there are cases in which identifying the number of the subject is not so simple. Sometimes languages present nouns that are semantically ambiguous in number, like for instance, collectives, as they can denote the collective as a whole

⁵See chapter 3: “Agreement in Psycholinguistics” for further information.

⁶The differences between types of agreement made by Corbett will be explained later on. However, I think it is important to clarify what we mean in this case by ‘agreement ad sensum’. Agreement ad sensum, or semantical agreement, is agreement consistent with its meaning.

or as the individuals it comprises, therefore, being treated as singulars or as plurals: *the team **plays** good* vs *the team **play** good*. There are other cases of complex NPs functioning as subject, such as the *picture on the postcards*, in which there is a picture in each of the postcards. Although it may seem similar to *the bridge to the islands*, semantically it is not. The referent in the first case is only abstractly singular, but concretely “it encompasses the identical picture of multiple postcards” (Bock et al. 1991:51), however, in the second case, there is only one bridge to the islands. Thus, we might expect more “errors” in the sentences similar to the picture example than in the bridge example. Another example of this agreement *ad sensum* is found in *number transparent* nouns (like *series*, *number*, *lot*, etc.) that tend to establish this type of agreement in English, in which the agreement of the phrase is controlled by the ‘wrong’ controller, in this type of complex noun phrases in which the first element functions as a quantifier agreement occurs between the demonstrative and the semantically significant noun, e.g. *a (sg) series of reports were (pl.) issued*.

This type of case of agreement in which the semantics of the noun overcomes formal agreement led authors to believe that agreement was a semantic operation. The main idea proposed by unification-based models is that, with rich morphology, “the two constituents that participate in an agreement relation may specify only partial information about a single linguistic object” (Acuña Fariña 2012:10). Thus, unification takes place when compatible information regarding the features on two sites becomes merged, and as we have said, features are shared, not copied or moved. Languages with rich morphology, such as Spanish and Italian, present verbs which contain this type of partial information directly and “can therefore directly connect to conceptual structure without any kind of mediation or control” (Acuña Fariña 2012:11). However, there are some strong arguments against treating unification as the only, or the major, cognitive strategy supporting agreement. One of these arguments is that if this were the case, there would be agreement inside adjective, adverbial and prepositional phrases as much inside NPs. Moreover, “unification per se does not relate to the Agreement Hierarchy [theory that will be explained later on], one of the most solid generalizations governing agreements system crosslinguistically” (Acuña Fariña 2018:16).

2.2.3 Mixed Agreement

The third theory that I will present in this piece of work is proposed by Wechsler and Zlatic (2000; 2011) through a mixed model of agreement. First of all, in order to understand how mixed agreement occurs, we have to explain what these authors consider to be the relevant lexical features of the noun. These features are (1) semantic conditions on reference; (2) person, number and gender features of the *referential index*; (3) *concord* features; and (4) declension class. These four features are correlated by a chain of binary constraints. When individual constraints are violated, and thus, the chain is broken, this leads to the aberrant result of “intri-

cate patterns of mixed agreement” (Wechsler et al. 2000:799). Cases in which the chain is broken and mixed agreement appears are, for instance, cases in which “a noun triggers one set of agreement features on adjectives but the NP headed by that noun triggers a different set of agreement features on verbs or coreferential pronouns” (Wechsler et al. 2000:799), that is the same controller imposing different feature specifications on different targets. The noun *majestad* in Spanish is an example of this phenomenon: in *Su Majestad suprema está contento. Él ha vuelto a casa.*, the word *majestad* refers to a male, thus, it triggers masculine agreement on predicates (*contento*) and pronouns (*Él*), however, it triggers feminine agreement on attributive modifiers (*suprema*). As this example shows, this phenomenon can also happen with the gender features, it is not restricted only to number. The study of these cases is interesting for us, as they shed light on regular agreement processes. The data received from the study of cases that present mixed agreement led Wechsler and Zlatic to suppose that inflected nouns present two different feature sets that determine the agreement value it triggers: Concord features, which are closely related to the noun’s declension class, or Referential Index features, which are related to the noun’s semantics, regarding for instance if the noun denotes a male or a female.

Concord and Index features are systematically related to each other. These features are normally identical, although in some exceptional cases in some languages they differ, as in the case of the Croatian words *zena* ‘woman’ and *knjiga* ‘book’, which are considered feminine nouns triggering feminine concord, but regarding the index-semantics correlations, while *zena* is female-denoting, *knjiga* is neither female nor male-denoting, so it “vacuously satisfies the rule” (Wechsler et al. 2000:800). That is, the biological and formal gender of *zena* (woman) are the same: a female entity which triggers feminine agreement. *Knjiga* (book), on the other hand, presents a conventionally adjudicated feminine formal gender, but the entity itself presents neither feminine nor masculine biological gender, thus, this correlation is not complete. However, this is not the only division that Wechsler and Zlatic (2000) propose. Index and Concord features are included into one of the two types of agreement that Wechsler and Zlatic distinguish: *Grammatical Agreement*. They argue that agreement processes can be divided into *Grammatical Agreement* and *Pragmatic Agreement*. While Grammatical Agreement is a result from structural properties of the grammar, Pragmatic Agreement is considered a result from “structural properties of the world as described in an utterance” and from “the general condition that coreferential elements must have compatible referential properties” (Wechsler et al. 2000:801). Then, Grammatical Agreement is divided into the Index and Concord features that have been mentioned above.

So, summarizing: Wechsler and Zlatic (2000) divide agreement into Pragmatic and Grammatical Agreement, which is at the same time divided into Index and Concord features. These features act in different domains: since Index is attached to the referential index, it applies to NPs and pronouns, which are “referentially anchored” (Wechsler et al. 2000:807), and often they also refer to finite elements, like verbs and auxiliaries; but NP-internal elements that are not referential and lack referential indices, like determiners or adjectives, are

referred to as concord. Normally, the gender/number features of Concord and Index for a given noun match, giving the illusion that “a single feature bundle on the noun is responsible for all the agreeing items: determiner, adjective, verbs and pronouns” (Wechsler et al. 2000:806). However, this is not always the case, and when these features do not match, mixed agreement takes place.

2.2.4 Agreement Hierarchy

Finally, the contribution of Corbett to the Grammar of Agreement deserves special mention. Corbett introduced in 1979 his Agreement Hierarchy so as to explain when and how grammar would decide between semantic or syntactic agreement in a case where the formal and semantic properties of an item do not coincide, for instance: *team* is a collective noun that is grammatically singular, but it implies a plural meaning, a group of people, therefore, it is notionally plural. Nevertheless, in order to understand this proposal, we should know what he means when he makes a differentiation between *semantic* and *syntactic agreement*. For Corbett (2006:155), syntactic agreement (also called agreement *ad formam*, ‘formal agreement’ or ‘grammatical agreement’) is agreement consistent with the form of the controller. Semantic agreement (‘agreement *ad sensum*’, ‘notional agreement’ or ‘logical agreement’) is agreement consistent with its meaning. These terms are used only when there is potential choice. *This committee is* would be an example of syntactic agreement, as there is a singular noun agreeing with a singular determiner; while *this committee are* is an example of semantic agreement, as a committee is formed by several people, so it implies notional plurality and it agrees with a plural determiner. However, semantic agreement is restricted by the syntactic environment: **these committee sat late*. In this case, *committee* does not accept plural agreement with the determiner. This proves that the effect that semantics has on agreement depends on the domain or syntactic environment in which agreement is taking place. As we have seen: the noun *committee* accepts either a plural or a singular verbal form, but only a singular determiner (Corbett 1979:203). Normally, formal and semantic properties of the controller coincide, thus, agreement is both syntactically and semantically justified, as in *John has chosen sugar vs The Jones have chosen sugar*. However, this is not always the case, for occasions in which the two types of agreement do not coincide, as with collectives, this hierarchy allows us to make predictions regarding the possibility and relative frequency of semantic agreement as compared to syntactic agreement. Good evidence to support this hierarchy is found in conjoined inanimate nouns in English, where the attributive must be singular, but the predicate and the relative pronouns can be of either number: *This (*these) wind and rain have/has affected the harvest*. When the conjoined nouns are animate, there is a shift in favour of semantic agreement: *This (*these) man and woman were (*was) squatting in a castle*. “Attributive position still requires singular agreement, however, the predicate requires plural agreement. The relative and personal pronouns require semantic (plural)

agreement” (Corbett 1979:207).

