

Processing Obviation in Spanish

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Introduction

Some Romance languages and other languages like Icelandic or Russian disallow the coreference of the pronominal subject of a complement clause and the subject of the main clause, as shown in (1):

- (1) a. *Je veux que je connaisse la verite. French: Farkas, 1992
I want that I know the truth.
- b. *Hann segir ad hann komi. Icelandic: Picallo, 1985
He says that he comes
- c. Volodja_i xočet čtoby on*_{i/j} poceloval Nadju. Russian: Avrutin & Babyonyshev, 1997
Volodya wants that.SUBJ he kissed Nadya.

In the theoretical framework of the Generative Grammar this restriction was labeled ‘Obviation’ or ‘Disjoint Reference Requirement’ (DRR) (Chomsky, 1981) and has kept this name in subsequent frameworks. Obviation occurs in very specific linguistic contexts. In Spanish, for example, in contexts like (2a) there is no such a restriction and the matrix and the embedded subjects can freely corefer, while in contexts such as (2b) DRR is obligatory:

- (2) a. Pedro_i cree que pro_{i,j} viene_{-ind}.
peter thinks.3sg that pro comes.3sg. (‘Peter thinks that he comes’)
- b. Pedro_i quiere que pro*_{i,j} venga_{-subj}.
peter wants.3sg that pro comes.3sg. (‘Peter wants that he comes’)

The same occurs in French, Icelandic or Russian and contrary to (1), the subjects are free to corefer in (3):

- (3) a. Je pense que je connais la verite. French: Farkas, 1992
I think that I know the truth.
- b. Hann veit ad hann elskar mig. Icelandic: Picallo, 1985
He knows that he loves me

c. Volodja, skazal čto on_{*ij} poceloval Nadju. |

Volodya said that he kissed.IND Nadya.

Russian: Avrutin & Babyonyshev, 1997

The most prominent difference between these sentences is that in (2a) the embedded verb is in the indicative form, while in (2b) the embedded verb is in the subjunctive mood. One of the most accepted hypotheses indicates that DRR is the result of a violation of Principle B (Chomsky, 1981). The main idea is that the subjunctive clause does not provide a free governing domain for the pronominal embedded subject and therefore, it cannot be coreferential with the matrix subject because it will violate Principle B (Picallo, 1985). The development of syntactic theory in the last decade led to a number of different proposals that seek to find an explanation for DRR.

Reuland (2001, 2011) proposes the Primitives of Binding framework (henceforth POB); the model distinguishes different modules of language for encoding anaphoric dependencies. These modules have different processing costs and they are hierarchically organized in computation: syntax > semantics > discourse. This hierarchy implies that encoding a dependency in syntax has a lower cost than a dependency that is resolved in discourse. Switching from one module to another triggers a cost in processing.

This thesis investigates a possible consequence of this approach, namely whether antecedent interference results in longer reading times while absence of antecedent interference would result in shorter reading times. The DRR syntactically restrains one possible antecedent in the sentence, as in (2b); while the absence of DRR allows for all possible antecedents present in the sentence, as in (2a). In line with the POB, we hypothesize that computing a syntactic dependency that bans one of the antecedents is less costly than choosing between different antecedents according to the discourse. In order to test this hypothesis, two self-paced reading experiments were conducted that measured Spanish speakers' reading times for different regions in a sentence.

This thesis is organized as follows. In section 1 the previous approaches to obviation are summarized. In section 2 a recapitulation of the data described in section 1 is drawn. In section 3 the POB framework is briefly explained together with supporting data from experimental research. Section 4 presents the self-paced reading experiments carried out in order to test the hypothesis briefly mentioned before. In section 5 an overview of the research made in the field

of acquisition of DRR and subjunctive is shown. Conclusions and future research follow in section 6.

1. Previous Theories on Disjoint Reference and Subjunctive

1.1. Subjunctive as Defective/Anaphoric Tense

One of the most influential approaches to subjunctive and the *Disjoint Reference Requirement* within the Principles and Parameters framework is the one developed by Picallo (1984, 1985). She claims DRR is the result of a violation of Principle B in the binding theory caused by the use of the subjunctive mood in the embedded clause. Because *tense* is proposed to determine *opacity* for binding relations only tensed clauses, thus indicative clauses, provide possible contexts for pronouns to corefer. Subjunctive is argued to be *defective* when compared with indicative forms since subjunctive forms cannot appear independently in assertive root clauses, as in (4):

(4) a. *Daniel haya llamado.

Daniel call.SUB.PERFC.3SG ('Daniel has called')

b. Daniel ha llamado.

Daniel call.IND.PERFC.3SG ('Daniel has called')

Subjunctive by virtue of being dependent for their tense specification and hence considered *defective in tense* creates a transparent domain for binding. In an embedded clause where tense is defective, the subject pronoun is not in a free position and thus coreference with the matrix subject will be a violation of Principle B.

Following Picallo (1985), it is possible to explain the contrast shown in (2), however the examples in (5) remain unexplained. In these cases the subjunctive mood is used in the embedded clauses, but the binding domain is not extended because coreference between the matrix and the embedded subject is allowed.

(5) a. pro_i Ignoraba que $pro_{i/j}$ estuviera en la sala.

pro didn't know.3SG that pro was.3SG.SUBJ in the lounge.

('S/He ignored that s/he was in the lounge')

- b. *pro*_i Dudo que *pro*_{i,j} tenga éxito.
pro doubt.1SG that *pro* will be.3SG.SUBJ successful.
 ('I ignore that he is successful')

Raposo (1985) dissociated the choice of mood from the temporal interpretation of the complement and the binding possibilities of the subject. He made a classification of E-predicates (including epistemic and declarative predicates) on the one hand, and W-predicates on the other, which includes verbs of volition, influence, permission, necessity and non-factive emotive verbs. The former group selects for a [+TENSE] operator in the embedded clause that determines the opacity effects and allows coreference. The second kind of predicates do not select a tense operator in C, which is specified as [-TENSE], making the embedded clause transparent for the binding possibilities of its subject, disallowing coreference. However, the presence or absence of [-TENSE] does not strictly correlate with the mood choice in the embedded clause. When E-predicates are negated, for example, they also select for a subjunctive clause but there is no DRR, as in (5c):

- c. Manuel_i no cree que *pro*_{i,j} gane_{-subj} la carrera.
 Manuel doesn't believe that *pro* wins.3sg the race.
 ('Manuel doesn't believe that he wins the race')

In line with this approach, Rivero (1971) and Salamanca (1981) have observed that while indicative complements do not seem to display sequence-of-tense restrictions with respect to the matrix predicate, subjunctive CPs are forced to agree in tense with the selecting verb. In (6a) any tense in the matrix clause may be combined with any tense in the embedded indicative clause; while in (6b) the tense of the embedded verb depends on the selecting verb:

- (6) a. Creo que viene/venia/ha venido/habia venido/habra venido/... (Indicative)
 (I) think.PRS that 3SG/1SG comes/was coming/ has come/ had come/ will have come...
 'I think that he came'

b. Lamenté que viniera/hubiera venido/*venga/*haya venido. (Subjunctive)

(I) regretted.PST that he came/ had come/*comes /*has come/*will come...

‘I regretted that he came’

This data supports the claim that subjunctive clauses have defective tense, and therefore they are dependent on the matrix verb, in accordance with Picallo (1985) and Raposo (1985). Nevertheless, as example (7) shows, there is no direct correlation between sequence-of-tense restriction and mood because even though the embedded clause appears in the subjunctive mood, there is no tense agreement required between the main and the embedded verb and neither DRR:

(7) Juan_i no sabía que *pro*_{i,j} tuviera/tenga/haya tenido/hubiera tenido cáncer.

John did not know that 1SG/3SG had/has/has had/had had cancer.SUBJ.

Suñer & Padilla (1987) and Padilla (1990) argue against the claim that subjunctive clauses lack tense in Spanish and reduce obviation effects to the lexical features of the selecting predicates. According to their argument, this property determines opacity of a clause, but it does not create temporal dependencies between the matrix and the embedded clauses. Padilla (1990) differentiates between *epistemic* and *volitional* verbs. On the one hand, *epistemic* verbs do not seem to impose any DRR, while *volitional* verbs do. As proposed, *volitional* verbs such as ‘want’ require a certain temporal ordering of the events in the matrix and the subjunctive clause, while *epistemic* verbs such as ‘ignore’ do not require it. This is borne out in the Spanish data; in (8a) an epistemic negative verb ‘ignore’ is used and even though it subcategorizes for a subjunctive clause Disjoint Reference is optional, while in (8b) the matrix verb is volitional (‘want’) and therefore, Disjoint Reference is obligatory.

(8) a. Juan_i ignora que *pro*_{i,j} haya ganado_{-subj}.

John ignores that *pro* has won.PERF.3sg. (‘John ignores that he has won’)

b. Juan_i quiere que *pro*_{*i/j} gane_{-subj}.

John wants that *pro* win.PRS.3sg. (‘John wants that he wins’)

Interestingly, when volitional verbs are used in the matrix clause, agreement between the tense of

the matrix and the embedded verbs is necessary. Thus, in (9a) the main epistemic verb ‘ignore’ appears in present tense while the embedded verb can appear in present perfect or in any other tense. However, in (9b) both verbs are required to agree in terms of tense. If any of the verbs had been in past tense in (9b), for example, the result would have been ungrammatical.

- (9) a. Juan ignora que *pro* ganase/ ganaría/ ganó/ hubiese ganado.
 John ignores.PRST that *pro* won-subj.IMPRF/ would won-ind.COND/ won-ind.PST/
 had won-subj.PERF.
- b. Juan quiere que *pro* *ganase/ *ganaría/ *ganó/ *hubiese ganado.
 John wants.PRST that *pro* won-subj.IMPRF/ would won-ind.COND/ won-ind.PST/
 had won-subj.PERF.

Farkas (1992) follows a rather different path from the accounts reported above. She treats obviation as a case of blocking by infinitival clauses in subject control contexts. Since Spanish, and other languages, offer the use of infinitives to encode subject dependencies, infinitives are selected over subjunctives. A potential problem for this explanation would be epistemic verbs, as those shown in (5) because they select for subjunctive also to encode subject dependencies while the infinitive is also an option.

It becomes clear that the properties attributed by Picallo (1984, 1985) to the category of subjunctive as such have to be reviewed as deriving from other factors, which crucially have to do with selectional properties of the matrix predicates, as Padilla (1990) and Padilla & Suñer (1987) proposed. Subjunctive may be essentially seen as an epiphenomenon derived from syntactic and/or semantic selection by the main predicate.

1.2. Subjunctive as Operator

Kempchinsky (1986)

Other approaches have related DRR to operator licensing. Kempchinsky (1986) proposed that subjunctive complements of *volition*, *influence* and *command* verbs are in some sense like *embedded imperatives*. In her proposal, the main predicate selects for an imperative operator in the subordinate C, which has to be identified by the subjunctive *I* head. This identification requirement is satisfied at LF in languages like Spanish by covert I-to-C movement, as

represented in (10):

(10) [CP [C₀ C_{[I₀ I [V]_i]_j]][IP NP_{[I_r e_j [VP e_i ...]]]]}}

Through this movement the subjunctive *Infl* head ends up coindexed with one of the arguments of the main predicate. This would constitute the explanation for the subject obviation effects caused by the extension of the binding domain of the embedded subject to the main clause. According to Kempchinsky, the restrictions on the sequence of tense are caused by the presence of the imperative operator, which imposes a future interpretation on the embedded event structure. Similarly, subjunctive-selecting verbs that do not belong to the volitional or directive type (negated epistemic) do not select for such an imperative operator, and consequently I-to-C movement does not apply. As a result, no effect of subject obviation or sequence of tense arises.

Avrutin & Babyonyshev (1997)

Similar to Kempchinsky, Avrutin & Babyonyshev (1997) adopted an approach based on operator licensing. In Russian, the disjoint reference requirement is similar to Spanish:

(11) a. Volodja_i xočet čtoby on_{*i/j} poceloval Nadju.

Volodya wants that_{-subj} he kissed Nadya. ('Volodya wants to kiss Nadya')

b. Volodja_i skazal čto on_{i/j} poceloval Nadju.

Volodya said that_{-ind} he kissed Nadya. ('Volodya said that he kissed Nadya')

(Examples taken from Avrutin & Babyonyshev, 1997:230)

In Russian, the subjunctive clause can only be formed with the verb in the past form (11a) while in the indicative clause there are no tense restrictions:

c. Volodja_i skazal čto on_{i/j} poceloval/celuet Nadju.

Volodya said that_{-ind} he will kiss/is kissing Nadya.

(Avrutin & Babyonyshev, 1997:230)

This might indicate that Russian fits in the analysis given by Picallo, who claims that subjunctive clauses are dependent on their matrix clauses. However, Avrutin & Babyonyshev argue that DRR

is a consequence of the violation of Principle B as a result of the co-indexation of AgrS with the embedded subject-pronoun. This proposal relies on the movement at LF of the operator “*ĉtoby*” (*that* in English and *que* in Spanish) to the complementizer position in the matrix clause where it takes scope over the two events in the matrix and the embedded clause. According to the authors, this explains the fact that the matrix and the embedded clauses are temporally ordered. Because the operator (‘that’) has moved to the a position where it also c-commands the matrix verb, the pronominal AgrS also moves and happens to be in a position where it is c-commanded by the matrix AgrS. If AgrS of the embedded clause and the AgrS of the matrix clause are assigned the same index, Principle B will be violated. On the other hand, the indicative complementizer does not rise at LF because it does not co-bind two events and, therefore the lower AgrS remains inside the embedded CP and the pronoun is locally free. This does not account, however, for sentences that subcategorize for a subjunctive clause, but allow coreference between embedded and matrix subject in Spanish. For example, see examples in (5) where negated epistemic verbs subcategorize for subjunctive. Therefore, they have to stipulate that the C selected by epistemic predicates such as ‘ignore’ or ‘not believe’, although identical in form to the C selected by volitional predicates, does not rise to the matrix V, because their subjunctive complements do not show sequence of tense restrictions or obviation effects.