Corbett (1979) provides an illustration for this Hierarchy, which is the one that follows:

Attributive > Predicate > Relative pronoun > Personal pronoun

These four positions represented in the Agreement Hierarchy represent successively less canonical agreement. Corbett explains that the Agreement Hierarchy works as follows:

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) (Corbett 2006:207).

This means that semantic agreement is as or more likely in the predicate as compared with the attributive position; and semantic agreement is as or more likely in the relative pronoun as in the predicate and so on. Looking at this hierarchy it can be observed that three of the positions of the Agreement Hierarchy (attributive, predicate and personal pronouns) –with the exception of relative pronouns and their position- imply different distances between controller and targets. While attributive modifiers and determiners are in most of the cases adjacent to their controllers, “verbs are farther away and pronouns even farther [therefore,] the points on the hierarchy represent increasing syntactic distance from the controller ” (Acuña Fariña 2009:399).

Summarizing, the Agreement Hierarchy is an important contribution to the linguistic theory, as it explains a substantial part of agreement phenomena in the world’s languages. It provides “the primary measure” (Corbett 1979:223) for the syntactic distance that separates an element from its controller and which, the greater this distance is, the more likely semantic agreement is. The Agreement Hierarchy also shows that even conceptual pressure, that is, agreement *ad sensum*, is “sensitive to hierarchical constituent structure” (Acuña Fariña 2017:29) in the sense that the ability of semantics to be able or not to do the agreement job alone is determined by this structure. Apart from providing enlightening information about agreement, syntax and semantics, the Agreement Hierarchy involves some interesting repercussions and implications for linguistic theory. Firstly, it implies that agreement choices are not a completely delimited phenomenon, but rather gradient. Thus, the problematic case for almost all theories of agreement, where “the same controller can control different feature values on different targets at the same time” (Acuña Fariña 2009:399) may be potentially understood. It also helps us to understand the syntax of relative pronouns: “if the relative pronoun is simply an element of the noun phrase, [it would be expected for it to] be structurally closer to the head noun phrase than the predicate is” (Corbett 2006:227), however, the evidence of the Agreement Hierarchy points in another direction.

After this breve presentation of theories and models that have been developed in the framework of linguistic theory, in the next chapter I will present theories of agreement developed by psycholinguists.

3 | AGREEMENT IN PSYCHOLINGUISTICS

From a psycholinguistic perspective, agreement has been widely investigated in the last two decades within the realm of production studies, while the realm of comprehension has been until recently ignored. This is one of the reasons why models of attraction were developed with production in mind. But, what do we mean by comprehension and production? These terms make reference to the direction of processing, that is, what is activated in the first place; for instance, in the case of production, meaning is the first feature to be activated. David Crystal defines these opposing terms in his dictionary as follows: while *production* is defined as “the process of planning and executing the act of speech” (Crystal 2008:389), comprehension makes reference to the “ability to understand and interpret spoken and written language” (Crystal 2008:97). In this chapter I will focus on how psycholinguists (especially authors like Bock, Vigliocco and their collaborators) define agreement, attraction, and their different methods in order to study these notions, focusing especially on subject-verb agreement.

Regarding subject-verb agreement in English, Quirk et al (1972) characterize the subject as the noun phrase that in a declarative sentence occurs before the verb phrase. However, there is an important clarification to be made: the verb has to agree “not with the number of the local noun phrase that immediately precedes it (except for indefinite expressions of amount) but with the number of the highest noun phrase that immediately precedes it in the same clause” (Bock et al. 1991:50), as in *The bridges to the island were damaged by the hurricane* vs **The bridges to the island was damaged by the hurricane*. Nevertheless, the studies made in the realm of the traditional grammar on these type of errors show that there is a tendency for the verb to erroneously agree with other noun phrases that precede it more immediately than the head noun, as in **The bridges to the island was damaged by the hurricane*. This is what we call *attraction* or *proximity concord*. This phenomenon can be regarded either as a grammatical error and something that writers and speakers should be aware of and avoid, or as a “principled or ruled-governed deviation from the more common agreement pattern [...] or as a dialectal variant” (Bock et al. 1991:51). The latter approach is what justifies regarding attraction as a type of proximity concord.

The research on agreement that led authors to find out about the type of mistake that we just described was done from a production perspective. It started with the seminal work of Bock & Miller (1991) on English subject-verb ties and soon extended to Italian (Vigliocco et al. 1995), Spanish (Vigliocco et al. 1996) and

other languages. This research had the agenda of finding out whether the agreement process was affected by semantic interference or whether this process was “blindly driven by morphosyntactic information” (Acuña Fariña 2012:9). In order to do so, authors conducted experiments in which they made use of participants who were presented with preambles consisting of complex noun phrases (as in 1a and 1b), and were asked to repeat and complete them with a verb and a predicate in order to form a full sentence. This type of task, called *completion task*, is the model that I will use in my study.

(1a) The label on the bottles . . . (IS BROKEN)

(1b) The labels on the bottles . . . (ARE BROKEN)

When presented with this type of preambles sometimes participants make the mistake (noted above in the example of **The bridge to the islands are. . .*) of establishing agreement between the local or proximal noun (in this example *bottles*) and the verb, thus disrupting the agreement process (in this case it would be **the label on the bottles are broken*). This is the, for us already known, phenomenon of attraction. The psycholinguistic literature focused on this type of agreement found that readers and listeners of English show a “notable indifference [. . .] to agreement violations” (Bock et al. 1991:53) compared to their sensitivity in the case of semantic violations or incongruities. This stands in conflict with the general observance of appropriate agreement in speech, and of children correctly marking agreement in most of the cases of verb production. This disparity between the “apprehension of the conceptual correlates of agreement and the implementation of agreement in speech helps to confirm the tenuous link between meaning and form in the English agreement system” (Bock et al. 1991:54). As we have previously said, the method used by Bock & colleagues (1991; 1999; 2001) in order to test agreement was to present participants with preambles consisting of a complex NP, ask them to repeat these preambles and then complete them.

3.1 Experimental work from the 90's

All of the experimental work that started in the 90's by the authors that we have already mentioned, such as Bock & Miller (1991), Vigliocco (1995; 1996) and Eberhard (1997), established a number of important findings that I will now present.

3.1.1 Bock & Miller (1991)

The first piece of work, together with its findings, that I will analyse is the already alluded work of Bock & Miller (1991). This study was made only in the English language. We can divide the findings into six:

(1) The first main finding was the presence of a strong mismatch effect, in other words, mistakes were more numerous when the two NPs that were part of the subject had different numbers than when they had the same: *the key to the cabinets vs the key to the cabinet*. According to Bock & Miller, sentences with subjects similar to the first example would show more mistakes than sentences similar to the second example. (2) The order of the mismatching numbers was relevant: mistakes only occurred in the structure [singular NP + plural NP], not the opposite possibility. Therefore, *the key to the cabinets* was more disturbing than *the keys to the cabinet*. (3) “The underlying distinction did not produce more mistakes in the case where inherent numerosity was more obvious” (Acuña Fariña 2012:9). That is, comparing single-token preambles such as *the bridge to the islands* (the NP makes reference to a single entity) with multiple-token preambles like *the label on the bottles* (if there is a label for each bottle there is more than one label) did not produce any difference in the results. (4) Attraction was stronger with phrasal modifiers. Experimenters were concerned with the factor of the participants’ memory, so in order to take care of this, half of the preambles had prepositional phrase post-modifiers, and half had clausal (both subject-and object-relative) post-modifiers. Due to this distinction in the preambles they concluded that attraction was stronger with phrasal modifiers. They claimed that this result was due to the fact that phrasal attraction “involves nouns in the same encoding cycle” (Acuña Fariña 2012:9), and reasoned that the clause is considered “the basic unit of encoding” (Acuña Fariña 2012:9). (5) The length of the post-modifier did not affect the results. These experiments varied the amount of material that separated the head and the local noun, so each preamble presented a short-postmodifier (*the key to the cabinets*) and a long-postmodifier version (*the key to the ornate Victorian cabinets*). This variation was introduced in order to test memory further, but as previously said, no effect was recorded. (6) The ‘palpability’ of the referent of the local noun did not produce semantic effects on the results. Subjects are known to be sensitive to animacy and topicality –it is more common to find a concrete noun such as *desk* or *kid* as a subject rather than an abstract noun like *love* or *intention*-, so by manipulating this parameter Bock & Miller wanted to check if: “the number of a relatively concrete local noun [would] hold more sway over the judged number of an abstract subject (*the speech of the authors*) than a relatively abstract local noun does over the judged number of a concrete subject (*the mountain of the nomads*)” (Bock et al. 1991:66). Again, no semantic effects were found.

This set of findings led to an inflectional view of agreement, as results led to the conclusion that semantics did not affect agreement operations. This inflectional view was supported by further findings provided by the

work made by Bock & Eberhard (1993). Among these new findings we can include that (7) there was no difference between regular (*boys*) and irregular (*men*) plurals regarding attraction, and (8) while collectives like *army* and *fleet* did not result in any attraction, ordinarily inflected nouns like *soldiers* or *ships* did. These results facilitated links with the linguistics literatures on notions like *directionality*, *feature inheritance*, and/or *feature copying* and *feature percolation*, some of which will be mentioned again in this chapter. This inflectional account of agreement became also a copying account whereby “a controller which possesses inherent features passes them on to a target to establish an agreement relation. This is done in a formally encapsulated manner that is strongly reminiscent of cyclic phases in linguistics” (Acuña Fariña 2012:10). However, the conclusions reached regarding the null effects of semantic manipulations would have to be modified soon.

3.1.2 Vigliocco et al (1995; 1996)

The next author that worked on this field and found out important results was Vigliocco. Bock & Miller (1991) had investigated the English language and concluded that distributivity had no effect on attraction mistakes. Vigliocco (1996) conducted research in Italian and found, for the first time, that in this language attraction patterns were sensitive to the distributivity of the preambles. Then, in 1996, Vigliocco et al. compared English and Spanish, in order to test if the distributivity effect previously found in Italian could be generalized to another language with a structure similar to Italian. Their premise was that if the hypothesis suggesting that “agreement is generally computed through a feature-copying operation” (Vigliocco et al. 1996:273) was right, these experiments should not reflect any difference between Spanish and English regarding distributivity effects; but if they did find any distributivity effect in Spanish, this would mean that, “at least in these languages, agreement is computed through a unification operation” (Vigliocco et al. 1996:273). This study led to more results that indicated that Spanish behaved like Italian, that is, attraction patterns in this language were also sensitive to the distributivity (the underlying notional plurality) of the preambles. This cross-linguistic disparity made people consider the possibility that not all languages behave in the same way. In her work in 1996, Vigliocco used the same type of completion task introduced by Bock & Miller (1991) in Spanish, but also some slightly different models: in some experiments, participants were presented with an adjective, then the preamble and then they had to assemble everything using a verb to link both parts. The results of this study replicated the ones already found in Italian in her work in 1995. When Vigliocco et al. found different results compared to those of Bock & Miller, they hypothesized that it was due to structural differences between the languages such as the word order (in Italian the subject of the sentence can be in a pre- or post-verbal position, while in English words normally follow a fixed order); that in Italian the subject can be omitted, and is, in fact, omitted in most of the declarative sentences; or that while in English the verb is inflected for person and number only in the

third person singular in the present tense for regular verbs, in Italian the verb form is marked for number and person in every conjugation. These results led them to realize the need of “a model of grammatical encoding that allows for crosslinguistic variation” (Vigliocco et al. 1996:264). Later in this chapter this model proposed by Vigliocco et al. will be explained in detail.

However, in the fourth and last experiment, Vigliocco et al. decided to approach this search for distributivity effects in English in a different way. This approach consisted in “looking for distributivity effects in English sentence types in which the produced utterance starts with the verb instead of the subject, such as questions” (Vigliocco et al. 1996:285). The word order that English follows in questions (subject in post-verbal position) should increase “the likelihood of independent retrieval of agreement features for the verb and the NP from the conceptual representation” (Vigliocco et al. 1996:287). The data resulting from this experiment confirmed the results of experiment 3 (Bock & Miller 1991): English speakers showed no sign of being sensitive to the notional number of the subject NP, regardless of the nature of the first element uttered (either the NP or the verb). So, summarizing the findings: Spanish, like Italian, showed distributivity effects, but English, as previously showed by Bock & Miller (1991) did not, even when producing utterances starting with the verb. These findings allowed the authors to reach two main conclusions with theoretical implications, which, as we have previously announced, are: languages react in different ways to distributivity due to structural differences among them; and that the findings support a model of “incremental grammatical encoding in which agreement is constructed via unification and no feature-copying” (Vigliocco et al. 1996:287). The structural differences among languages that make their agreement systems be affected in different ways are that they differ from one another regarding whether and where they permit semantic agreement; their morphology, that is, the richness of their verbal inflectional system, the word order (a fixed word order vs a more relaxed word order), or being a pro-drop language or not. These results support a unification based model because while a feature-copying approach to agreement would not “predict any semantic or pragmatic effects as the result of an independent retrieval of agreement features by verb procedure” (Vigliocco et al. 1996:290), a unification based approach would predict “a distributivity effect as a consequence of independent retrieval of agreement features from the conceptual representation at different points during incremental production” (Vigliocco et al. 1996:290). That is, the fact that some languages are sensitive to distributivity forces brought authors to propose a new model in which these interferences are possible, which is the unification model¹. With these studies Vigliocco (1995; 1996) proved the interference of semantics, thus proving Bock et al (2001) wrong on this aspect.

¹See 3.2.2: “Maximal Input”.

3.1.3 Eberhard (1997)

The third piece of work that changed the conception of agreement during the 90's was the piece of work carried out by Eberhard (1997). This author undermined the cross-linguistic explanation proving that all the languages studied presented agreement operations sensitive to at least some semantic manipulations. For some time the English vs Romance contrast suggested by Vigliocco (1996) was thought to be a result of their belonging to different families of languages and therefore their already explained structural differences. However, Eberhard (1997) proved that, "when materials are carefully controlled for imageability, distributivity effects arise in English as well" (Acuña Fariña et al. 2014:112).

In this research it was noted that it is the overall distributivity of the phrase what counts, not the collectivity of the local nouns (Bock & Miller (1991) had already reported that collectives do not attract in the local noun position), that is, words like *army* or *team* will not attract. Eberhard concluded that the main reason why Bock & Miller (1991) had not found any distributivity effect on their research was that the preambles were not correctly manipulated: they had low imageability.

Before these results were reached it was believed that *porosity* (the interference of semantics in agreement) in the form of distributivity effects would be more common in the Romance languages due to their rich morphology, which provides opportunities "to consult meaning representations launched by the conspicuous cues" (Acuña Fariña et al. 2014:121). However, the predominant theory today is the opposite: a recent study by Lorimor et al. (2008) on attraction in richly-inflected languages, such as Russian, showed that this language was less affected by semantic interference than English.

3.2 Main models of agreement in psycholinguistics

These main findings, results and corrections shaped the conception that psycholinguists had of agreement, how it works and what type of process it is. These different points of view were reflected especially in two main models, which are the ones that will be explained in this chapter. One of the psycholinguistic models that try to explain agreement is *Marking and Morphing*, a hybrid model formulated in 2001 by Bock, Eberhard, Cutting et al. It is called a hybrid model because it contemplates the possibility of both formal and semantic operations taking place at different moments in processing. This theory bears "a certain degree of encapsulation in its approach to the topic" (Riveiro Outeiral 2014:19). The other main psycholinguistic theory that will be discussed, *Maximal Input*, by Vigliocco et al. (2001; 2002), maintains that agreement can be influenced by semantic and/or pragmatic factors at all levels, thus, grammatical encoding can easily be affected by conceptual representations

if that causes a processing advantage for the processor. In other words, they believe in a 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. While Marking and Morphing is the theory "heir to the inflectional, formal account of agreement" (Acuña Fariña 2012:14), Maximal Input presents the semantic, unification-based view of attraction.