Concluding, both approaches need to argue for the lexico-semantic and selectional properties of the embedding predicate: subjunctive complements of *volitional* and *command* predicates are different from those that appear with *epistemic* main predicates.

1.3 Lexical head licensing, operator head licensing and types of subjunctive

Tsoulas (1995) and Manzini (2000)

Tsoulas (1995) draws a parallelism between indefinite nominals and infinitive/subjunctive clauses on the basis of *wh*-extraction patterns: *wh*-movement out of an indefinite NP or an infinitival/subjunctive clause gives a better result than extraction of a definite NP or an indicative CP. According to him, indefiniteness derives to temporal indefiniteness and therefore, impossibility to assign a truth value to the embedded proposition. Thus, subjunctive as an indefinite Tense, needs to be licensed by a sentential operator in the main clause. Contrarily, indicative clauses do not appear in the scope of such operators.

Manzini (2000) argues that subjunctive is an indefinite T bound by an intensional operator in a head-to-head syntactic dependency. According to her, predicates like ‘want’ embed intensional operators. However, there are cases in which it is not a lexical head that licenses the presence of the subjunctive in the embedded clause, but the negation, a question operator or the conditional *if*. This explains why in (12) subjunctive is licensed in a sentence with an epistemic verb like ‘know’:

- (12) a. Non sa che io sono/sia andato. *Italian*
 He doesn’t know that I have_{-ind}/have_{-subj} gone.

Similarly if a sentence like (12a) is questioned, or a question operator is used, or it is transformed into an if-conditional clause, the embedded clause can be in indicative or subjunctive mood, as in (12b-d)¹:

- b. Sai che lui é/sia andato?
 Do you know that he has_{-ind}/has_{-subj} gone?
 c. Chi sai che é/sia andato?
 Who do you know that has_{-ind} /has_{-subj} gone?
 d. Se sai che lui é/sia andato.
 If you know that he has_{-ind} /has_{-subj} gone.

(Italian: Manzini, 2000)

According to Manzini (2000), subjunctive morphology constitutes the spell-out of such a T-dependency. In the absence of such dependency T is spelled out as an indicative.

In accordance with Tsoulas’ argument that indefiniteness derives to temporal

¹ In Spanish similar observations can be made:

- | | |
|---|---|
| <p>a. No sabe que me he ido_{-ind}/ haya ido_{-subj}.
 Doesn’t he know that I have_{-ind/-subj} gone.</p> <p>b. ¿Sabes que se ha ido_{-ind} / haya ido_{-subj}?
 Do you know that I have_{-ind/-subj} gone?</p> | <p>c. ¿Quién sabe que se ha ido_{-ind} / haya ido_{-subj}?
 Who knows that he has_{-ind/-subj} gone?</p> <p>d. Si sabes que se ha ido_{-ind}/ haya ido_{-subj}.
 If you know that he has_{-ind/-subj} gone.</p> |
|---|---|

indefiniteness and therefore, it is not possible to assign a truth value to the embedded proposition, Manzini shows the difference between the indicative and subjunctive embedded propositions in (12b) repeated here in (13):

- (13) Sai che lui *é/sia* andato?
Do you know that he *has_{-ind}/has_{-subj}* gone?

When the embedded clause in (13) is in the indicative form the truth of the embedded sentence is still presupposed and the interpretation would be “He has gone. Do you know this?”, On the other hand, if the embedded clause is in subjunctive in (13), the truth of the embedded sentence is no longer presupposed and the interpretation would be: “Has he gone, as far as you know?”. The same occurs under negation in (12a) and with the conditional in (12d).

Like other syntactic dependencies, Manzini points out that subjunctives are sensitive to islands and parasitic gap-like configurations. In (14) a question operator and conditional *if* do not license subjunctive inside an adjunct:

- (14) a. E' andato perché *é/ *sia* stanco?
Has he gone because he *is_{-ind}/is_{-subj}* tired?
b. Se *é* andato perché *é/ *sia* stanco...
If he has gone because he *is_{-ind} /is_{-subj}* tired.

Because of this, Manzini argues that there is a dependency between the operator and the subjunctive T that is sensitive to islands. Long distance reflexivization and obviation effects are argued to rest on the presence of the syntactic dependency established by the subjunctive.

This approach, however, does not differentiate between the dependency of a subjunctive clause licensed by a negation operator and a subjunctive clause licensed by a predicate of volition or command. Therefore, the fact that only a predicate of volition or command causes DRR remains unexplained. Moreover, it has been shown that only subjunctive clauses selected by a predicate of volition or command predicates show sequence of tense restrictions. It is then expected that the kind of dependency that is found with subjunctives licensed by operators is not the same as the dependency found with subjunctives licensed by the matrix predicate.

Kempchinsky (2009)

More recently, Kempchinsky (2009) incorporates lexical factors into Bianchi (2001)'s obviation approach in terms of *logophoricity*. The main idea is that complements to *desideratives* and *directives* are characterized by the presence of a *modal operator* in the head of the clause. This modal operator is motivated by the fact that complements to volitional and command verbs are *embedded imperatives*. According to Portner (2005), *imperatives* represent possibilities on a so-called *to-do-list* of the addressee, which means that the external argument of the predicate can be everyone but the speaker. To put it simply, *complements to desideratives* are referent to anyone but the matrix subject (Kempchinsky, 2009:1788). The argued semantic parallelism between imperatives and complements of verbs of command or volition is that they denote events or state of affairs that are not obtained in the actual world at the moment of speaking:

(15) a. Yo quiero que *pro* baje a la calle.

I want that *pro* goes_{3SG-SUBJ} to the street. ('I want that he goes out to the street')

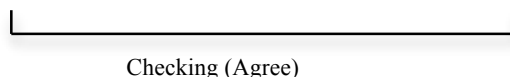
b. El jefe insiste en que *pro* enseñe la clase.

The boss insisted that *pro* shows_{3SG.SUBJ} the classroom.

('The boss insists that s/he shows the classroom')

In Bianchi's analysis, imperatives orient to an external logophoricity center, which is located in a Fin head and links to the event of speaking (world of the speaker). Complements of desiderative predicates orient to an internal logophoricity center, which establishes a subordinate cognitive state that corresponds to the perspective of the internal speaker (perspective of the matrix subject). Kempchinsky assumes that the quasi-imperative operator proposed is located in the Fin head of the subjunctive CP. Thus, obviation in subjunctive complements of predicates of *volition* and *command* is due to the role that the quasi-imperative subjunctive operator plays in the interpretation of the subject pronoun. The lexical selection for a subjunctive complement is expressed as an *uninterpretable* W-feature in Force, just as a *wh*-feature when an interrogative is selected. This feature must be checked and deleted. To summarize, the complex head [[[V]T]M] in Mood checks, via Agree, the uW feature in Force:

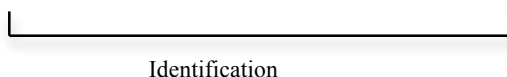
(16) ...V_w [CP [ForceP Force[**uW**] [FinP [Fin **OP**] [IP (DP) [MoodP [V+T+M_w] [TP T[VP V...]]]]]]]]



Thus, intensional predicates lexically select for subjunctive complements that introduce future worlds. An internal logophoric center establishes a subordinate cognitive state that corresponds to the perspective of the internal speaker, generally the matrix subject. Because this is a consequence of the semantics of the matrix verb, the selectional relation triggers the presence of W. Therefore, according to Kempchinsky, W itself is uninterpretable in (16) and must be checked.

In (17), however, the shift is only made visible by the *subjunctive* mood itself, there is no lexical selection and thus, the relation between W in Force and the mood phrase is not checking, only identification.

(17) ...V [CP [ForceP Force[**w**] [FinP +Fin [IP (DP) [MoodP [V+T+M_w] [TP T[VP V...]]]]]]]]



Because there is no operator that restricts the linking of the two subjects, subjunctive complements to negated epistemic causes a shift in the model, represented by the interpretable W feature in Force, but do not show obviation effects. This is why disjoint reference effects holds in the complements of verbs of command and volition, but does not hold in complements of epistemic negated predicates.

Summarizing, subjunctive complements are characterized as embedded imperatives and they correspond to the perspective of the *matrix subject*. In this light, Kempchinsky suggests that when subjunctive is the default option but not selected, such as subjunctive complements of a negated epistemic verb, this refers to the world of the matrix subject. But when indicative mood is used, the speaker evaluates the context. Therefore, it is pragmatically odd when an indicative complement is taken by a negative epistemic verb whose subject is the speaker:

(18) a. #El decano no cree que los estudiantes merecen el premio.

The dean does not believe the students deserve_{3SG.SUBJ} the prize.

However, this is not so easy to establish, since there are examples in Spanish with negated epistemic verbs that use indicative embedded clauses and are felicitous. For example, see (18b) and (18b'')

b. El decano no sabía que tenía cáncer.

The dean did not know that *pro* had_{3SG.IND} cancer

b'. El decano no sabía que tuviera cáncer.

The dean didn't know that *pro* had_{3SG.SUBJ} cancer.

If Kempchinsky's approach is taken, we need to assume two separate entries in the lexicon for the predicates in (18b) and (18b') depending on whether they take an indicative or a subjunctive complement. We do not want to assume, however, that there are different lexical entries for verbs that might select for both, indicative and subjunctive, when they are negated.

Moreover, it does not seem easy to argue that in (18b) the context is evaluated by the world of the speaker, while in (18b') it is evaluated by the world of the matrix subject. Finally, according to this analysis it is necessary to assume that the proposed W-feature is uninterpretable when the subjunctive clause is lexically selected, but interpretable when it is optional. This, however, seems to be an irrelevant assumption, since the element that blocks referentiality is the operator which is only present in *desiderative* and *intensional* predicates. This will be further discussed below.

Quer (1998, 2001, 2009)

According to Quer (2009), the polarity approach to mood has been pursued in a number of syntactically oriented studies. The foundations of such approaches can be sought in Stowell's (1993) theory of tense. Stowell argues that sequence of tense phenomena has to be understood as a consequence of the polar properties of tense. Subjunctive clauses have to remain necessarily in the scope of its licenser, yielding a narrow scope effect; while indicative CPs have to undergo LF movement in order to get out of the scope of an intensional operator. This approach distinguishes two types of subjunctives: subjunctive lexically selected by a strong intensional predicate and subjunctive licensed by a clausal operator like negation, already mentioned above. Stowell (1993)

calls them Intensional Subjunctive and Polarity Subjunctive, respectively. Quer (2006) shows the properties of each type of subjunctive and they will be briefly summarized here.

Intentional subjunctive, which is the subjunctive selected by an intensional matrix verb (volitional verb), can only be selected in the immediately selected clause as in (19a), it does not alternate with indicative mood, as in (19b) and it displays sequence-of-tense restrictions as in (19c) and subject obviation effects (19d):

- (19) a. Quieres que creamos que tienes/*tengas razón.
 ‘You want us to believe_{.SUBJ} that you are_{.IND/*SUBJ} right.’
- b. Quieres que creamos/*creemos que tienes razón.
 ‘You want us to believe_{.SUBJ/*IND} that you are_{.IND} right.’
- c. Quieres que creamos/*creyéramos que tienes razón.
 ‘You want us to believe_{.PRS.SUBJ / *PST} that you are_{.IND} right.’
- d. Quieres que creamos/*creas que tienes razón.
 ‘You want us/*you to believe_{.SUBJ.1PL/*2SG} that you are_{.IND} right.’ (Quer 2009: 1781)

Polarity subjunctive, which is the one licensed by an operator such as negation or question, can be licensed in consecutively embedded domains as in (20a), it can alternate with the indicative mood as in (20b), it does not show sequence of tense restrictions (20c) and it does not show subject obviation effects as in (20d):

- (20) a. No piensa que creas que tienes/tengas razón.
 ‘S/he does not think you believe_{.SUBJ} that you are_{.IND/SUBJ} right.’
- b. No piensa que creamos/creemos que tienes razón.
 ‘S/he does not think you believe_{.IND/SUBJ} that you are_{.IND} right.’
- c. No piensa que creamos/ creyéramos que tienes razón.
 ‘S/he does not think you believed_{.IND/SUBJ} that you are_{.IND} right.’
- d. No piensa que crea realmente que tienes razón.
 ‘S/he_i does not think s/he_{i/j} really believes_{.SUBJ} that you are_{.IND} right.’
- (Quer 2009: 1781)

Hence, DRR only appears with verbs of volition and command, while subjunctive clauses selected by negated epistemic do not show DRR with the subject of the matrix clause. It is clear

that this is not a property of the subjunctive mood itself, but it is a property of the selecting verbs for the subjunctive clauses.

Quer (1998) points out that intensional subjunctive also surfaces in at least one type of adjunct clauses: purpose adjuncts. It seems that when ‘para que’ (‘in order to’) is used, the same effects are observed when intensional subjunctive is used in the subordinate clause. (21a) shows that the use of the indicative mood is not allowed and there is obligatory DRR; while (21b) shows tense agreement is also needed.

- (21) a. Llama para que *pro**_{i/j} la ayudes._{subj}/**ayudas*._{ind}.
pro call._{3SG.PRS} in order that *pro* ACC-cl help._{2SG.PRS}.
(‘Call her in order for you to help her’)
- b. *Llama para que la ayudases.
pro calls._{3SG.PRS} in order that *pro* ACC-cl help._{2SG.PAST}.