3.2.1 Marking and Morphing

The first model that will be discussed is Marking & Morphing. This model is heir to the first conception of agreement that resulted from the studies carried out by Bock et al. (1991), thus, as we have previously noted, it conceives agreement as a formally encapsulated process divided into phases that are strongly similar to the cyclic phases in linguistics. These phases that compose agreement are called *marking* and *morphing*; as we will see, each phase has a different function and is affected by different processes (the first stage is affected by semantics, while the second stage is on formal rails).

Marking & Morphing "captures the notional influence that a parameter n has on the number value of a subject phrase, which comes directly from the first marking stage (the overall conceptualization of, for example, a collective as either a multiplicity of individuals or a whole)" (Acuña Fariña 2017:37). In other words, in the marking stage, where agreement starts, it is decided if the overall number of the subject phrase is singular or plural depending on "whether the notion expressed by the subject makes reference to a singleton or multiple things" (Acuña Fariña 2012:14). Thus, if the subject is *table*, the overall of the subject phrase will be marked as singular, while if the subject is *tables*, it will be marked as plural. This marking stage takes place during the mapping from message to a lexical-grammatical representation, and as we can see, we take into account the notional number, thus, semantics interferes in this stage.

To this first marking, morphological calculations which are later weighted by hierarchical distance in the syntactic tree are added. This means that in a morphologically rich language a certain extra amount m is added to the notional component n . 'M' consists of two sub-components that are absent or diminished in languages with poor morphologies: a negative value when the subject head determiner is marked as singular, and a positive value when the interfering noun's determiner is marked as plural. Since the model also factors in distance, in a morphologically rich language the negative value is presumably larger than the positive one, yielding more opportunities for the verb to be singular (Acuña Fariña 2017:37).

The presence of the parameter M is what explains why languages with poor morphology are more prob-

able to be affected by semantic interference and produce agreement mistakes, contrary to the general belief after the results of Bock et al. (1991). After presenting how the marking stage works, we can conclude that Marking is the mechanism that is in charge of transmitting the message number to the syntax –which carries number constraints from the message “in the form of features of an utterance’s structure” (Bock et al. 2005:8). As stated by Bock in (Bock et al. 2005:8): “The site of number marking is the seed or root of the subject noun phrase. Marking serves to make sure that, in the case of other information being absent, a subject noun phrase carries a number consistent with the notional number of the phrase’s referent. It can be singular or plural, or, presumably, null”. The idea that NPs might be notionally controlled is derived from the findings that show that noun phrases “may take plural agreement, despite having singular heads, when they support a highly accessible distributive construal” (Bock et al. 2001:89). This idea is reflected in examples that have already been mentioned like, for instance: *the label of the bottles*, where there is one label for each bottle, therefore, during the marking stage, the brain understands that there are several labels, thus, the phrase is plural. To this example of distributivity that supports the notional control of NPs, we can add other examples that we have already mentioned, but that are worth remembering: the many cases of semantic overrides that English is famous for², such as number transparent nouns (*a series of books were written*), measure terms (*three pounds is a ridiculous amount*) or other types of agreement *ad sensum* (*the team are thinking about the proposal*).

It is important to point out that “this message-based number marking is supposed to affect the subject, not the verb, at least in English” (Acuña Fariña 2012:14). This phenomenon, as we know, is a result of the impoverished English verbal system that provokes that verbs are considered unlikely to carry number indices (English verbs only have number feature mark in the third singular person: *I sing* vs *she sings*, or in the verb *to be*). This means that they acquire their number specifications through *number Morphing* (the stage after marking in which the analysis carried out in the first stage is passed on onto the verb). Marking is needed to deal with abstract phrase number (phrases with *what*, *who*, and *which*, which can be plural or singular), conjunctions (*cold and wind*), elided or lexically unrealized phrases (imperatives or expressions such as *doesn’t matter*) as well as differences in the number behaviour of pronouns and verbs (Bock et al. 2005:8). Due to structural characteristics of the English language such as a largely opaque meaning of the verb number, even to native speakers (as it is not morphologically marked in verbs apart from *to be* and most of the verbs in the third singular person in present), that the role of notional features in modern English agreement is weak, and that there is unlikely to be a direct assignment of number to the verb from the notions represented in the message, the linguistic requirements of verb agreement may be “more easily met by rooting the number features that support agreement in the notional referents of subjects alone and in English by providing access

²See 2.2.2: “Unification”.

to the notional underpinnings of grammatical number to the subject alone” (Bock et al. 2001:90). Except for “formally relevant features such as mass and count, which affect phrasal configurations, lexical-grammatical specifications of number do not come into play until the selected lexical entries are used in retrieving morphemes. This paves the way for number morphing” (Bock et al. 2001:91). After Marking, the following stage would be *Number Morphing*. As previously noted, in English it is the number marking of the subject function what controls the number features of the subject noun phrase. The assembling of the subject noun phrase takes place when the morphological representations of words and inflections are bound to specific positions within the phrase. “At this point, the specifications of number in the lexicon are morphologically instantiated and, if necessary, reconciled with the number features on the subject. This, along with the implementation of agreement operations, constitutes number morphing” (Bock et al. 2001:91). In English most of the morphemes do not carry intrinsic number specifications; this makes sure that in most of the cases a number marking that is notionally determined prevails. However, there are some morphemes which do have a number specification such as plural, singular or both simultaneously (for instance, the words *tree* and *trees* present a singular and plural morpheme, respectively, but words like *fish* do not have a morpheme to express their notional number). Therefore, “number specifications can mismatch the marked number of the phrase [which will trigger] an effort to resolve the marking of the phrase” (Bock et al. 2001:91). These number conflicts are often resolved by adjusting the number specification of the subject noun phrase in a stage that follows marking and morphing, but is not compulsory, it only occurs when it is needed, that is, when a mismatch has taken place. This adjustment (sometimes referred to as *percolation* in formal linguistics, or *reconciliation*) is “the compromise component of number morphing and it aligns morphological number and phrase number” (Bock et al. 2001:91). This stage is occasionally needed in cases where, as noted above, “the morphological number specifications of constituent nouns may mismatch the number of the whole noun phrase assigned –previously- during making” (Acuña Fariña 2012:15), as is the case of the already commented example of collective nouns: *the team are playing*. This type of conflicts is resolved by *adjusting* the number specification of the whole phrase, that is, by aligning morphological number and phrase number. The number morphing stage terminates in a number feature for the verb, which satisfies the requirements of number agreement, thus, constituting the control component of number morphing. The verb phrase acquires its number when it is transmitted from the subject noun phrase, and it is this “transmission what accounts for the findings regarding plural verb agreement with distributive subject noun phrases such as *the label on the bottles*” (Bock et al. 2001:92). The plural verbs in these cases, as argued by Bock et al. (2001), are a result of the notional plurality present in the message, and not of attraction. On the other hand, examples like *The baby on the blankets are...*, since they cannot be plural on the speaker’s mind, are considered as true attraction errors that take place via control. Attraction thus, “reflects the resolution of number conflicts between morphological number and phrase number” (Bock et al. 2001:91).

The morphing stage proceeds on the basis of constraints imposed from the lexicon and syntax, and it helps to create representations that can support phonological encoding.

So far we have seen how Morphing works, but now I will present the functions of this stage. The set of interrelated operations that conform the morphing stage have several functions, such as:

(1) Bind morphological information to structural positions, (2) reconcile number-relevant features from the syntax (number marking) and the lexicon (number specification), and (3) transmit number features to structurally controlled morphemes (Bock et al. 2005:9).

Summarizing:

Morphing operates during structural integration [in order] to select and position the number morphology that [is represented in] pronouns and verbs. The marking and morphing account of verb morphing is straightforward: verbs inherit the number of the subject noun phrase. This constitutes agreement control of verb number by the subject number (Bock et al. 2005:9).

The number of a subject noun phrase is a result (reconciliation) of “the initial marking of notional number and the number specifications of morphemes that compose the phrase [and that] capture the grammatical number properties of morphemes” (Bock et al. 2005:9). Therefore, it is a result of marking and morphing. The reconciliation of disparities between marked and specified number facilitates lexical specifications, in other words, when there is a disparity, it is easier for semantics to interfere.

Summarizing this hybrid model: Marking and Morphing is a formal theory that conceives agreement as an encapsulated process divided into two different stages: Marking, affected by semantics, moment of the agreement procedure in which the overall number of the clause is decided; and Morphing, stage that occurs on formal rails, moment in which the analysis that took place during marking is passed on to the verb, with no semantic interference.

3.2.2 Maximal Input

The following theory that will be discussed is a functionalist theory that presents the opposite agenda to Marking & Morphing. As noted above, the semantic, unification-based view of attraction is best represented today by the Maximal Input hypothesis of Vigliocco and collaborators (Vigliocco & Franck 2001; Vigliocco & Hartsuiker 2002). In essence, this theory maintains that: “even though agreement relations occur during a phase

of morphosyntactic encoding, processing phases are not rigidly encapsulated, so that a previous conceptualisation may affect morphosyntactic operations if that is advantageous for the creation of an interpretation” (Acuña Fariña et al. 2014:112). This conception of phases as fluid rather than encapsulated allows the Maximal Input hypothesis to suggest that “the conceptual or notional information is directly used in implementing agreement”, (Bock et al. 2005:7) reinforcing the linguistic operations behind agreement and making the cases of agreement that are semantically supported less variable than the cases that are not semantically supported.

According to Maximal Input “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” (Riveiro Outeiral 2014:119). This theory assumes that every morph, that is, every agreement cue, is a symbol and that as such they come with a meaning side to be consulted. Maximal Input belongs to the group of theories that, as *Constraint Satisfaction* models and the *Competition Model* do, account for the influence of extrasyntactic factors in processing. These models share the view that a level of processing is not completely isolated, and can, therefore, experience some interference from neighbouring levels, so, if circumstances make it advantageous for processing, grammatical encoding (the second level) may be affected by the previous conceptualisation stage and even by the following phonological stage (despite agreeing on this point, models differ in how much interference they allow). Maximal Input argues for more pervasive effects of meaning throughout the agreement process than they do in other theories of agreement. For instance, Vigliocco et al. predict that “notional correlates of local nouns should contribute to attraction” (Bock et al. 2005:19). This model allows to extend some of the elements of the Marking and Morphing theory to other kinds of agreement relations, other kinds of agreement features and other languages. For example, apart from the subject-verb and antecedent-pronoun number agreement, there also exists agreement in number between determiners and nouns. In English, there are words like *a*, *each* and *this* that occur with singular nouns (*each kid*, *this person*), while words like *some*, *many* and *these*, only occur with plurals (*many children*, *these people*). It might be assumed that these words, like personal pronouns, “carry number features that make them accessible for lexical selection from number meaning. This would [mean that] their agreement with the nouns they accompany [is] a matter of concord, as in the pronoun model, rather than control, as in the verb model” (Bock et al. 2005:19).

In general, this theory presents a strong emphasis placed on the idea that “the grammatical encoder takes all of the information available from conceptual structures” (Acuña Fariña 2012:16). Nevertheless, Vigliocco & Frank (2001) make the careful observation that not all processing is subject to interference in an unconstrained way, since there are home domains for specific processes:

Subject-verb agreement is computed during grammatical encoding, a stage in which the unfolding representa-

tion is syntactic in nature, as suggested by slips of the tongue and other types of evidence. For example, Garret (1980) observed that errors occurring during this process [...] do not show semantic/conceptual constraints. Instead, they show a strong grammatical class constraint (Acuña Fariña 2012:16).

However, Vigliocco & Franck (2001), through the distinction of primary and secondary sources of information, incorporate the notion of interference, allowing some flexibility that is needed in to order clarify the complex facts of agreement. Maximal Input means that

accuracy is achieved by taking advantage of information from other levels when available. Such information is 'additional' but nevertheless beneficial since it protects against information loss. On this view, when semantic information is congruent with grammatical information, agreement should be more accurate. (Acuña Fariña 2012:17).

Nevertheless, this theory has been presented with a challenge that goes beyond the other challenges to constraint satisfaction: "the difference between verb and pronoun agreement in sensitivity to notional properties [...] suggests that some kinds of processing must be more permeable than others" (Bock et al. 2005:22). This difference goes against what is proposed by Maximal Input. An explicit account of agreement would be needed in order to find out if more conceptual information is accessible to pronouns than to verbs, whether pronouns can capture differences in notional number better than verbs, or if it is something else what makes pronoun production more maximal than verb production. Marking and Morphing does offer explanations for these differences.

Summarizing, this theory does not contemplate agreement as separated in encapsulated stages, but maintains that grammatical encoding can be affected by the previous, or even the subsequent, encoding stage, if this, for some reason, is advantageous. Thus, notional information can be acceded in later production processes, if this information is needed. Unlike in Marking and Morphing, interference is possible. Vigliocco et al. (2002) found support for the Maximal Input hypothesis in "the findings of conceptual influences on the construction of number and gender agreement" (Bock et al. 2005:7). Another interesting suggestion of this hypothesis is that languages with a rich morphology, like Russian, will have its agreement computations affected by semantic interference more easily than those languages with a poorer morphological system, like English. This opinion is opposite to the one presented by Lorimor et al. (2008), and mentioned before in this chapter, that it is in fact the languages with poor morphology the ones that will be more easily affected by semantic interference.

3.3 Conclusion

So, as a conclusion, and as we have previously said, the findings resulting from experimental work in production conducted in the 90's, together with some corrections, shaped the way in which psycholinguists understand the process of agreement in the present days. Some of these different views of agreement are represented in the two theories that were presented in this chapter. As we have seen, they present two opposite points of view: while Marking & Morphing seems to be a more classic proposal, as it contains the "classic encapsulation that is characteristic of Fodorian views of language in general" (Acuña Fariña 2012:16), Maximal Input aligns itself with proposals that have been put forward in order to account for the influence of extrasyntactic factors and incorporates the notion of interference, thus allowing some flexibility needed to account for the notoriously complex facts of agreement. Despite decades and decades of research on the topic of agreement, authors have not been able to reach a conclusion on whether this is a semantic or a syntactic process, in fact, some authors (Acuña Fariña 2018) have understood this binary conception of agreement as problematic and have recently suggested the possibility of some sort of hybrid conception of agreement as a more fluid process than the more traditional idea. According to this proposal, agreement would be a dynamic system where depending on factors such as structural distance between controllers and targets, or the raw size of the morphological component, agreement would be more encapsulated or more permeable to conceptual pressures. With my study on agreement I do not intend to find the answer to this issue that has been tackled for decades by professionals, but to add to this field of investigation, especially on the feature of (semantic) concreteness, since there are not many studies on this topic. I will do so in the next chapter using the materials created by Riveiro Outeiral (2014) through the method introduced by Bock & Miller (1991).

4 | MY STUDY

4.1 Semantic forces: Concreteness

As noted in (2.1), there are elements that are present in every agreement operation, which are controllers, targets, features and domains. However, these may not be the only factors that play a role in sentence processing and thus, agreement. The most recent literature on psycholinguistics has proven that there are some semantic forces that interfere in syntactic processing. These *semantic forces* or *constraints* are normally unexplored, especially if compared to the main features of agreement such as gender or number. An example of these semantic constraints would be *emotionality* (the level of arousal and how pleasant the word is for the listener) or *concreteness*. It is this last constraint the one that will concern the following study. By analysing concreteness in agreement I intend to check if it has any effect in agreement mistakes. If the concreteness of the local noun produces agreement mistakes, this shows that semantics does interfere with agreement, as abstract nouns are less palpable and more difficult to provide a number for.