In Italian this property also extends to adjunct sentences introduced by prepositions. Thus, rationale “perché” (‘in order that’) selects for subjunctive, while causal “perché” (‘because’) selects the indicative (Manzini, 2000):

- c. Vado perché tu vieni.
I go because/ *in order that you come._{ind}.
- d. Vado perché tu venga.
I go in order that/ *because you come._{subj}.

The use of the purposive complementizer ‘para que’ or ‘perché’ can be linked to the use of volitional predicates. This might explain the appearance of DRR, which would support the idea that DRR is caused by the properties of verbs of volition or command as mentioned. Moreover, Quer (1998) also indicates that other examples in Spanish show that the intensional subjunctive is also selected cross-categorically in the complements taken by a head that encodes volition, such as in:

- (22) a. El deseo de que vuelva-subj.
 The wish of that *pro* come-back.3SG. ('The wish that s/he comes back')
- b. Deseoso de que vuelva-subj.²
 Eager of that come-back.3SG. ('Eager for her/him to come back')

After reviewing some of the most important proposals in the previous literature it becomes clear that the original association of subjunctive clauses with lack of tense and DRR developed in Picallo (1985) faces some unresolved empirical problems. However, there remains the possibility of distinguishing different sorts of subjunctive clauses and restraining tense constraints and obviation effects to the group of subjunctive complements embedded under *volitional* and *command* predicates.

1.4. Subjunctive: incompatible with *De se* reading

Constantini (2005a, 2006, 2009) reformulates the Disjoint Reference Requirement in terms of “un-availability of first-person interpretation”. This notion was originally discussed by Castañeda (1968) and it was referred to as ‘*de se* reading’ by Lewis (1979). According to Constantini, the matrix subject counts as a ‘attitude bearer’ and an order or request expresses a certain sort of will (2006). For Constantini obviation relies on two requirements. First, ‘obviative subjunctives’ are part of the class of sentential arguments whose properties depend on the time sequence of the attitude bearer. Second, obviation occurs only in sentences in which the *de se* reading is not possible. An example for a *de se* reading would be the following: there is a scenario where there is a certain warrior who suffers from amnesia. He is reading stories about the wars he fought in and he also reads about a certain warrior who did heroic deeds. Without realizing that that warrior was himself, he says: “That warrior is a hero”. In such a scenario, (23a) can be considered to be true while (23b) and (23c) cannot be true:

- (23) a. The warrior thinks he is a hero.
 b. The warrior thinks that he himself is a hero.
 c. The warrior thinks himself to be a hero.

² Examples from Quer (1998: 42).

Since (23b) and (23c) presuppose that the warrior consciously knew that he is reading about himself, they are not true in such a scenario, i.e. the *de se* interpretation is not possible. However, if the warrior did not suffer from amnesia, then all three sentences would be felicitous.

Higginbotham (1992) notices that the null-PRO subject of infinitival clauses introduces a *de se* interpretation, as in (24).

(24) The warrior expects to be a hero.

The warrior_i expects PRO_i to be a hero.

Therefore, obviation is the “property of being a syntactic structure unable to support [...] the *de se* [...] interpretation” (Constantini 2005a: 115). On the other hand, subjunctives and infinitives that are non-obviative are syntactic structures that support the *de se* reading.

Based on the distribution of long distance anaphora by Giorgi (2004), Constantini argues that the *de se* interpretation obtains if and only if an unsatisfied position is theta-identified with the agent of the context (2009:108). The interpretation of the null subject of an infinitive clause, PRO, is compatible with an “unsatisfied position”. This accounts for the fact that infinitival clauses give a *de se* interpretation straightforwardly and PRO is theta-identified with the bearer of the attitude. Subjunctive clauses, on the other hand, cannot be *de se* interpreted. Small *pro* does not spell out an unsatisfied position. A *de se* reading can only be achieved if an “unsatisfied position” occurs.

This approach leads to the conclusion that the small *pro* also present with subjunctive selected by an operator such as negation or a question marker, i.e. epistemic negated verbs, cannot be coreferent with the matrix subject because small *pro* does not spell out an “unsatisfied position” in Constantini’s words. Nevertheless, as shown in the previous section, subjunctive selected by an operator does not show DRR.

Constantini (2009) also shows that obviation is sensitive to the nature of the matrix predicate. Even though it seems that obviation is less strict in Italian than in Spanish, i.e. it occurs in sentences with epistemic matrix predicates and subjunctive subclauses, it becomes weak with emotive-factive verbs:

- (25) a. Gianni si rammarica che *pro*_{i/j} debba partire domain.
 Gianni regrets that *pro*_{i/j} must_{3SG.SUBJ.PRES} leave_{.INF} tomorrow.
 ‘Gianni regrets that he must leave tomorrow’

Similarly, obviation does not occur with emotive-factive predicates in other languages:

- b. *pro* Pentien que *pro* deguessin produir una falsa impressió.
pro Regretted that *pro* must_{3SG.SUBJ.PRS} produce a false impression.
 ‘They regretted they had to produce a false impression’ (Catalan: Picallo, 1985)

- b. *pro* Espero que *pro* pueda ir.
 Pro Hope that *pro* can_{3SG.PRS.SUBJ} to go.
 ‘I hope to be able to go’ (Spanish: Quer, 2006)

Obviation is also weakened in other contexts such as sentences with modal verbs (26a), passive sentences (26b), sentences with non-agentive verbs (26c) and conditional sentences with an adverb (26d):

- | | | |
|-----------------------------|--|--------|
| (26) Modal: | a. Je veux que je puisse partir.
I want that I can _{SUBJ} leave.
I want that I can leave. | French |
| Passive: | b. Je veux que je sois aurisé à partir tôt.
I want _{.1SG} that I be _{.1SG.SUBJ} authorize.
I want that I am authorized to leave early. | |
| Non-agentive verb: | c. Je veux que je guérisse aussi vite que possible.
I want that I heal _{.1SG.SUBJ} as fast as possible.
‘I want that I recover as soon as possible’ | |
| <i>Conditional+adverb</i> : | d. Je voudrais bien que je parte tôt.
I want _{.1SG.COND} well that I leave _{.1SG.SUBJ} early.
‘I would like that I leave early’ | |
- (Farkas 1992:88)

Further assumptions would be needed to explain these examples and the sentences where subjunctive is licensed by a negation or a question operator.

1.5. DRR in terms of Control

Feldhausen (2007) argues that obviation is an effect that directly relies on the control properties of the matrix predicate. He argues that control is not limited to infinitival complement clauses but also shows up in finite clauses. While control leads to an obligatory identification of two elements, obviation leads to *non-control*, i.e. a disjoint reference of the two elements.

Based on Stiebels (2007), he establishes four different classes of predicates according to their control properties: *strong inherent control predicates*, *weak inherent control predicates*, *structural control predicates*, and *marked inherent control predicates*. First, *strong inherent control predicates* are verbs which only take an infinitival complement and never a subjunctive, e.g. *amenazar* ('threaten'), *estimar* ('consider'), *probar* ('try'). Second, *weak inherent control predicates*, which allow for control, but no obviation appears, e.g. *prohibir* ('forbid'), *agradecer* ('thank'). Third, *structural control predicates* are those which allow for infinitives and subjunctives but the finite mood does not show control and obviation is not obligatory, e.g. *dudar* ('doubt'). Finally, the *marked inherent control* predicates only subcategorize for subjunctive and not infinitives, e.g. *gritar* ('gritar').

In this classification, the verbs that select for both infinitives and subjunctives do not fall into one single class and they are to be found in the class of weak inherent control and structural control. Obviation can only occur with *structural control verbs* because this is the only class that licenses for infinitival and subjunctive sentential arguments but in which the latter do not show obligatory control. However, the class of structural control is not homogeneous. Within this class, there are verbs which show obviation (*volitional* verbs and *psych* verbs) and verbs that do not show obviation (verbs of *doubt* and *denial*).

Feldhausen's proposal supports the idea that there is a dependency between the matrix and the embedded clause for obviation and non-obviation to occur. While only in control-inducing structures argument identification is obligatory, in control-neutral structures argument identification is not obligatory. However, not all predicates belonging to the structural control predicates show obviation. This is what is left over from Feldhausen to be taken up by future

approaches to obviation.

1.6. Recapitulation

In conclusion, the approaches proposed so far to explain obviation need a distinction between volitional predicates (like *want*, *wish* and *desire*) and verbs of *doubt* and *denial* (like *doubt*, *not believe*) which can select for subjunctive clauses, but do not show DRR. Other verbs such as factive-emotive verbs can also select for subjunctive clauses, but do not show obligatory subjunctive. Certain communication verbs also differ depending on their meaning: they select for indicative when they have the epistemicity meaning and they select for subjunctive when they have the interpretation of a command verb:

(27) a. Dice que viene.

pro says that s/he is coming_{3SG.IND.} ('He says that he is coming')

b. Dice que vaya.

pro says that s/he comes_{3SG.SUBJ.} ('He orders him to go')

Cross-linguistically, there are differences between languages. For example, unlike other epistemic verbs such as *saber* 'to know', belief predicates in Italian, i.e. *credere* or *pensare* ('to think') select for the subjunctive and not for the indicative as in Spanish.

(28) a. Credo che lei sia/*è stanca.

Italian

'I think she is_{SUBJ}/*SUB tired.'

b. Dice che lei è /*sia stanca.

'S/he says she is_{IND}/*SUBJ tired.'

(Quer 2009:1783)

In other languages like Greek and Romanian, the subjunctive can be used with volitional main predicates. However, in these cases there are no sequence-of-tense restrictions between the predicates. There is no dependency between the clauses in these languages, while such a dependency exists in languages like Spanish, Catalan or Italian. Moreover, it seems that epistemic predicates also license subjunctive even though this is not negated:

(29) Pisté vonaminfijinoíris.
 ‘I think s/he won’t leave soon.’

Greek
 (Quer 2009:1785)

The cross-linguistic differences show there is no common use of the subjunctive mood across languages, some languages allow subjunctive clauses with epistemic predicates and others do not. This is why subjunctive cannot be taken as the main cause for obviation, but rather as an epiphenomenon. However, languages that show sequence of tense restrictions among clauses use obligatorily the subjunctive mood in the embedded clause. This shows that whenever there is a “strong” dependency between clauses, the subjunctive is selected and DRR occurs. In languages where there is no such requirement for tense agreement across clauses, there is no syntactic dependency, and therefore no requirement about reference.

2. DRR in Spanish

The review drawn in the last section shows that despite the differences and assumptions, significant new insights are broadening our understanding of the distribution of subjunctive and the interpretation of the Disjoint Reference Requirement. This section will present a review of DRR by leveraging all the data described above.

2.1. Factors for DRR: Volitional verbs and tense agreement

Taking into account the data described in the previous section, we propose that the distribution of DRR in Spanish can be represented as in Figure 1:

Figure 1. Linguistic context for Disjoint Reference Requirement in Spanish

A. Epistemic	B. Epistemic with negation	C. Epistemic Inherently Negative	D. Volitional
Indicative Mood	Indicative/Subjunctive Mood	Subjunctive Mood Obligatory	Subjunctive Mood obligatory
No Tense Agreement (TA)	No TA	No TA	Tense Agreement
No Obviation or DRR required	No DRR	No DRR	Obligatory DRR

First, *affirmative epistemic* verbs such as ‘to think’ or ‘to know’ do not subcategorize for subjunctive mood, there are no sequence-of-tense restrictions between the matrix and the embedded verb and DRR does not occur. Hence the subject in the embedded clause can be coreferential with the matrix subject as in (30a):

- (30) Pedro_i cree que *pro*_{i,j} viene/ vendrá/ vino/ había venido._{ind.}
 peter thinks that *pro* comes/will come/came/has come.
 (‘Peter thinks that he comes, etc.)

In the case of *epistemic verbs with negation* like ‘not to know’, the embedded clause can appear in the indicative or subjunctive mood. There are no sequence of tense restrictions nor DRR:

- (31) a. Pedro_i no sabe que *pro*_{i,j} come-_{ind}/ comió-_{ind}/ ha comido-_{ind}/ coma-_{sub}/ haya comido-_{sub}/
 peter doesn't know that *pro* eats/ ate/ has eaten/ eats/ had eaten/ would have eaten/
 hubiera comido-_{sub}/ comiese-_{sub} saltamontes.
 would eat grasshoppers.
 (‘Peter doesn’t know that s/he eats/ate/has eaten/ had eaten/etc. grasshoppers’)

The same occurs when a question operator triggers the subjunctive mood. Thus, if the negative or the interrogative is eliminated, the use of the subjunctive mood results in an ungrammatical structure and only the indicative is allowed:

- b. ¿Recuerda que Miguel trabaje-_{subj}?
 remember.PRS-3sg that Miguel works.PRS-3sg?
 ‘Does s/he remember that Miguel work?’
 c. *Recuerda que Miguel trabaje-_{subj}.
 remember.PRS-3sg that Miguel works.PRS-3sg
 ‘S/he remembers that Miguel works’

Third, *epistemic verbs which are inherently negative*, i.e. verbs that inherently express a negative action like ‘to ignore’ or ‘to doubt’ without overt *not*, subcategorize for a subjunctive embedded

clause obligatorily³. However, there is no tense agreement required between matrix and embedded verb and DRR is optional:

(32) El mono_i desconoce que *pro*_{i,j} patee/ pateara/ patease/ hubiera pateado/ haya pateado_(-subj) la bola bien.

The monkey ignores that *pro*-3sg kicks/ kicked/ had kicked/ has kicked the ball well.

(‘The monkey ignores that s/he kicks the ball’)

Finally, when the matrix verb is *volitional* or *desiderative*, the subcategorization for subjunctive mood is also obligatory, but in this case, tense agreement is crucial and DRR occurs.

(33) Pedro_i quiere que *pro*_{*i,j} apruebe/ *aprobara/ *aprobase/ *haya aprobado/*aprobere/ _(-subj) el examen.

Peter wants-3sg that *pro* passes/ passed/ has passed/will pass the exam.

(‘Peter wants that s/he passes the exam’)

Summarizing, it seems that both the lexical type of verb and the sequence of tense restrictions between the matrix and the embedded verb affect the requirement of disjoint reference in Spanish. If this is the right classification for Spanish epistemic and volitional predicates, Kempchinsky’s theory will need to make a complicated distinction between the four categories identified above⁴. On the one hand, epistemic predicates without negation, which require the use of the indicative mood, will not have any W-feature. Epistemic predicates with negation accept the use of indicative and subjunctive mood although DRR is not required. Under Kempchinsky’s approach, we will need to assume that epistemic verbs with negation might or might not have W-feature, which will only be required when the subjunctive mood is selected. Inherently negative epistemic predicates will have interpretable W-feature; and finally, volitional and desiderative predicates

³ Quer (1998) points out that some exceptional examples, like sentences with the negated epistemic verb ‘negar’ (deny) have shown possible selection for the indicative mood. However, I argue this is infelicitous for Spanish speakers:

a. #Niega que Miguel ha acabado-**ind** la tesis. b. Niega que Miguel haya acabado-**subj** la tesis’.

S/he denies that Miguel has finished the thesis. S/he denies that Miguel had finished the thesis.

⁴ Kempchinsky claims that subordinate clauses with subjunctive mood have a W-feature which is uninterpretable with desiderative and intensional verbs, but it is interpretable with negated epistemic predicates.

will need an uninterpretable W-feature. This approach requires at least three assumptions: there is such a feature as W-feature when the subjunctive mood is used; this can be interpretable or uninterpretable depending on the main predicate; and some verbs might or might not have it depending on the type of mood they subcategorize for. A double-entry analysis for each verb that displays this behaviour clearly misses an insight into the workings of DRR.

Making a difference between two types of subjunctive (*intensional* and *polarity* subjunctive) as in Quer (1998) is not clearly motivated. Why should there be two types of subjunctive? Regarding the data described above subjunctive seems to be epiphenomenal and it is not the cause for the DRR, thus, a distinction between two types of subjunctives does not seem to be a solution. In the approaches suggested by Manzini (2000), Padilla (1990), Kempchinsky (2009) and Quer (1998) it is clear that there is a distinction between epistemic verbs and volitional verbs. Contrary to epistemicity, volitionality requires that the subject in the embedded clause does not refer to the subject in the matrix clause and there is a dependency of tense agreement between the matrix and the embedded verb. This requirement does not exist in other contexts where the subjunctive mood is used. It also does not exist in other languages where volitional verbs also select for subjunctive clauses, but there are no sequence-of-tense restrictions.

The approaches proposed by Feldhausen and Manzini support the idea that there is a certain dependency between the main clause with a volitional verb and the subjunctive embedded clause as well as there is a dependency between the main clause with an epistemic verb and the subjunctive clause. Nevertheless, the difference between these dependencies is not clearly explained.

Derived from the binding theory as developed by Reuland (2001, 2011) I argue that the dependency between two clauses found in those sentences where DRR happens, i.e. whose main predicate is volitional in Spanish, is computed differently than those sentences in which there is no DRR, i.e. whose main predicate is epistemic in Spanish. This affects the number of possible antecedents for an embedded *pro*, which consequently affects processing. DRR becomes the result of the different modules in which dependencies are encoded. This will be discussed in detail in the following sections.

3. The Primitives of Binding Framework perspective

3.1. Introduction to The POB framework

Reuland (2001) ‘Primitives of Binding Framework’ (POB) presents a comprehensive framework in order to explain the use of anaphora across a large number of languages. The proposal is built partially on the proposal of Reinhart and Reuland (1993) and on the minimalist program (Chomsky, 1995). According to Reuland, referential dependencies can be resolved in different modules of language: binding reflexives is computed in the *syntactic module* through A-chain formation, binding pronominals is done in the *semantic module* and coreferring pronominals is a relation encoded in the *discourse module*. Reuland (2001) uses feature checking and chain composition as in Chomsky (1995).

In the Dutch examples in (34) we can see that (34a) requires a complex anaphor, i.e. a SELF anaphor, while (34b) does not require it.

- (34) a. Oscar haat *zichzelf***zich*.
Oscar hates himself
b. Oscar gedraagt *zich*.
Oscar behaves SE

In order to express the reflexive interpretation in Dutch, i.e. Oscar x (x hates Oscar), the reflexive form *zichzelf* is required. This reflexive marker triggers a syntactic process and it transforms the transitive verb into a reflexive verb. However, if the predicate is lexically reflexive, the simplex anaphor, namely *zich* is used instead, as in (34b). In (34b), pronominal *hem* would derive to an ungrammatical result, while *zich* does not. This is because (*Oscar*, *zich*) form a chain which is violated if *hem* is used instead. According to Reuland (2001) the Chain Condition requires that the head be fully specified for ϕ -features (person, gender, number and structural Case). Here, *hem* is fully specified for ϕ -features and therefore, the Chain Condition would be violated because it clashes with the properties of the head. Since *zich* is only specified for person, but not for gender or number, there is no violation of the Chain Condition. Summarizing, encoding by a strictly syntactic process, encoding by lexical properties of the verb and encoding by a reflexive marker is possible if A-chain formation is allowed.

Unlike reflexives, pronominals cannot be encoded through chain formation in the syntactic module of language since that would violate the Chain Condition due to the fully specified ϕ -features of pronouns. Thus, interpretive dependencies of pronouns are encoded at the semantic or the discourse level (Reuland, 2001). In (35a) the pronoun *him* is bound in the semantic module by the quantifier *everyone*. In (35b) the dependency of the pronoun *he* is encoded at the discourse level, *John* is the discourse topic.

- (35) a. Everyone thought that Mary would choose him.
b. John fell off the bike. He went to the hospital.

According to the POB (Reuland, 2001, 2011), the sources of referentiality have different processing costs: an anaphoric dependency enters the syntactic module, which results into an A-chain formation. After finishing this operation, the syntactic module sends the output to the semantics module where variable binding takes place. Finally, the semantics sends the output to the discourse module in which coreference occurs. Accordingly, there is a hierarchy of resources used in computation: syntax > semantics > discourse. This hierarchy implies that encoding a dependency in syntax has a lower cost than resolving a dependency in discourse. Switching from one module to another results in an extra cost in processing.

3.2. Supporting experimental data

Koornneef (2008) tested in an eye-tracking experiment the online resolution process of the Dutch simple reflexive ‘*zich*’ by Dutch adults. The online resolution process was tested in two different constructions: one in which ‘*zich*’ constitutes the reflexive argument of the verb, and another one in which ‘*zich*’ is used “logophorically”. Results show that the logophoric use of ‘*zich*’ elicited longer reading times. According to the author, ‘*zich*’ requires a higher processing load when it is used “logophorically” than when it is used as a coargument reflexive. This suggests that a dependency encoded in the discourse module has a higher cost than a dependency that is encoded in the semantics module.

Koornneef (2008) also tested if dependencies established through binding in semantics, were preferred to dependencies created through coreference in discourse. He presented two stories to the participants with an ambiguous pronoun ‘*he*’ which could have potentially two

antecedents: a quantificational expression like “every worker” or a referential expression like “Paul”. The context preceding the sentence elicited one interpretation or the other. Results show that during the later stages of processing, in second-pass measure, the reading times were longer when the coreference interpretation was elicited by the context. The reason for these results might be considered to be the fact that both semantics and discourse are available as sources of referentiality, and this means that semantics is also checked when the context is discourse biased, but the dependency is resolved in discourse.

This interpretation predicts that in a context where the semantics module is not accessible, there will be no difference in reading times, because the discourse source will be the only one to check.

Koornneef (2008) also tested this hypothesis in a follow-up experiment, in which he controlled for the complexity of the antecedent and compared reading times of pronouns with referential expressions as antecedent in both c-commanding and non c-commanding domains. Results show that when the antecedent is in a no c-command domain, thus the dependency has to be established obligatorily in discourse, the reading time was longer than when the dependency was created through binding. According to the author this implies that readers first consider the binding source in order to create a dependency even though this could only be created in discourse. Participants consider the semantics source of referentiality before computing a pronominal dependency in discourse.

These results also support the idea that there is a hierarchy of referentiality sources that results from a difference in processing costs.

4. The POB and the Disjoint Reference Requirement

4.1. Processing dependencies with volitional and epistemic predicates

Coming back to the Disjoint Reference Requirement, in line with the POB framework I argue in this thesis that an anaphoric dependency between the (covert) pronoun/subject in the embedded clause and the external argument in the main clause with a *volitional verb* is blocked in *syntax*. The properties of a sentence with a main volitional predicate shows that this complex sentence is an A-chain domain. Using a barriers-style syntax for reasons of exposition, an A-chain is any sequence of coindexation headed by an A-position that satisfies “antecedent government”, which

means that all coindexed links are c-commanded and there is no barrier between them (Reuland, 2011: 102). The reasons to argue that a complex sentence with a volitional main predicate constitutes an A-chain domain, i.e. there is no barrier between the two subjects in the sentence, are the following. Firstly, there are sequence-of-tense restrictions between the main and the embedded verb as it is shown in (36a), as argued by Picallo (1985), Manzini (2000) and Feldhausen (2007).

- (36) a. Pedro quiere que *pro* venga-subj/ *fuera-PST.IMPF.SUBJ/ *fuere-FUT.SUBJ/ *hubiera ido-PERF.SUBJ
 Peter wants.3sg that pro comes.3sg/ came/ would come/would have come.SUBJ

This leaves the non-anaphoric interpretation as the only possible interpretation, as seen in (36b). An A-chain between *pro* and its antecedent would clash with the ϕ -features of the antecedent. In accordance with the POB, this leads to a cancelled derivation in the sense of Chomsky (1995); consequently also binding *pro* by the matrix subject and coreference by the latter are blocked.

- b. Pedro_i quiere que *pro*^{*i,j} venga.
 Peter wants._{3SG} that *pro* comes._{3SG.SUBJ}. ('Peter wants that he comes')

Because the clauses in the sentence are syntactically dependent, the subjunctive mood needs to be used obligatorily, see (36c).

- c. *Pedro quiere que *pro* va.
 Peter wants._{3SG} that *pro* comes._{3SG.IND}.

Moreover, due to this syntactic dependency between the two clauses the subjunctive needs to be selected immediately in the clause, as shown in (36d).

- d. Pedro quiere que creamos que *pro* tienes/ *tengas razón.
 Peter wants that we believe that (you) are._{3SG.PRS.IND}/ *are._{3SG.PRS.SUBJ} right.

These facts show that the sentences in (36) constitute an A-chain domain, i.e. the A-position of

the embedded subject satisfies “antecedent government” and there is no barrier between the two subjects in the clause. Due to this strong dependency between the two clauses, an A-chain between *pro* and its most local antecedent would clash with the ϕ -features of the antecedent because *pro* is fully specified for ϕ -features and therefore, the Chain Condition would be violated because it clashes with the properties of the head. The only possible interpretation is the non-anaphoric interpretation of *pro* with the subject of the volitional predicate.

On the other hand, an anaphoric dependency between a DP in the external argument position of an embedded clause and the external argument of the main clause with *an epistemic verb* is encoded in *discourse*. In this case, the reader can decide whether to corefer the subjects, i.e. the anaphoric interpretation, or not to corefer the subjects, i.e. the non-anaphoric interpretation. This depends on the discourse context. The properties of a sentence with a main epistemic predicate shows that this complex sentence does not constitute an A-chain domain. As mentioned, an A-chain is headed by an A-position that satisfies “antecedent government”, i.e. all links are c-commanded and there is no barrier between them. The reasons to argue that a complex sentence with an epistemic main predicate does not constitute an A-chain domain, i.e. there is a barrier between the two subjects in the sentence, are the following. Firstly, there are no sequence-of-tense restrictions between the verbs in the main and the embedded clause, as (37a) shows. As expected, there is nothing that rules out coreference, i.e. there is no cancelled derivation, between both subjects (37b)⁵.

(37) a. *pro* No piensa que creamos/ creyéramos que tienes razón.

He doesn't think that (we) believe_{2PL.PRS}/believed_{2PL.PST} that you are right.

b. Pedro_i cree que *pro*_{i,j} viene.

Peter thinks_{3SG} that *pro* comes_{3SG.IND}. (‘Peter thinks that he comes’)

As expected, the use of the subjunctive mood is optional when an operator such as a negation operator or a question operator licenses the subjunctive:

⁵ These facts are related to the English cases pointed out by Reinhart (1983) shown in (a) where *him* must admit ‘Bill’ as its value, and thus, coreference between ‘Bill’ and *him* is allowed even though binding the pronoun by ‘Bill’ would be out.

a. I know what Mary and *Bill* have in common. Mary adores *him* and *Bill* adores *him* too.

b. *pro* No ha ido porque *pro* esté cansado.

He hasn't gone because he is._{3SG.PRS.SUBJ} tired. (= He has gone not because he is tired)

c. *pro* No ha ido porque *pro* está cansado.

He hasn't gone because he is._{3SG.PRS.IND} tired. (= Because he is tired, he hasn't gone)

Finally, the subjunctive mood is licensed in consecutively embedded domains (37d), contrary to the subjunctive mood licensed in sentences with a volitional predicate.

d. *pro* No piensa que *pro* crea realmente que tienes/ tengas razón.

He doesn't think that (she) really believes._{3SG.PST.SUBJ} that you are._{3SG.PST.IND /SUBJ} right.