If concreteness is going to be one of the main topics of this chapter we should have a definition to know what we mean by this. As already noted, words possess different characteristics that allow them to be classified on the basis of semantic criteria; for instance, regarding nouns, whether it is a proper or a common noun, or, regarding concreteness, whether the noun is *abstract* or *concrete*. From a traditional point of view, this distinction makes reference to nouns representing entities that are not easily perceived by the senses, less imageable or hard to put in context (abstract nouns, such as *hope* or *speech*), or to nouns representing entities that are easy to perceive through the senses, imageable and easily put in context (concrete nouns, like *dog* or *table*) (Riveiro Outeiral 2014:177). Concrete words have been shown to be processed quicker than abstract words, as well as to be better understood and “more efficiently processed in a variety of cognitive tasks including paired associative learning translation, comprehensions tests, lexical decision and free recall” (Riveiro Outeiral 2014:177). This processing advantage presented by concrete words has been denominated as ‘concreteness effect’. Another difference that has been observed regarding abstract and concrete nouns is that their meanings differ more across languages than the meanings of concrete words. For instance, the Oxford English Dictionary and the RAE dictionary provide quite similar definitions for *table*: “A piece of furniture with a flat top and one or more legs, providing a level surface for eating, writing, or working at” in

the Oxford dictionary and “mueble compuesto de un tablero horizontal liso y sostenido [. . .] generalmente por una o varias patas, para diferentes usos, como escribir, comer, etc.” in the RAE dictionary. However, for an abstract noun such as *love* the definitions provided are not so similar: “a strong feeling of deep affection for somebody/something, especially a member of your family or a friend” in the Oxford dictionary and “sentimiento intenso del ser humano que, partiendo de su propia insuficiencia, necesita y busca el encuentro y unión con otro ser” in the RAE dictionary. These crosslinguistic differences have been blamed by Della Rosa et al. (2010) on the fact that concrete words are added to the speaker’s lexicon through experience, but abstract words are highly related to language and to lexical networks, so it is expected to find a higher variation across languages on abstract nouns than on concrete nouns.

For such reasons, it has been concluded that this crosslinguistic difference must reflect that the brain mechanisms that are behind the processing of the two word classes must not be the same, that is:

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 (Riveiro Outeiral 2014:178).

Studies done while dealing with brain damaged patients supported the conclusions reached while working with the ERP methodology. However, this idea that the computation of concrete and abstract words involve different brain circuits has not always been accepted. Hitherto, authors have presented two theories trying to explain the differences between concrete and abstract words processing, which are *The dual coding theory* (Pavio, 1971, 1991) and *The context availability hypothesis* (Bransford & McCarrel, 1974; Schwanenflugel & Shoben, 1983) (Riveiro Outeiral 2014:178). According to The dual coding theory, the differences found between concrete and abstract nouns are a result of a “dual coding system [that involves] differentiated brain areas” (Riveiro Outeiral 2014:178). This means that concrete words are processed through verbal code representation of the left cerebral hemisphere and they also activate an imagery system that will provide an image representation for the entity that the word represents. On the other hand, abstract words are processed only through the verbal code representation, the creation of the image representation is not activated. This is due to the fact that concrete nouns have referents that are easily imaginable, they have a visual referent, and thus, a stronger cognitive connection, while this is not the case with abstract words. As a result of this difference, abstract words are more difficult to process and remember. The context availability hypothesis proposes that the differences between the types of words are a result of “the amount of contextual information a word evokes in our mental lexicon” (Riveiro Outeiral 2014:178). That is, concrete words have “more contextual information in semantic memory” (Riveiro Outeiral 2014:180), therefore, they are more easily recalled and comprehended.

According to this, there is a directly proportional relation between the contextual information of a word and its degree of concreteness, and therefore, the speed of its processing. Thus, abstract nouns, which present less contextual information, are harder to process than concrete words.

4.1.1 Previous studies on concreteness

Nevertheless, this distinction between abstract and concrete nouns should be treated with caution. There are some occasions in which it is not so easy to decide to which category a noun belongs, for instance, with a noun like *table*, there is no doubt that it is a concrete noun, it can be seen, touched and perceived by the senses, but other nouns like *music* or *happiness* are not so straightforwardly assigned to a category. Traditionally, words like these are said to be abstract, but music is perceptible to the senses, and happiness can be related to observable behaviour. This is why linguistically oriented grammars “prefer to operate with such formal distinctions as *countability*” (Crystal 2008:3), and probably why this semantic constrain of concreteness has not been so explored. Even though concreteness has, in general, been ignored, there are some authors that did pay attention to it and studied its effects on agreement. Some of these authors were Bock & Warren (1985) and Bock & Miller (1991). In Bock & Miller’s second experiment (1991) in order to look for effects on concreteness in agreement mistakes, half of the preambles they used had animated head nouns in singular form that were more concrete than the inanimate local nouns and, the other half had less concrete animated head nouns. With this, they wanted to test if:

the number of a relatively concrete local noun [would] hold more sway over the judged number of an abstract subject (as in *the speech of the authors*) than a relatively abstract local noun does over the judged number of concrete subject (as in *the mountain of the nomads*) (Bock et al. 1991:66).

The results from this experiment indicated that the “singular-plural asymmetry was [. . .] more prominent for concrete than for abstract local nouns” (Bock et al. 1991:71). That is, providing that there was a number mismatch between the head and local noun following the structure that, as we know, creates agreement mistakes [Sg NP + Pl NP], concrete local nouns were slightly more likely to produce agreement mistakes than abstract local nouns. After these results Bock & Miller (1991) decided to replicate the experiment, but this time, the same items “were assigned to lists in a manner that counterbalanced both animacy and concreteness for individual participants” (Bock et al. 1991:72). In this experiment the difference regarding abstract and concrete nouns disappeared, so Bock & Miller concluded that the concreteness effects that they had found in their second experiment (1991) were a result of the “unbalanced distribution of concreteness variations over participants” (Bock et al. 1991:72). However, Bock & Miller point out that even if concrete local nouns did produce

an increasing number of agreement mistakes, this phenomenon could not be explained as “a tendency for the verb to agree with a concrete noun” (Bock et al. 1991:72).

More recently, Riveiro Outeiral (2014) studied the effect of concreteness on agreement mistakes in English and Spanish. Since the data used by Bock & Miller presented some “limitations” Riveiro Outeiral (2014) designed a questionnaire that consisted in “[carefully selected sentences] according to the levels of concreteness that the two nouns had, and the people who participated on this experiment were encouraged to use verbs that showed number inflection (i.e. the verb *to be*)” (Riveiro Outeiral 2014:202). These modifications of the materials and instructions for the participants intended to solve some problems posed by Bock & Miller (1991): sentences with uninflected verbal forms were eliminated from the final score of the experiment, which led to an important reduction of the data and can be easily solved by telling the participants to use verbal forms that are inflected, as is the case on Riveiro Outeiral’s experiment, of the verb *to be*. The results of the experiment in Spanish revealed that concreteness affects subject-verb agreement in Spanish whenever a singular abstract local noun is followed by a plural concrete noun in a complex NP, in the sense that in this situation “the probability of making an attraction mistake on the verb significantly increases” (Riveiro Outeiral 2014:199). On one hand, these results agree with Bock & Miller’s (1991) experiment, as it is the marked number of the complex NP that attracts the verb “towards its number configuration” (Riveiro Outeiral 2014:199). On the other hand, the conclusion that abstract nouns produced more mistakes than concrete nouns and, therefore, semantics does play a role in the production of agreement mistakes, contradicts the findings of experiment 2 in Bock et al. (1991). Riveiro Outeiral (2014) conducted the same experiment in English expecting a higher number of attraction mistakes, as English presents a poorer morphological system than the Spanish one. As expected, the results of this English experiment showed that “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” (Riveiro Outeiral 2014:203). Therefore, not only did Riveiro Outeiral (2014) find a “concreteness” effect in her tests, but also language differences. She concluded that concreteness appears to have “an important processing weight in a language like English” (Riveiro Outeiral 2014:206) and that it presents this weight in a language like Spanish, even though to a lesser extent. This is probably due to the morphological systems that these languages present, as languages with a richer morphological system, like Spanish, are supported by a rich system of inflections which allows speakers to “devote lesser attention to the inner semantics of each of the words” (Riveiro Outeiral 2014:206).

4.2 My study

I will now present my study, which is inspired in the one conducted by Riveiro Outeiral (2014). As we have previously advanced, the objective of this research is to add more data to the analysis of a semantic force that has not been widely explored. The results of the experiment will hopefully provide some insight into the question that linguists and psycholinguists have been asking themselves for decades: is agreement a purely syntactic operation, or is it affected by semantics? According to the theories presented above (*The dual coding theory* and *The context availability hypothesis*) concrete nouns present an easier processing when compared to abstract nouns, therefore, these differences should be reflected when concrete and abstract words are integrated into syntactic structures. More specifically, in the context of this study, there could be a difference regarding the production of agreement mistakes. The hypothesis that is being tested in this study is that since concrete nouns show an easier processing over abstract nouns, concrete words should attract the verb to agree with them, rather than with the abstract nouns. If this is correct, words that are easier to process and comprehend should be better attractors for the verb and will be more easily taken as subjects. We will test this hypothesis through two experiments that will be explained in the following paragraphs.

However, before explaining the tests themselves it is important to mention some things. In order to do this type of test based on concrete and abstract words these words have to be tested. That is, a selection of words is made and sent to participants so they can value on a scale from 1 to 7 how abstract or concrete these words are. The participants that take part in this test cannot take part in the following test. For this study this posed a problem, as we did not have access to so many English speaking people. As a way to solve this problem we decided to use the materials created for Riveiro Outeiral's (2014) thesis, as these had passed this first test. Moreover, all the experiments conducted until now have had a different procedure to the one presented in this piece of work: Bock & Miller (1991) and Riveiro Outeiral (2014) presented their participants with oral preambles that they had to write down and complete; as we will see in the following paragraphs, the procedure used in this experiment differs slightly from the one they used. A further difference is that for this tests participants were not offered anything, while in the other tests they were generally offered some credit for their subjects. Now that this has been made clear, we can proceed with the study.

4.2.1 First study: concreteness test (Spanish)

After solving the limitations of the data used in the study by Bock & Miller (1991), which as we know, did not show any results of concreteness interfering in agreement mistakes, Riveiro Outeiral (2014) conducted a

similar study which showed that concreteness did have an effect in agreement mistakes. Now, we will perform an experiment that is similar to the ones mentioned above.

4.2.1.1 Description

Fourty preambles were taken from the seventy five that were created by Riveiro Outeiral (2014)¹. The sentences used are presented in appendix A.

4.2.1.2 Objective

The objective of the present test is to prove if the combination of an abstract singular head noun and a concrete local plural noun could produce more attraction errors in the systematic computation of agreement. If the processing of concrete words activates more areas of the brain and presents more advantages when compared to the processing of abstract words, this could mean that concrete words attract the verb when they appeared in their marked form (plural). This is the initial hypothesis for this test.

4.2.1.3 Method

4.2.1.3.1 Participants

Twenty three people participated in the questionnaire. Most of them were students of high school level or university ranging from the age of 17 to 58. 69'6% of the participants were women and 30'4% were men. The first three people to do the questionnaire could not answer properly to three of the sentences due to a problem with the questionnaire (the questionnaire only allowed an answer with a number, which is not what we look for in this experiment), thus, they had to be eliminated and we had to add three more people in order to reach twenty participants with valid answers. None of the participants knew what the purpose of the experiment was.

4.2.1.3.2 Materials

As previously mentioned in subsection (4.2.1.1), 40 preambles were taken from the 75 preambles created by Riveiro Outeiral (2014)². These 40 preambles were distributed as follows:

¹See apendix G in Riveiro Outeiral (2014)

²See apendix G in Riveiro Outeiral (2014)

- Ten concrete singular – concrete plural (C-C) sentences formed the **control condition**. E.g. *El campo de los elefantes...*
- Ten abstract singular – concrete plural (A-C) sentences formed the **experimental condition**. E.g. *El significado de los besos...*
- Twenty fillers in which both nouns had the same number (either singular + singular or plural + plural). Since there is no possible semantic attraction in these filler sentences they will not be analysed as part of the experimental data. E.g. *El dueño del gato...*

4.2.1.3.3 Procedure

Participants received a link to a questionnaire made on the online platform Google Forms [<https://www.google.es/intl/es/forms/about/>] through several social media such as Whatsapp, Instagram or email. They were presented with 40 incomplete sentences in written form that they had to complete with at least a formal verb and an adjective, also in written form. Due to our lack of resources we could not conduct the experiments as Bock & Miller (1991) and Riveiro Outeiral (2014) had done it, so we had to use this resource.

4.2.1.4 Results

In the Spanish questionnaire there was only one agreement mistake in an abstract singular-concrete plural sentence. This means 1 out of 145 examples (145 after deleting 55 of the 200 because they were not correct, for instance, participants used a nominal phrase instead of an adjective), that is 0'69% of agreement mistakes in the A-C structure and, in this case, in the whole experiment.

4.2.1.5 Discussion

These results reflect that concreteness interferes with subject-verb agreement in Spanish. The number of mistakes is quite low, but this is probably due to the procedure followed in this experiment. This provides data supporting the hypothesis that the structure [NP1 abstract + NP2 concrete] increases the possibility of making an attraction mistake on the verb. On the one hand, these results agree with the conclusion that was drawn from Bock & Miller's (1991) research, that is, that marked nouns in a complex NP tend to produce more attraction on the verb, thus, making it agree with them. On the other hand, this contradicts another conclusion from Bock & Miller (1991): they had not found any effect of concreteness in agreement mistakes. In the next experiment to be discussed, the same difference in the number of agreement mistakes is expected to be found. Moreover,

as the morphological system of English is poorer than the Spanish system, a crosslinguistic difference is also expected, with the number of agreement mistakes in English expected to increase.

4.2.2 Second study: concreteness test (English)

4.2.2.1 Description

The preambles used in the previous experiment³ were translated into English and native speakers of English completed them.

4.2.2.2 Objective

The objective of this test is the same as the previous one: to know if the combination of abstract and concrete nouns following the structure [Sg Abstract NP + Pl Concrete NP] would make the participants produce more agreement mistakes than with concrete nouns on both of the NPs. In this case, the language tested in the experiment was English. With this we intended to compare the results obtained in (4.2.1) with the experiments that we will obtain in this test, and also to draw a comparison between these and other results in the literature, such as the already mentioned results from Bock & Miller (1991) and Riveiro Outeiral (2014).

4.2.2.3 Method

4.2.2.3.1 Participants

Twenty four native speakers of English participated in the questionnaire. 37'5% of the participants were men and 62'5% were women, ranging from the age of 19 to 67. The first four people to do the questionnaire could not answer properly to four of the sentences due to a problem with the questionnaire (the questionnaire only allowed an answer with a number, which is not what we looked for in this experiment), thus, they had to be eliminated and we had to add four more people in order to reach twenty participants with valid answers. None of the participants knew what the purpose of the experiment was.

4.2.2.3.2 Materials

The same preambles used in the previous test were translated into English and distributed in the same way:

³See (4.2.1): "First study: Concreteness test (Spanish)".

- Ten concrete singular – concrete plural (C-C) sentences formed the **control condition**. E.g. *The field of the elephants...*
- Ten abstract singular – concrete plural (A-C) sentences formed the **experimental condition**. E.g. *The meaning of the kisses...*
- Twenty fillers in which both nouns had the same number (either singular + singular or plural + plural). Since there is no possible semantic attraction in these filler sentences they will not be analysed as part of the experimental data. E.g. *The owner of the cat...*

4.2.2.3.3 Procedure

Managing to find native English speakers who would fill in this questionnaire was more difficult than for the Spanish test. Again, we could not have them in a room to present them with oral preambles, so we had to use the resource of Google forms [<https://www.google.es/intl/es/forms/about/>] again. They received the link through Instagram, Facebook or via email. They were presented with forty incomplete sentences that they had to complete with at least a verbal form of the verb *to be* in the past or present tense and an adjective.

4.2.2.4 Results

Participants made 10 agreement mistakes out of 198 examples of concrete singular-concrete plural sentences (2 sentences had to be eliminated due to the fact that they did not follow the structure verb + adjective as requested in the instructions). In the abstract singular-concrete plural examples participants made 22 agreement mistakes out of 200 examples. That is 5% of agreement mistakes if a concrete noun is in the local noun position, and 11% if the local noun is abstract.

4.2.2.4.1 Parallel results

As it has been previously explained, the structure of a complex NP that produces attraction mistakes is the one in which there is a mismatch following the pattern [NP1 sg NP2 pl]. However, while analysing the results of this experiment, we have found some unexpected cases of agreement mistakes. There were four examples in which there was not a number mismatch between the NPs, but which had eight answers (2% of the answers to the fillers) that presented agreement mistakes, as in **the cases for the pencils is green*. All of these examples followed the structure [NP1 pl NP2 pl]. This type of results had already been found in other experiments, such as Riveiro Outeiral's (2014) and it had been concluded that the repetition of an operation in a short period of time produces an effect on the parser, who tends to automatize this operation, that is, "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” (Riveiro Outeiral 2014:205). This phenomenon appears to be increased in languages, like English, in which the mark for the plural in nouns is the same as the mark for the singular in verbs.