These facts show that the sentences in (37) do not constitute an A-chain domain, i.e. the A-position of the embedded subject does not satisfy “antecedent government” and there is a barrier between the two subjects in the clause. Due to this non-syntactic dependency between the two clauses, an A-chain between *pro* and its antecedent does not clash with the ϕ -features of the antecedent even if *pro* is fully specified for ϕ -features. The Chain Condition is not violated because there is no A-chain domain. Therefore there is no cancelled antecedent. Because syntax does not block any interpretation, *pro* can be interpreted as any of the possible antecedents in the sentence.

In accordance with the POB, encoding a dependency in the syntax module by an A-chain where one of the antecedents has been blocked is “less costly” than establishing coreference when there are two possible antecedents in discourse. Therefore processing an anaphoric dependency in syntax as in (36) where one antecedent is banned is less costly than solving an anaphoric dependency in (37) where there are two competing antecedents. If this is true it is expected that processing an anaphoric dependency between *pro* and its only possible antecedent in (36) would be faster than processing a coreferent dependency between *pro* and one of the two possible antecedents in (37). In other words, in (38a) where the anaphoric dependency between ‘Messi’ and ‘*pro*’ is syntactically blocked and ‘Ronaldo’ is the only possible antecedent for *pro* is less costly than sentence (38b). In (38b) there is no such restriction and the speaker is allowed to

corefer *pro* with either ‘Messi’ or ‘Ronaldo’ in the discourse, thus the processing of (38b) is costlier and expected to be slower.

- (38) a. Ronaldo se enteró de que Messi no quería que jugase en la Liga de la BBVA.
Ronaldo heard that Messi did not want that *pro* played_{3SG.PST.SUBJ} in the League BBVA.
- b. Ronaldo se enteró de que Messi no sabía que jugase en la Liga de la BBVA.
Ronaldo heard that Messi did not know that *pro* played_{3SG.PST.SUBJ} in the League BBVA.

In order to investigate the predictions as set out above, two self-paced reading experiments were conducted to measure Spanish speaker’s reading times for different regions in a sentence. The hypothesis is that the interpretation of *pro* in the complement of a volitional verb, i.e. a *want*-type verb, is processed faster than the interpretation of *pro* in the complement of an epistemic verb, i.e. a *know*-type verb. This is because in a sentence where the main predicate is volitional there is only one possible antecedent allowed by grammar, therefore the reader can easily find the proper antecedent for *pro*. In a sentence whose main predicate is epistemic there are two possible antecedents for *pro*; therefore the decision between them requires some measurable effort. This will result in faster reading times at the point where the reader needs to give an interpretation to the embedded *pro* in sentences like (38a) where there is only one possible antecedent contrary to (38b) where there are two possibilities.

Notice that (38a) and (38b) could also have a third party reading, i.e. an individual in the discourse that is not mentioned in the linguistic context, to which *pro* could also refer to. However, this possibility was controlled during the self-paced experiments (See below for more details). The bias towards one reading nevertheless could work out very effectively, which could cause that the difference in processing in (38a) and (38b) would be not significant. For this reason, another experiment was carried out; in this experiment the interaction of number agreement and the effect of the type of verb was tested. In the following section the details of the self-paced reading experiments will be described.

4.2. General methods

To assess differences in reading times between complements of a volitional verb and complements of an epistemic verb, we used two self-paced reading tasks.

4.2.1. Design for Experiment 1. Processing differences between *volitional* and *epistemic* predicates

Consider the structure shown in (39):

- (39) (i) DP1_{sing}... DP2_{sing} + **volitional** verb + that + [*pro* **dependent** subjunctive_{sing} ...]
(ii) DP1_{sing} ... DP2_{sing} + **epistemic** verb + that + [*pro* **independent** subjunctive_{sing} ...]

In (i) small *pro* needs an antecedent. In principle this could be either DP1 or DP2. However, DP2 is not a possible antecedent for grammatical reasons. As explained before, (i) constitutes an A-chain domain. An A-chain between *pro* and its most local antecedent, i.e. DP2, would clash with the ϕ -features of the antecedent because *pro* is fully specified for ϕ -features and therefore, the Chain Condition would be violated because it clashes with the properties of the head. Because syntax blocks this reading, DP2 cannot bind *pro* in semantics or corefer with *pro* in discourse. The only interpretation left is the anaphoric interpretation of *pro* with the less local antecedent, i.e. DP1. This decision is made straight away since the interpretive system will not consider DP2; there is no other competing option.

Alternatively, in (ii) DP1 and DP2 are grammatically possible antecedents for *pro*. As explained above, (ii) does not constitute an A-chain domain. Consequently, an A-chain between *pro* and its antecedent does not clash with the ϕ -features of the antecedent even if *pro* is fully specified for ϕ -features. Therefore, *pro* is free to corefer with the subject of the epistemic verb, i.e. DP2, and with the less local antecedent, i.e. DP1. This is expected to lead to an additional cost in the interpretation of *pro* in (ii). In other words, we expect that the interpretation of DP1 as the antecedent for *pro* in (i) will proceed faster because there is only one possible antecedent allowed by grammar, while interpreting DP1 as the antecedent for *pro* in (ii) costs more processing time because there is one competing antecedent in the sentence, i.e. DP2.

Hypothesis for Experiment 1: the interpretation of *pro* in the complement of a *volitional* verb will proceed faster than the interpretation of *pro* in the complement of an *epistemic* predicate.

It is necessary to control for the effects of 3rd party readings in the constructions (i) and (ii). As well as it is convenient to avoid that some participants in the experiment interpret *pro* with DP1

and others do it with DP2 in (ii). Therefore, the test-items used in both experiments were biased in favor of DP1 as the antecedent of *pro*. If the bias towards DP1 works out well, it can occur that in (ii) DP2 is hardly considered by the participants. As explained, in (i) it is expected that participants do not consider DP2 because this is blocked by syntax. However, it might be the case that due to the bias, in (ii) DP2 is only considered subliminally but not enough to be measured directly. In such a case, there will be no contrast between (i) and (ii) in processing cost. In order to control for this, we would like to have another indication to test whether there is a difference in processing time between (i) and (ii). This is done following the logic in Experiment 2.

4.2.2. Design for Experiment 2. Interaction of *number* and *verbtype*

In Experiment 2 the interaction between grammatical *number* and *verbtype*, i.e. volitional versus epistemic verb, is used in order to measure the differences between processing the interpretation of *pro* in a sentence with only one possible antecedent and the interpretation of *pro* in a sentence with two possible antecedents indirectly. Consider the structure shown in (iii) to (vi):

Volitional verb:

(iii) DP1_{plur}...DP2_{plur} + **volitional** verb + that + [*pro* **dependent** subjunctive_{eplur} ...]

(iv) DP1_{plur}...DP2_{sing} + **volitional** verb + that + [*pro* **dependent** subjunctive_{eplur}...]

Epistemic verb:

(v) DP1_{plur}...DP2_{plur} + **epistemic** verb + that + [*pro* **independent** subjunctive_{eplur}...]

(vi) DP1_{plur}...DP2_{sing} + **epistemic** verb + that + [*pro* **independent** subjunctive_{eplur}...]

On the one hand, (iii) and (iv) contain a main volitional predicate, i.e. a predicate like *want*. In both cases the embedded subjunctive verb is plural, thus the antecedent for *pro* should be plural. In principle, both DP1 and DP2 should be possible antecedents for *pro* in (iii) since both antecedents are also plural, while in (iv) DP2 would not be a possible antecedent for *pro* because it is singular. However, as mentioned before both (iii) and (iv) constitute A-chain domains and therefore, an A-chain between *pro* and its most local antecedent, i.e. DP2, would clash with the ϕ -features of the antecedent. This would violate the A-chain condition and hence, the only possible antecedent for *pro* in (iii) and (iv) is DP1 regardless of the number agreement between

antecedents and *pro*. We expect that in (iii) and (iv) readers do not consider DP2 as a possible antecedent for *pro*. If this is true we expect no difference in processing between (iii) and (iv).

On the other hand, (v) and (vi) contain a main epistemic predicate, i.e. a predicate like *know*. As in (iii) and (iv), the subjunctive verb in the embedded clause is plural, in (v) both antecedents are also plural while in (vi) DP2 is singular. As explained before, (v) and (vi) do not constitute A-chain domains. Subsequently, an A-chain between *pro* and its antecedent does not clash with the ϕ -features of the antecedent even if *pro* is fully specified for ϕ -features. Accordingly, in principle *pro* is free to corefer with the subject of the epistemic verb, i.e. DP2, and with the less local antecedent, i.e. DP1. However, in (vi) DP2 does not agree with the number of *pro*, which means that isolated DP2 is not a possible antecedent for *pro* in (vi) while it is in (v). Accordingly, it is expected that the processing costs in (v) are higher than in (vi) because in the former *pro* is ambiguous, i.e. it can be interpreted as plural DP1 or plural DP2, while in the later *pro* is not ambiguous since DP2 does not agree with the number of *pro*. Thus, we expect an interaction between the factors *number* and *verbtype*.

To recapitulate, when the main predicate is epistemic we expect a difference in processing between (v) and (vi) because in (v) *pro* is ambiguous between DP1 and DP2. The decision between one of the two antecedents needs some measurable cost that it is not expected in (vi) where *pro* is not ambiguous. On the other hand, when the main predicate is volitional we do not expect any difference in reading time between (iii) and (iv) because DP2 cannot be considered a possible antecedent for *pro* in either of the cases. In conclusion, an interaction effect between *number* and *verbtype* is predicted in Experiment 2.

Hypothesis for Experiment 2: There is an interaction effect between the factors *number* and *verbtype*. On the one hand, interpreting *pro* in the complement of a volitional verb does not vary even if the number of the antecedent changes. On the other hand, interpreting *pro* in the complement of an epistemic verb proceeds slower when *pro* is ambiguous.

4.2.3. General materials

Sixty test-sentence stories were constructed. The critical sentence that included the critical verb, i.e. the embedded subjunctive verb, was always the final sentence of the story. It was always presented on a new line to make sure that the critical or spill-over regions would never appear at the end of a line and would affect the reading time measures. The first segment always consisted of the complementizer *que* ('that'), which introduces the embedded critical sentence. The critical region, section 0, was always a third person singular form of a predicate, either in present or past form, but always in subjunctive. The first spill-over always consisted of 1 word of only one syllable (no content word), most of the times a preposition. The second spill-over region consisted of 1 word of 1-4 syllables, some of the sentences contained a non-content word like in "que jugase en la Liga de BBVA." ('that *pro* played in the League of BBVA') and others contained a content word like in "que estudien los viernes por la noche." ('that *pro* study on Fridays night'). Region 3 contained the main content of the sentence, for example "que hiciera yoga en la escuela de baile" ('that *pro* did yoga in the school of dancing'). Region 4 consisted in mostly all sentences of a non-content word, i.e. a preposition. The final region contained 1 word of 2-3 syllables that was always a content word. The critical sentence always followed the construction: "that + *pro* + subjunctive verb + 4-5 words". The crucial manipulation was the type of the verb in the main clause, i.e. volitional or epistemic. The frequency of the main verbs in each item condition was controlled. In the critical region the subjunctive mood was always used, therefore, only epistemic verbs with negation or inherently negated epistemic predicates were used. As mentioned, epistemic verbs that are negated or inherently negative can select for subjunctive clauses. This avoids that the difference in mood, i.e. subjunctive versus indicative, affects reading times since indicative mood is more frequently used in Spanish than the subjunctive. The remainder of the sentence was identical across conditions in order to be able to compare identical regions in case the effect spilled over.

Test items were randomly divided over six lists in a Latin square design and every list contained ten items per condition. Experiments 1 and 2 were tested as in one task; however, their corresponding results and discussion is presented separately in this thesis. There were therefore six different structures for each story created, corresponding to the structures (i) to (vi) presented

before. Experiment 1 consisted of 20 test-sentences and Experiment 2 consisted of 40 test-sentences.

Each of the six lists included 60 true/false statements about the sentences presented that had been pseudo-randomly divided over the stimuli. There were 30 true/false statements among the test-sentences and 30 true/false statements among the fillers. Participants were instructed to respond to the statements by pressing a True or False button that appeared on the computer's screen by pressing the computer mouse. The same materials (computer and mouse) were used for all participants.

4.2.4. General Procedure

Participants were tested in soundproof rooms. The experiments were run in Madrid (Spain), in the following buildings: Universidad Autónoma de Madrid, Consejo Superior de Investigaciones Científicas (CSIC), and Colegio Virgen de la Paloma. The self-paced reading task ran on Zep software (Veenker, 2012). The stories were presented in the non-cumulative moving-window self-paced reading paradigm. Words are presented one by one as the participant pressed the space bar or the 'enter' button. At the moment one new word appeared on the screen the previous word would be replaced by a line. The time between two presses was measured to collect reading times. When participants pressed after the last word of the sentence, either a verification statement or the next test-sentence would appear on the screen.

Before the experiment, participants were familiarized with their tasks during a short practice session. They were instructed to read the sentences fast but at a speed that allowed them to properly understand the sentences in order to answer correctly the verification statements. The experiment consisted of two blocks. Between each block participants could relax for one minute. If participants needed to rest they were told to do so between sentences and they were instructed not to stop in the middle of a sentence. Most participants completed the experiments in around 30 minutes with the exception of one participant who completed the task in one hour. This participant was excluded prior to analysis.

4.3. Experiment 1. Processing differences between volitional and epistemic predicates

The hypothesis for Experiment 1 is again presented in (40):

- (40) **Hypothesis for Experiment 1:** the interpretation of *pro* in the complement of a *volitional* verb will proceed faster than the interpretation of *pro* in the complement of an *epistemic* predicate.