4.2.2.5 Discussion

These results provide data supporting the hypothesis that the semantic force concreteness has some effect on agreement mistakes in English. This influence of concreteness on agreement procedures is much bigger in English than in Spanish, where it has certainly proved to be negligible. This is probably due to the lack of morphological marks, which forces the speakers to rely on semantic information, thus making the process a less automatic one (Berg 1998, Acuña Fariña 2009, 2012). Other languages, like Spanish, which present a richer inflection system allow speakers to pay less attention to the semantic information of each word, as phrasal packaging appears to run on the formation of alliterative sequences of the -0 -0 -0 or -A -A -A type. Moreover, these results show a disparity between the number of agreement mistakes when the head noun is abstract and when it is concrete. Once again, this supports the hypothesis that when a concrete noun is in the local noun position and an abstract noun takes the local noun position, the concrete noun attracts the verb.

5 | CONCLUSION AND SUGGESTIONS FOR FURTHER RESEARCH

In this piece of work information regarding the process of agreement has been presented: what it consists of, some special cases like Basque and other so-called “exotic” examples, and several terms that are central for the understanding of agreement processes. As well as the theories, both linguistic and psycholinguistic, that try to explain how it works from different perspectives; and then, specifically, the role of a semantic force –concreteness- in this process. After this theoretical background, we conducted an experiment, which allowed us to add an experimental perspective to the theoretical study of agreement, and to reach a comprehensive understanding of this phenomenon. The results of the experiment have been analysed and we can draw several conclusions from them.

First of all, this study confirms the hypothesis presented by Bock & Miller (1991) that in a complex noun phrase, the structure [NP1 sg + NP2 pl] produces agreement mistakes, while a number mismatch in a different order, or a non-mismatching structure, do not normally produce this type of agreement mistake. This surely tells us something about the architecture of the system. Moreover, we have found some evidence that indicates that semantics plays a role in agreement procedures. This is shown in the fact that in the case of complex noun phrases in which an abstract noun was in the head noun position, and a concrete noun in the local noun position, agreement mistakes were found twice as often than in the cases where both head and local noun were taken by a concrete noun, in the English experiment. This shows that participants found more trouble trying to process the abstract noun and therefore the concrete nouns attracted the verb to establish agreement with them. Thus, it proves that agreement is not a completely formal process, but that the semantics of the nouns matters. The most relevant results that allow us to reach these conclusions are the results drawn from the English questionnaire, as in the Spanish one there was only one agreement mistake. However, this crosslinguistic disparity was also expected and is relevant for our study.

Furthermore, other non-expected results were found when analysing the data. As noted in the previous chapter, a small percentage of the answers given by the participants presented agreement mistakes even though both the local and head noun were in the plural, that is, the verb was in the singular (**The cases for the pencils is green*). This has been called the “phonological priming” effect and it is a result of the repetition of the sound [s] across the complex NP, which makes the participant repeat it again in the verb, thus, using the

singular form *is* instead of the plural *are*: **The cases for the pencils is green.*

How do these results affect the way in which we see the hypothesis about the nature of agreement process? As we have seen, the results confirm the influence of semantics on agreement processes. Moreover, the results showed a crosslinguistic disparity resulting from the different morphological systems that English and Spanish present; thus, this proves that morphology also plays a role in the agreement processes. This crosslinguistic difference provides data supporting the theory presented by Lorimor et al. (2008) that holds that the richer the morphological system of a language is, the less affected the language will be by semantic interference. Since both semantics and morphology interfere in the agreement processing, the theories that conceive agreement as a completely encapsulated process should be discarded, as they do not contemplate the implications that these results provide. That is, theories such as Marking and Morphing (Block et al. 2001) are no longer adequate, according to these findings. There are some authors that, in the light of research that indicates the same as the findings of our study, propose a model in which the parser “takes advantage of the most valuable information in order to speed up the processing” (Riveiro Outeiral 2014:225). Acuña Fariña (2012) is one of the authors that support this type of model in his theory of “leaking and blocking”. In this theory it is argued that “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” (Riveiro Outeiral 2014:225). This theory agrees with Lorimor’s (2008) proposal and it is the one that we support on this study.

This paper is just a first step in the study of agreement and, more concretely, in the role that the semantic constraint of concreteness plays in its processing. Due to lack of time and resources this piece of research is not aimed to be exhaustive, as we could not reach to as many participants as it would be necessary in order to obtain more significant data. The same applies to the number of sentences that participants have to complete. Due to these and the following limitations, the results of this experiment should be interpreted carefully.

Moreover, and this is the main problem that we faced while doing this research, making participants answer the questionnaire through Google Forms appears to be problematic. It seems that through this platform participants have too much time to think about the sentence, it is not as automatic as listening to the preamble, writing it down and then completing it. Thus, this results in fewer agreement mistakes than expected. For instance, in the Spanish questionnaire, there was only one agreement mistake out of approximately two hundred examples. Moreover, we also found that, even though it was specified in the instructions that the preambles should be completed with a verbal form and an adjective, in quite a lot of answers, especially in Spanish, we found that people answered with nominal phrases or just a verbal form with other adjuncts, but not an adjective. Fortunately, this happened especially in the fillers, so we did not have to eliminate a lot of examples that were

relevant for the study, but the data could have been significantly reduced due to this situation. Thus, for further research in this realm a good course of action could be to ask participants to complete the sentences with the verb *ser*, as we did in the English questionnaire, and maybe put more than one example, so participants are completely sure of what we are asking.

A | APPENDIX: QUESTIONNAIRE USED IN THE CONCRETENESS STUDY IN SPANISH

- C - C

1. El campo de los elefantes
2. El laboratorio de los investigadores
3. El patio de los niños
4. La oficina de los investigadores
5. El uniforme de los trabajadores
6. La oficina de las chicas
7. La partitura de los compositores
8. La habitación de sus hijos
9. La ropa de los chicos
10. El sueldo de los trabajadores

- A - C

1. El significado de los besos
2. El tamaño de las margaritas
3. La narración de sus fantasías
4. La causa de las victorias
5. La frecuencia de los orgasmos
6. La forma de las muñecas
7. La importancia de sus caricias
8. El aspecto de las uvas
9. El peso de las estufas
10. El diseño de las camisetas

- Fillers

1. Los familiares de las víctimas
2. El lápiz de la mesa
3. El bienestar de su hijo
4. Los jugadores de los equipos
5. Los estuches de los lápices
6. El director del colegio
7. Los resultados de los análisis
8. El nieto de la señora
9. Los instrumentos de los músicos
10. El alcalde del ayuntamiento
11. La oficina de la secretaria
12. La actuación del cantante
13. Las notas de los estudiantes
14. Los marineros de los barcos
15. El abogado del acusado
16. Los jinetes de los caballos
17. Los profesores de las chicas
18. El dueño del gato
19. El mecánico del taller
20. El jefe del trabajador

B | APPENDIX: QUESTIONNAIRE USED IN THE CONCRETENESS STUDY IN ENGLISH

- C - C

1. The field of the elephants
2. The laboratory of the researchers
3. The playground of the boys
4. The office of the investigators
5. The clothing of the guys
6. The office of the girls
7. The uniform of the workers
8. The stave of the composers
9. The bedroom of his sons
10. The salary of the workers

- A - C

1. The meaning of the kisses
2. The size of the lilies
3. The narration of their fantasies
4. The cause of the victories
5. The frequency of the orgasms
6. The shape of the dolls
7. The appearance of the grapes
8. The weight of the stoves
9. The importance of their caresses
10. The design of the T-shirts

- Fillers

1. The pencil on the table
2. The boss of the worker
3. The welfare of his son
4. The players in the team
5. The mechanic of the garage
6. The cases for the pencils
7. The headmaster of the school
8. The results of the analyses
9. The grandson of the lady
10. The instruments of the musicians
11. The mayor of the council
12. The office of the secretary
13. The performance of the singer
14. The qualifications of the students
15. The sailors in the boats
16. The lawyer of the accused
17. The jockeys of the horses
18. The teachers of the girls
19. The owner of the cat
20. The fragrance of the perfume

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