According to the hypothesis, we expect that interpreting *pro* in (i) where DP2 is not a possible option will be faster than choosing an antecedent for *pro* in (ii) where DP1 and DP2 are grammatically possible options:

(i) DP1_{sing...} DP2_{sing} + **volitional** verb + that + [*pro* **dependent** subjunctive_{sing} ...]

(ii) DP1_{sing} ... DP2_{sing} + **epistemic** verb + that + [*pro* **independent** subjunctive_{sing} ...]

4.3.1. Method

Participants

Fifty-one participants participated in the experiment. All participants were native speakers of Spanish and they were between 18 and 50 years old. They were paid for their participation. They had no known reading disability.

Test-items

Experiment 1 consists of two conditions: the *want*-condition, i.e. the structure with the volitional predicate as in (i), and the *know*-condition, i.e. the structure with the epistemic predicate as in (ii). The variable tested is called *verbtype*, i.e. *want*-type verb versus *know*-type verb. The structures of the sentences follow the same schema shown in (i) and (ii). In (41) we present an example for each condition that was used during the experiment.

- (41) *Want*-condition:

(a) Sara Baras oyó que Víctor Ullate no **quería** que hiciera yoga en la escuela de baile.

Translation: ‘Sara Baras heard.3rd.SG.PST that Victor Ullate didn’t **want**.3rd.SG.PST that *pro* did.3rd.SG.PST.SUBJ yoga in the school of dancing.’

Know-condition:

(b) Sara Baras oyó que Víctor Ullate no **sabía** que hiciera yoga en la escuela de baile.

Translation: ‘Sara Baras heard.3rd.SG.PST that Victor Ullate didn’t **know**.3rd.SG.PST that *pro* did.3rd.SG.PST.SUBJ yoga in the school of dancing.’

The test-items used in the experiment were biased to interpret *pro* as the first antecedent presented in the sentence, i.e. DP1; in (41a) DP1 is “Sara Baras”. As explained, it is necessary to control for the effects of 3rd party readings in the constructions (i) and (ii). As well as it is convenient to avoid that some participants in the experiment interpret *pro* with DP1 and others do it with DP2 in (ii). This was also pre-tested with six Spanish speakers who did not participate in the experiment.

Fillers

Sixty filler items were included, however, they were also used to control for two variables.

One could argue that the difference in processing between (41a) and (41b) is caused by the type of verb that is used in the main predicate, i.e. volitional versus epistemic verb. In order to control for this fact, in this experiment we test whether there is a natural difference when processing a volitional verb compared to an epistemic verb. An example of one of the fillers that we used for this purpose is shown in (42).

(42) a. Los del jurado no **necesitan** que los chicos del coro superen determinadas pruebas de selección.

The ones from the jury do not need_{VOL} that the boys of the choir pass_{3PL.PRS.SUBJ} certain selection tests.

b. Los del jurado no **piensan** que los chicos del coro superen determinadas pruebas de selección.

The ones from the jury do not think_{EPIS} that the boys of the choir pass_{3PL.PRS.SUBJ} certain selection tests.

As described in the introduction, subjunctive mood has been argued to be the cause for the Disjoint Reference Requirement by some authors. In the current experiment we also test whether there is a difference in processing between complements that contain a subjunctive form and complements that contain an indicative form. In order to do so, some of the fillers in the experiment were designed to test this difference. These sentences differ significantly to the test-sentences, but the only difference between them is in the form of the embedded verb, i.e. indicative versus subjunctive. An example of one of the fillers is shown in (43):

- (43) a. Tu colega no me cae del todo bien aunque **sea** muy simpático con nosotros.
I don't get well with your friend although he is_{3SG.PRS.SUBJ} very friendly with us.
- b. Tu colega no me cae del todo bien aunque **es** muy simpático con todos nosotros.
I don't get well with your friend although he is_{3SG.PRS.IND} very friendly with us.

Post-test

To control for the differences between the six participants who did the pre-test and the participants of the current experiment, after the self-paced reading task in Zep, participants were asked to fill-in a questionnaire in which they were asked about their interpretation of some of the test-sentences they were presented. During the experiment participants were shown 60 test sentences in total, 30 of them contained epistemic verbs, and therefore the interpretation of *pro* could vary among the different possible antecedents in the sentence. Participants were presented with one test sentence and three options that contained four sentences that paraphrased the original. They were asked to choose the one that fitted their interpretation of the sentence. For example, they were presented a sentence like (44) and they were given the three options presented in (45):

- (44) Ronaldo se enteró de que Messi no sabía que jugase en la Liga BBVA.
Ronado heard that Messi didn't know that *pro* played in the League BBVA.
- (45) a. Messi no sabía que él mismo jugaba en la Liga.
Messi didn't know that he himself played in the League.

b. Messi no sabía que Ronaldo jugaba en la Liga.

Messi didn't know that Ronaldo played in the League.

c. Messi no sabía que algún otro jugador jugaba en la Liga.

Messi didn't know that some other player played in the League.

In the post-test most of the participants gave a different interpretation than the expected one for four of the test-items, i.e. they interpreted *pro* as coreferent with the most local antecedent, i.e. DP2. These four items were excluded from the analysis. The fifty-six items left were given the expected interpretation, i.e. *pro* was coreferent with the less local antecedent (DP1), by all participants.

4.3.2. Results - Experiment 1

Eight participants were excluded prior to analysis because they answered less than 70% of the verification statements correctly. The sample thus consisted of 42 participants (21 males and 21 females between 18 and 50 years old). As mentioned, out of the 60 items that were tested four items were excluded after the post-tests showed that the interpretation that participants gave were not the intended ones. All observations that were two standard deviations above or below item and subject mean for each position and condition were excluded from the analysis. The log-transformed mean reading times were analyzed for seven different regions. Mean (raw) reading times per region are reported in Table 1:

Table 1. EXPERIMENT 1. Mean reading times per region in the two different conditions: want-condition and know-condition.

Word Position							
	-1	0	1	2	3	4	5
Condition:	e.g. que that	participase participate _{SG.SUBJ}	en in	la the	final final	de of	Wimbledon Wimbledon
<u>Reading Time</u> <i>Want-condition</i>	468	478	438	399	391	394	506
<i>Know-condition</i>	469	497	444	409	391	397	567

On the log-transformed reading times, Linear Mixed Effects Regression analyses (LMER)

(Baayen, 2008) were performed with *verbtype* (volitional predicates, e.g. want, versus epistemic predicates, e.g. know) as fixed factor. Subjects and items were crossed random effects using lmer package in R (for each region separately). P-values were obtained using Markov Chain Monte Carlo (MCMC) sampling (Baayen, 2008).

In Experiment 1 two models were tested. The first model only included the crossed random effects: subjects and items; in the second model the condition *typeverb* was included. Results show that there are significant effects of *typeverb* in region 5. An ANOVA test shows that the second model fits significantly better than the first model ($\chi^2(1)=6.129, p<0.05$). As expected, this effect is in favor of the *want*-condition, which was processed faster than the *know*-condition in region 5.

4.3.3. Discussion - Experiment 1

The prediction for Experiment 1 was that in the *want*-condition, the most local antecedent, i.e. DP2, is blocked by syntax while this is not blocked in the *know*-condition. According to these predictions, it was expected that the complements of a volitional verb would be read faster than the complement of an epistemic predicate because in the former the reader has only one possible antecedent to interpret *pro*, while in the latter there are two possible antecedents. The data shows that these predictions are borne out in region 5, where complements of a volitional predicate were processed faster than the complements of an epistemic predicate. However, the fact that this is a late effect, which does not occur in other regions of the sentence, might lead to other possible explanations than the interference of DP2 in the *know*-condition, such as some kind of plausibility effect.

Mean reading times, however, show that the *want*-condition has a processing advantage compared to the *know*-condition. This will be further discussed below. Moreover, as previously mentioned we expected that the bias towards the less local antecedent, i.e. DP1, could dismiss the effect of DP2 in the *know*-condition. This is the reason why we designed Experiment 2, where we use number-agreement to visualize the effect of DP2 without the risk of the bias towards one of the antecedent.

4.4. Experiment 2. Interaction of *number* and *verbtype*

The hypothesis for Experiment 2 is again presented in (46):

- (46) **Hypothesis for Experiment 2:** There is an interaction effect between the factors *number* and *verbtype*. On the one hand, interpreting *pro* in the complement of a volitional verb does not vary even if the number of the antecedent changes. On the other hand, interpreting *pro* in the complement of an epistemic verb proceeds slower when *pro* is ambiguous.

According to this hypothesis, we expect that if syntax blocks DP2 in the *want*-condition, i.e. (iii) and (iv), but it does not block DP2 in the *know*-condition, i.e. (v) and (vi), then we expect an interaction effect between the factors *number* and *verbtype*. The predictions are that in the *want*-condition there will be no difference in processing (iii) compared to (iv); while in the *know*-condition there will be a difference when processing (v) compared to (vi).

Want-condition:

- (iii) DP1_{plur}...DP2_{plur} + **volitional** verb + that + [*pro* **dependent** subjunctive_{plur} ...]
(iv) DP1_{plur}...DP2_{sing} + **volitional** verb + that + [*pro* **dependent** subjunctive_{plur}...]

Know-condition:

- (v) DP1_{plur}...DP2_{plur} + **epistemic** verb + that + [*pro* **independent** subjunctive_{plur}...]
(vi) DP1_{plur}...DP2_{sing} + **epistemic** verb + that + [*pro* **independent** subjunctive_{plur}...]

4.4.1. Method

The same participants that participated in Experiment 1 participated in Experiment 2.

Test-items

Experiment 2 consists of four conditions. The *typeverb* factor includes the *want*-condition, i.e. the structure with the volitional predicate as in the structures (iii) and (iv), and the *know*-condition, i.e. the structure with the epistemic predicate as in (v) and (vi). The *number* condition includes the *PLURAL*-condition, i.e. the structures in (iii) and (v) whose DPs share the same grammatical number (both DP1 and DP2 are plural), and the *PL_SG*-condition, i.e. the structures in (iv) and

(vi) whose DPs do not have the same number (DP1 is plural and DP2 is singular). The structures of the sentences follow the same schema shown in (iii), (iv), (v) and (vi). In (47) we present an example for each condition that was used during the experiment.

(47) *Want-condition:*

(a) *PLURAL-condition:*

Sara Baras y Tamara Rojo oyeron que Víctor Ullate y Joaquín Cortés no **querían** que hicieran yoga en la escuela de baile.

Translation: ‘Sara Baras and Tamara Rojo heard.3rd.PL.PST that Victor Ullate and Joaquín Cortés didn’t **want**.3rd.PL.PST that *pro* did .3rd.PL.PST.SUBJ yoga in the school of dancing.’

(b) *PL_SG-condition:*

Sara Baras y Tamara Rojo oyeron que Víctor Ullate no **quería** que hicieran yoga en la escuela de baile.

Translation: ‘Sara Baras and Tamara Rojo heard.3rd.PL.PST that Victor Ullate didn’t **want**.3rd.SG.PST that *pro* did.3rd.PL.PST.SUBJ yoga in the school of dancing.’

Know-condition:

(c) *PLURAL-condition:*

Sara Baras y Tamara Rojo oyeron que Víctor Ullate y Joaquín Cortés no **sabían** que hicieran yoga en la escuela de baile.

Translation: ‘Sara Baras and Tamara Rojo heard.3rd.PL.PST that Victor Ullate and Joaquín Cortés didn’t **know**.3rd.PL.PST that *pro* did.3rd.PL.PST.SUBJ yoga in the school of dancing.’

(d) *PL_SG-condition:*

Sara Baras y Tamara Rojo oyeron que Víctor Ullate no **sabía** que hicieran yoga en la escuela de baile.

Translation: ‘Sara Baras and Tamara Rojo heard.3rd.PL.PST that Victor Ullate didn’t know.3rd.SG.PST that *pro* did.3rd.PL.PST.SUBJ yoga in the school of dancing.’

The rest of the procedure is exactly the same as the one described in Experiment 1.

4.4.2. Results - Experiment 2

The log-transformed mean reading times were analyzed for seven different regions.

Table 2. EXPERIMENT 2. Mean reading times per region in the two different conditions: want-condition and know-condition. Interaction of number and typeverb factors.

Word Position							
	-1	0	1	2	3	4	5
Condition:	e.g. que that	participasen participate _{PL.SUBJ}	en in	la the	final final	de of	Wimbledon Wimbledon
Reading Time: Number-agreement Want PLURAL & PL_SG	433	438	420	388	380	390	505
Know PLURAL & PL_SG	444	489	426	400	391	397	541

On the log-transformed reading times, Linear Mixed Effects Regression analyses (LMER) (Baayen, 2008) were performed with *verbtype*, i.e. *want*-condition versus *know*-condition, and *number*, i.e. *PLURAL*-condition versus *PL_SG*-condition, as fixed factors. Subjects and items were crossed random effects using lmer package in R (for each region separately). P-values were obtained using Markov Chain Monte Carlo (MCMC) sampling (Baayen, 2008).

In Experiment 2 the goal was to see if there are interaction effects between the factors *number* and *verbtype* in both conditions: the *want* and the *know* conditions. Thus, the model used in this experiment tested the interaction of *number* and *verbtype* using lmer package in R. Number-agreement is used as a tool to visualize the differences between volitional and epistemic predicates. Similarly to the methodology followed in the previous experiment, in this experiment firstly the crossed random effects, subjects and items, were included into the model and then the fixed factors, *number* and *verbtype* and the interaction between them. Results show that there is a small trend when the interaction of *verbtype* and *number* is measured in region 2 (Estimate=0.0618, SE=0.036, t=1.71, p(MCMC)<.08). An ANOVA test shows that the model

that includes the interaction between the two factors is significantly better ($\chi^2(1)=2.9447$, $p<0.1$). However, significant interaction effects were not found in the other regions.

In Experiment 2 we hypothesized that interpreting *pro* in the complement of a volitional verb does not vary even if the number of the antecedent changes while interpreting *pro* in the complement of an epistemic verb proceeds slower when *pro* is ambiguous. In order to test this hypothesis, pair-wise tests were done for Experiment 2. The observations for a volitional verb, i.e. *want*-condition, in the *PLURAL*-condition were compared to the observations of the *want*-condition in the *PL_SG* context. The same was done for the *know*-condition. As proposed, the most local antecedent in a sentence where the main predicate is volitional is blocked by syntax. Therefore, the reader cannot consider the local antecedent, i.e. DP2, in either of the cases: *PLURAL* or *PL_SG* conditions. However, in the *know*-condition, a difference is predicted between the *PLURAL*-condition and the *PL_SG*-condition. In the former, there is ambiguity between the two possible antecedents because they both agree in number with the embedded predicate, e.g. both DP1 and DP2 are plural. Thus, the reader has to make a decision between two possible antecedents allowed by grammar that also share the same number. In the *PL_SG*-condition however, only one of the antecedents (DP1) agrees in number with the most embedded verb. Therefore, it is expected that reading times in the *SG_PL*-condition are faster than reading times in the *PLURAL*-condition when the main predicate is epistemic. In the second case the reader finds only one antecedent that shares the same number with the embedded *pro*; there is no competing option.

Table 3. EXPERIMENT 2. Mean reading times. Pair-wise comparisons: *want*-condition (PLURAL versus PL_SG) & *know*-condition (PLURAL versus PL_SG)

Word Position							
	-1	0	1	2	3	4	5
<i>Condition:</i>	e.g. que that	participasen participate _{SUBJ}	en in	la the	final final	de of	Wimbledon Wimbledon
Experiment 2							
<i>Want</i>							
<i>PLURAL</i>	439	432	420	392	390	390	502
<i>SG_PL</i>	427	444	420	383	370	390	508
<i>Know</i>							
<i>PLURAL</i>	442	477	421	389	390	386	522
<i>SG_PL</i>	445	500	432	411	392	408	559

On the log-transformed reading times, Linear Mixed Effects Regression analyses (LMER) (Baayen, 2008) were performed. This time we were interested in testing the effect of *number* in the *want*-condition, which contains the observations for both the *PLURAL*-condition and the *PL_SG*-condition, and do the same with the *know*-condition. *Number* was the fixed factor and subjects and items were the crossed random effects. The lmer package in R (for each region separately) was used. P-values were obtained using Markov Chain Monte Carlo (MCMC) sampling (Baayen, 2008).

The results show that one of the predictions made above is borne out by the data. Results show that there is no difference for *want*-verbytype in the *PLURAL* or the *PL_SG* conditions while there is a difference for the *know*-verbytype ($\chi^2(1)=3.8979, p<0.05$) in region 0. There is also a trend in region 2 only in the *know*-condition ($\chi^2(1)=3.7912, p<0.1$). The same trend is found in region 4 ($\chi^2(1)=3.7644, p<0.1$) and in region 5 ($\chi^2(1)=2.8708, p<0.1$) only in the *know*-condition. As predicted, this trend is not found in the *want*-condition in *PLURAL* and *PL_SG*. However contrary to the expectations, the *know*-verbytype complements in the *PLURAL*-condition were read faster compared to the *PL_SG*-condition, as can be seen in the mean reading times in Table 3. It was predicted that this would turn out in the other direction, i.e. complements in the *PLURAL* contexts would have slower reading times, because *pro* is ambiguous. Nevertheless, this shows that readers need more time in the *PL_SG*-condition.

4.4.3. Discussion - Experiment 2

The prediction for Experiment 2 was that if syntax blocks the most local antecedent, i.e. DP2, in the *want*-condition in the *PLURAL* and the *SG_PL* structures, but it does not block DP2 in the *know*-condition, then there will be an interaction effect between *number* and *verbytype*. According to the analyses, there is only a small interaction trend in region 2 but this trend is not found out in other regions.

It was also expected that *number* would interact with *verbytype* because in the *know*-condition we expected longer reading times in the *PLURAL*-condition compared to the *PL_SG*-condition while in the *want*-condition we expected no difference. For this matter we carried out pair-wise comparisons in which we compared the *PLURAL* and *PL_SG* conditions inside the

want-verbytype and separately, the *PLURAL* and the *PL_SG* conditions inside the *know*-verbytype condition. According to the predictions, analyses show that there are no differences between the *PLURAL* and *PL_SG* conditions when a verb of volition is used (*want*-verbytype); but there are differences between the *PLURAL* and the *PL_SG* conditions when an epistemic verb is used (*know*-verbytype). This suggests that in the *want*-condition readers never consider the most local antecedent, i.e. DP2. Since syntax has blocked DP2 as a possible antecedent for *pro* in the embedded clause the readers do not consider DP2 as an antecedent for *pro* no matter the number of the antecedents. On the other hand, readers subliminally consider the most local antecedent, i.e. DP2, in the *know*-condition and this is why the difference in the grammatical number of the antecedents has caused a difference in reading times. However, we predicted that the *PLURAL*-condition would be processed slower, i.e. when *pro* is ambiguous, compared to the *PL_SG*-condition, i.e. when *pro* is not ambiguous regarding number. Contrarily to what we expected, results suggest that processing times are longer in the *PL_SG*-condition. We suggest that this is due to a *number mismatch effect*. That is, in the *know*-condition readers subliminally check against the most local antecedent (DP2) even if this one does not agree with the number of the embedded *pro*. This causes an agreement clash between the number of *pro* and the number of the most local antecedent. This syntactic effect causes slow reading times. However, when both antecedents share the same number and *pro* is ambiguous, reading times are faster. In this case, readers simply choose one of the antecedents according to the discourse context. Contrarily to the *know*-condition, in the *want*-condition there is no DP subliminally checked and therefore, there is no processing cost. Because the factor *number* only affects the *know*-condition but not the *want*-condition, the interaction effect has probably failed to reach significance in a model that includes both conditions.

To recapitulate, these results suggest that the local antecedent plays a role in the *know*-condition, but it does not affect the *want*-condition. Since the most local antecedent has been blocked by syntax in the *want*-condition, readers do not consider it as a possible antecedent for *pro*. In the *know*-condition the most local antecedent has not been blocked by syntax and thus, this antecedent affects processing. The fact that readers subliminally consider this antecedent has a processing cost that results to be longer when there is a number mismatch between *pro* and the antecedent than when there are two antecedents that agree with the number of embedded *pro*.

4.5. Processing Epistemic and Volitional predicates in different sentences

As mentioned, the current experiment uses the fillers to test whether volitional and epistemic verbs are processed differently in different sentences than those tested in Experiment 1 and 2. If we find out a difference when processing these sentences which only differ in the type of predicate used, that would show that volitional verbs like *want* and epistemic verbs like *know* are normally differently processed. Consequently, the differences in processing that were found out in Experiment 2 could not be directly attributed to the effect of the local antecedent over the *know*-condition, but it could be the case that these predicates normally cause different reading times. Similar to Experiments 1 and 2, all observations that were two standard deviations above or below item and subject for each position and condition were excluded from the analysis. The log-transformed mean reading times were analyzed for seven different regions. Mean (raw) reading times per region are reported in Table 4:

Table 4: Mean reading times per region in different conditions. Epistemic and Volitional verbs in different contexts across all conditions.

	Word Position						
	-1	0	1	2	3	4	5
Condition:	e.g. hermanos brothers	saliesen went	de of	fiesta party	esa that	misma (same)	noche. night.
<i>All conditions</i> <i>Volitional</i>	490	449	407	399	392	419	517
<i>Epistemic</i>	472	469	410	395	393	402	510

In this case we were interested in testing the effect the factor *verbtype* had across all conditions. For this reason, the six conditions were collapsed into one model. On the log-transformed reading times, Linear Mixed Effects Regression analyses (LMER) (Baayen, 2008) were performed with *verbtype*, i.e. *volitional* verbs versus *epistemic* verbs as fixed factor. Subjects and items were crossed random effects using *lmer* package in R (for each region separately). Similarly to the methodology followed in Experiments 1 and 2, we firstly added to the model the crossed random effects, subjects and items, and afterwards we tested the main effect of *verbtype* over the model that included all six conditions. P-values were obtained using Markov Chain Monte Carlo (MCMC) sampling (Baayen, 2008).

Analyses show that there were no main effects in none of the regions when the epistemic or the volitional verb was shown in different sentences. This supports the idea that the differences in processing found in Experiments 1 and 2 can be directly attributed to the effect of the local antecedent over the *know*-condition and not to a different cause.

4.6. Indicative versus Subjunctive Mood

Finally, we also tested whether there is a significant difference when Spanish adults process a subjunctive or an indicative mood. All observations that were two standard deviations above or below item and subject for each position and condition were excluded from the analysis. The log-transformed mean reading times were analyzed for seven different regions. Mean (raw) reading times per region are reported in Table 5:

Table 5: Mean reading times per region in different conditions. Subjunctive versus Indicative across all conditions.

Word Position							
	-1	0	1	2	3	4	5
Condition:	e.g. amigo friend	vaya/ va goes.SUB/IND	a to	the la	fiesta party	de of	primavera. spring.
<i>All conditions</i> <i>Subjunctive</i>	432	404	393	376	378	376	544
Indicative	448	389	390	379	381	373	524

The goal was to see the effect that the factor *moodtype*, i.e. *subjunctive*-mood versus *indicative*-mood, had across all conditions. For this reason, the six conditions were also collapsed into one model. Analyses show that there were no significant differences when processing indicative or subjunctive mood. This means that there is no difference in reading times between a Spanish verb in the indicative mood and a Spanish verb in the subjunctive mood. Interestingly, indicative mood is more frequently used than the subjunctive mood, so a difference in processing was expected. These results support the idea that subjunctive should not be taken to be the main cause for DRR; in terms of processing there seems to be no difference between indicative and subjunctive in Spanish.

Concluding, the type of verb (volitional or epistemic) and the mood (indicative or subjunctive) do not affect processing time. The difference between reading times that was found in the pair-wise comparisons in Experiment 2 can be attributed to the role of antecedent interference.

4.7. Overall discussion – mismatch and ambiguity

In Experiment 1 we predicted that there was a difference when processing complements of a volitional verb compared to complements of an epistemic verb in sentences whose antecedents shared the same number, i.e. singular. Because the bias towards the less local antecedent in Experiment 1 could dismiss the effect of the most local antecedent, in Experiment 2 we used number-agreement in order to see if there was any difference when readers process complements of volitional or epistemic verbs. In Experiment 2 we hypothesized that there was an interaction effect between *number* and *verbtype*: we expected no difference between *PLURAL* and *PL_SG* in the *want*-condition, but we expected a difference in the *know*-condition.

On the one hand, the hypothesis in Experiment 1 was not borne out by the data. We suggest that the reason for this is that once the bias towards one of the antecedents in the sentence is strong enough, the non-biased antecedent does not affect readers. Since the most local antecedent, i.e. DP2, only affected processing time in region 5 where the *want*-condition was read faster than the *know*-condition.

On the other hand, Experiment 2 did not show a significant interaction effect between the factors *number* and *verbtype* when the four conditions, *want*-condition (*PLURAL* and *PL_SG*) and *know*-condition (*PLURAL* and *PL_SG*) were included in one model. However, pair-wise comparisons showed that the most local antecedent has an effect in the *know*-condition, but it does not affect the *want*-condition as it was hypothesized. This means that in the *know*-condition, i.e. the main predicate is epistemic, participants consider DP2 since this antecedent is not blocked by syntax. We proposed that the longer reading times in the *PL_SG*-condition are caused by the *number mismatch effect* between the different number of embedded *pro* and the most local antecedent.

We observed that mean reading times show the trend that the *want*-condition has a processing advantage compared to the *know*-condition. In order to see whether this trend was significant, the effect of the factor *verbtype* was tested in a model that included all conditions tested in Experiments 1 and 2. This was done in order to see the main effect of *verbtype* across all conditions. We first created a model that included only the crossed random effects, subjects

and items, with all the conditions. To this model, the *verbtype* factor was added. Results show that there are significant effects of *verbtype* in region 0 ($\chi^2(1)=14.801$, $p<0$); in region 2 there is a small trend ($\chi^2(1)=3.1719$, $p<0.1$); there are significant effects in region 4 ($\chi^2(1)=4.1331$, $p<0.05$) and also in region 5 ($\chi^2(1)=13.317$, $p<0$). Just like mean reading times seemed to suggest, these results show that the *want*-condition has a processing advantage compared to the *know*-condition when all conditions are collapsed into one model.

Table 6. Mean reading times. Effect of *verbtype* across all conditions in Experiments 1 & 2.

Word Position							
	-1	0	1	2	3	4	5
Condition:	e.g. que that	participasen participate.SUBJ	en in	la the	final final	de of	Wimbledon Wimbledon
<i>Want</i> <i>All conditions</i>	445	431	426	392	384	391	505
<i>Know</i> <i>All conditions</i>	452	492	432	403	391	397	549

Moreover, consider the mean reading times for all conditions separately in Experiment 1 and 2 as shown in Table 7. These show a trend that again advantages complements of a *want*-*verbtype* in processing time compared to complements of a *know*-*verbtype*.

Table 7. Mean reading times. All conditions separately.

Word Position							
	-1	0	1	2	3	4	5
Condition:	e.g. que that	participasen participate.SUBJ	en in	la the	final final	de of	Wimbledon Wimbledon
Experiment 1							
<i>Want</i>	468	478	438	399	391	394	506
<i>Know</i>	469	497	444	409	391	397	567
Experiment 2							
<i>PL SG</i>							
<i>Want</i>	427	444	420	383	370	390	508
<i>Know</i>	445	500	432	411	392	408	559
Experiment 2							
<i>PLURAL</i>							
<i>Want</i>	439	432	420	392	390	390	502
<i>Know</i>	442	477	421	389	390	408	559

The fact that the *want*-condition shows a processing advantage compared to the *know*-condition when we look at the effect of *verbtype* across all conditions and when we look at main reading times shows that complements of volitional verbs are often read faster than complements of epistemic verbs. The reason is that, as suggested, the most local antecedent (DP2) in the *know*-condition is available and thus, probably often considered by the reader; while the most local antecedent is not available in the *want*-condition, and therefore the reader does not consider it. The reader finds an antecedent for *pro* in the *want*-condition faster, since there is only one possible antecedent, but the reader needs more time to find an antecedent for *pro* in the *know*-condition where there are two possibilities.

As shown by the fillers the type of verb (volitional or epistemic) and the mood (indicative or subjunctive) do not affect processing time. This is crucial since all effects that we have found can be attributed to the difference status of DP2 in the different conditions, i.e. *want*-condition versus *know*-condition. When the main verb is volitional DP2 is ruled out as an antecedent of *pro* but when the main verb is epistemic DP2 is only ruled out by a discourse preference, hence at least subliminally considered by the reader.

The studies by Kazanina et al. (2007) are relevant for this current experiment. Kazanina and her colleagues investigated the mechanisms of active search for pronoun antecedents on the impact of grammatical constraints on coreference relations. For this matter, three self-paced reading studies were carried out. Results showed that structural constraints on coreference in particular Principle C of the Binding Theory exert an influence at an early stage of the antecedent search process such that gender mismatch effects are elicited at grammatically licit antecedents positions, but not at grammatically illicit antecedent positions. Relevant to this current study, the participants did not consider positions that were inaccessible antecedent positions due to a structural syntactic constraint. Interestingly the results of our study show that participants did not consider the most local DP that was an inaccessible antecedent due to syntactic constraints.

4.8. Alternative account - Further research

The account that has been proposed suggests that there are two different explanations for the delay in reading times that we found in the *know*-condition compared to the *want*-condition. On the one hand, we proposed that the delay found when only one of the possible antecedents in the sentence agrees with the number of the embedded verb is the result of a *mismatch effect*. The

reader considers the most local participant because it is allowed by syntax, but a number clash is produced because this DP does not have the same number that *pro* has. Thus, a *number mismatch* effect occurs and results in longer reading times. The analyses show that the readers need more time when there is number mismatch between the most local *pro* and the embedded verb in the subjunctive clause. On the other hand, we also observed longer reading times in the *know*-condition when the number of the possible antecedents in the sentence does not differ, i.e. both are plural. We propose that this delay is the result of an *ambiguity effect*. The reader considers the most local antecedent because this is allowed by syntax and it agrees in number with the embedded verb; but the human language processor is biased to choose the less local antecedent due to the discourse context. This operation has a processing cause that is not needed when the main verb is volitional and thus, one of the antecedents has been already blocked by grammar.

This account needs further research that would make it possible to disentangle the effects of ambiguity and number mismatch. ERPs studies have shown that processing semantic information influences the amplitude of a negative-going ERP component between roughly 250 and 550 msec and with a maximum amplitude at about 400 msec (Kutas & Hillyard, 1980), what is known as the N400 effect. On the other hand, syntax-related ERP is a positive-polarity shift that starts at about 500 msec and can continue for another 500 msec; this is known as the P600 effect. Relevant to this study, P600 effects have been found in morphosyntactic violations (Münter & Heinze, 1994) such as phrase structure violations, subcategorization violations, and violations in the agreement of number and case (cf. Hagoort et al., 1999 for a review). To tease the *number mismatch effect* and the *ambiguity effect* apart, we propose to investigate this difference with an ERP study. If a P600 effect shows up when only one of the grammatically possible antecedents agrees with the number of the embedded verb, but it does not show up when the antecedents in the possible antecedent positions have the same grammatical number, we would show that the number mismatch effect proposed occurs in online processing. This is left for further research.

5. Acquisition of the Disjoint Reference Requirement and the Subjunctive mood

Several studies on the acquisition of the DRR and the subjunctive mood have been carried out. In this section the most relevant studies will be summarized and briefly related to the results of this current experiment.

5.1. Acquisition of the DRR

Previous experiments have been carried out on the acquisition of DRR in languages like Russian and Spanish. Avrutin & Wexler (2000) tested Russian children at the age of 4 and 5 using the Truth Value Judgment Task. The experimenters tested whether there was a difference in the interpretation of coreference between indicative and subjunctive subclauses by children. The results show that when the antecedent was referential, the matrix and the embedded subjects were interpreted as coreferential 80% of the time when it was allowed, i.e. with the indicative mood. Moreover, 39% of the time the coreferential reading was accepted when this was not permitted, i.e. with subjunctive clauses. When a quantifier was the antecedent, children accepted legal coreference 50% of the time, and 20% when coreference was not grammatically allowed. They concluded that at the age of 4 and 5 the subjunctive principles are highly abstract and this provokes that children illegally corefer subjects when subjunctive mood is used. However, the results indicate that Russian children show a *Quantificational Asymmetry*, which means that their performance enhances when the antecedent is a quantifier.

On the other hand, Padilla (1990) tested 80 Spanish children divided into four groups ranging from age 3 to 9 using the act-out test. Padilla's purpose was to determine the effect of mood, tense and lexical properties of verbs on the comprehension of DRR by children. According to the results, *mood* and *tense* were not significant factors. In the mood test, children gave 11% of the time coreferential responses to sentences with subjunctive complements and 28% to sentences with indicative complements. However, the difference is not significant. Padilla states that tense agreement did not interact with mood in determining binding relations for the subject of the complement clause. Finally, the results show that the lexical class of verbs was a significant factor. Children gave disjoint reference responses with volitional verbs 41% of the time and 21% with epistemic verbs; and they gave coreferential responses 56% of the time with verbs of volition and 77% with epistemic predicates. The differences in this case were significant. Padilla (1990) concludes that children consult the lexical properties of the verb to

establish binding relations. Furthermore, results show that age was a significant factor when performing successfully. For example, group 2, which is formed by children of age 5 and 6, gave coreferential responses 80% of the time with volitional verbs and 84% with epistemic; meanwhile, group 3, formed by children of age 7 and 8, gave coreferential responses 39% of the time with volitional verbs and 68% with epistemic. Padilla concludes that the treatment of binding relations based on lexical properties is a developmental factor that improves with age.

In summary, both experiments indicate that there is, at least, a period in which children are not sensitive to the DRR in both Russian and Spanish. This seems to be when children are between 4 and 6 years old. Although there are differences between the results reported by these authors, these might be caused by the different methods and data they used, e.g. in the Russian experiments the embedded subject was an overt pronoun while in the Spanish experiment it was small *pro*.

5.2. Acquisition of the Subjunctive

According to Aguado (1988), subjunctive morphology becomes active in spontaneous production in imperative contexts at the age of 19 months. For example:

(48) a. *No supa guaugau. No supa.

No lick_{IND} wow wow. No lick_{IND}. ('Don't lick me dog.')

López-Ornat and his colleagues (1994) claim that the subjunctive morphology becomes active at the age of 2 in affirmative and negative commands, see (49b). They also found out that soon the present subjunctive is extended to adverbial clauses such as (49c):

b. Que no te bañes tú.

That no you_{refl} CL bathe_{SUBJ} you. ('That you don't take a bath')

c. Mira, esto es para ti, para que te lo eches.

Look this is for you for that *refl* it throw_{SUBJ}. ('Look this is for you to put on')

At the age of 4, subjunctive production can be elicited in indirect commands, i.e. those that express volition (Blake, 1980), see (49d) for an example. It is also at the age of 4 that children start producing subjunctive morphology in present commands (Fernández y Aguado, 2007).

d. Quiero que lo sepa.

I want that (he) knows_{SUBJ} it.

Between 5 and 6 years old, children acquire the subjunctive morphology in temporal relative clauses (Pérez-Leroux, 1998). For example,

e. Los niños miran por la ventana antes de que salga el arcoiris.

The children look at the window before the rainbow appears_{SUBJ}.

At the age of 6 to 7, children produce subjunctive in nominal clauses with verbs like ‘doubt’ or other attitudinal comments.

f. Dudo que lo sepa.

I doubt that (he) knows_{SUBJ} it.

Montrul (2004) argues that the acquisition of subjunctive mood in a variety of semantic and syntactic context is a process that takes six or seven years. As shown by Padilla (1990) children become sensitive to obviation and therefore do not corefer the subjects in illegal contexts at the age of 7 and 9. These studies suggest that the acquisition of the DRR is directly related to the acquisition of the subjunctive mood.

5.3. Relation between the results of our experiment and the acquisition of DRR in Spanish

The studies on DRR suggest that Spanish and Russian children prefer a coreferent interpretation rather than a non-coreferent interpretation whenever they have the option. Therefore, even if DRR is violated they corefer *pro* with the subject of the volitional predicate instead of coreferring *pro* with another antecedent available in discourse. In line with the POB (Reuland, 2011), it can be argued that children prefer the less costly procedure, i.e. a computation in syntax, to a computation in discourse, which has a higher cost. According to Koornneef (2008) children should strongly prefer bound dependencies over coreferential dependencies because the former are cross-modularity cheaper and young children have not fully developed the processing capacities of their brains. As shown by the studies on the acquisition of DRR and subjunctive, it is not until the age of 7 and 9 that children are sensitive to the DRR and have fully acquired the subjunctive mood.

With regard to the results of our experiments, if children directly interpret *pro* to be the

most local antecedent regardless of the syntactic restrictions certain sentences might have, we would expect that children process complements of volitional predicates in the same way they process complements of epistemic predicates. Hence, differences between reading times would not be predicted. Antecedent interference is not expected to have any effect if young children (before the age of 7) are tested in a similar experiment to the ones carried out in this study, for example using a visual word paradigm.

6. Conclusions and Issues for further research

In Spanish the main subject and the embedded subject in a sentence cannot corefer if the main verb of the sentence is volitional. This restriction, known as Disjoint Reference Requirement, does not occur however with epistemic predicates even if these subcategorize for a subjunctive clause similarly to the former. In the present study it was hypothesized that the dependencies in sentences with volitional and epistemic predicates are resolved in different modules of the human language. Sequence-of-tense restrictions between the clauses when the main predicate is volitional, the obligatory use of the subjunctive mood and the fact that it needs to be selected immediately in the clause, suggest that complex clauses with a volitional main predicate constitute an A-chain domain. On the other hand, complex sentences with an epistemic predicate in the main clause do not constitute an A-chain domain because they do not show signs of sequence of tense restrictions, the subjunctive can be optionally used and subjunctive does not need to be selected by the immediate clause. In an A-chain domain the fully specified *pro* clashes with the fully specified head antecedent and thus, binding of *pro* by the matrix subject and coreference with the latter are blocked. In a domain that is not suitable for A-chain formation, *pro* is free to corefer with a fully specified ϕ -features antecedent. Consequently, in the former the number of antecedents is decreased by syntactic reasons, while in the latter the number of possible antecedents does not decrease and choosing one depends on the discourse context. We proposed that the interpretation of *pro* when there are two possible antecedents is costlier than the interpretation of *pro* when there is only one possible antecedent. Subsequently, the interpretation of *pro* in a complex sentence whose main predicate is volitional and thus one of the antecedents is banned is faster than the interpretation of *pro* in a complex sentence whose main predicate is epistemic and hence no antecedent has been excluded by syntax.

In order to test this hypothesis, two self-paced reading experiments were conducted that measured Spanish speakers' reading times for different regions in a sentence. Results show that complements of volitional verbs are often read faster than complements of epistemic verbs. However, the discourse bias towards one of the readings might affect processing time and thus, significant results may not show up. Moreover, results also show that the number of the antecedents affects reading times for sentences with an epistemic verb, but it does not affect reading times for sentences with a volitional verb. Therefore an antecedent that is allowed by grammar interferes with the reader's processing resources, but an antecedent that is grammatically illegal does not modulate reading times. Finally, it was shown that when the human language processor subliminally considers an antecedent that is mismatched in number with *pro* longer reading times are obtained, as compared to the reading times that result when the language processor reads a sentence with two matching antecedents for *pro* that share the same number.

The present study has shown that Spanish readers do not process differently the indicative and the subjunctive mood. According to these results, it seems implausible to argue that subjunctive is the cause for DRR in Spanish, as argued by Picallo (1985). As Reuland claims, it must be emphasized that what should be believed to be universal is not a particular factor blocking a syntactic encoding of a binding relation, such as subjunctive mood; but rather "what blocks syntactic encoding should follow from the nature of each specific encoding device" (2011:171).

The contribution of this thesis to this topic is not to present a new analysis on obviation, but to give new insights to the study of obviation from the point of view of language processing. Numerous theoretical accounts have been proposed in order to explain obviation, but there is no unifying theory that has been accepted. Future research will provide a better picture of this phenomenon. One possibility would be to run a similar experiment to the one carried out in this study, but with children. In order to do so, a visual word paradigm should be used instead of a self-paced reading experiment. A visual word paradigm will give us new information on which are the antecedents that are specifically considered by adults and children. Self-paced reading allows us to measure reading times, while visual word paradigm allows us to identify the antecedents that are considered by the participants. We also proposed a possible experiment using

an ERP study to disentangle a possible number mismatch effect from the ambiguity effect. This is left for future research.

7. References

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