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Native and Nonnative Processing of Modality and Mood in Spanish

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NATIVE AND NONNATIVE PROCESSING OF
MODALITY AND MOOD IN SPANISH

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I dedicate this to Yesennia and Gabriel.
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ABSTRACT

The present study reports the findings of two self-paced reading tasks (N = 98). The primary experiment (subjunctive task) investigated the effects of lexical preference on L1 Spanish and L2 Spanish readers’ processing of the subjunctive during online sentence processing. Participants of various proficiency levels (intermediate, high intermediate, advanced and native Spanish speakers) read sentences that were either ±Form or ±Meaning. The variable “Form” was operationalized as a (mis)match between the lexical expression of modality in the main clause of a sentence and the mood marker (indicative or subjunctive) on the subordinate verb. The variable “Meaning” was operationalized as a (mis)match between the lexical-semantics of the subordinate verb in a sentence and the action or situation depicted in a corresponding image. The secondary experiment (local agreement task) investigated the same learners’ processing of localized subject-verb agreement violations during online sentence processing. The results of the subjunctive task revealed that only native speakers demonstrated sensitivity (i.e., increased reading times as measured via a self-paced reading methodology) to modality-mood mismatches (±Form). Intermediate through advanced-level L2 learners demonstrated sensitivity to sentence-image mismatches (±Meaning) only. In the local agreement task, only intermediate L2 learners were not sensitive to grammaticality violations. These findings are discussed in light of the Lexical Preference Principle (VanPatten, 2004, 2007) and the Shallow Structures Hypothesis (Clahsen & Felser, 2006a, 2006b, 2006c).
CHAPTER 1
INTRODUCTION

It has long been observed by second language (L2) researchers and practitioners that the Spanish subjunctive is difficult to acquire. Studies of first language (L1) acquisition suggest that children fully acquire the Spanish subjunctive by age 12. However, errors persist well into advanced stages of L2 acquisition. Although a number of proposals seek to explain the difficulty of the subjunctive, this dissertation examines VanPatten’s (2004, 2007) Lexical Preference Principle, which hypothesizes that it may be the co-occurrence of lexical items with verbs marked subjunctive that makes this verb form more difficult to process. Because the Spanish subjunctive largely co-occurs with lexical expressions of modality (e.g., es dudoso – it is doubtful, es posible – it is possible), the Lexical Preference Principle predicts that L2 learners will prefer to derive meaning from these lexical items, as opposed to verb morphology that encodes the same meaning. At the same time, there are contexts in which mood markers (indicative vs. subjunctive) are optional and convey different meanings. It has therefore been argued that the subjunctive is not merely a redundant marker of modality, but that the use of the indicative or subjunctive by adult native speakers depends on the semantic notion of [±Assertion]. The question that remains is whether lexical markers of modality, and the lexical-semantics of the verb marked subjunctive, override inflectional morphology for mood during L2 comprehension. In other words, do L2 learners rely on form, or do they rely on meaning only during online sentence processing?

This first chapter begins with an examination of modality and mood, and the modal system in Spanish. Next, I discuss both syntactic and semantic criteria that govern mood choice among native speakers of Spanish. I then consider studies that have investigated both L1 and L2 acquisition of the Spanish subjunctive. Afterwards, I explain the theoretical significance of this study and motivate the importance of online methodologies as a means for data collection. Lastly, this chapter concludes with an outline of the dissertation and definition of terms.
**Modality and Mood**

Modality is a semantic notion that exists in all languages. According to Palmer (1986), there are two macro-modalities: deontic and epistemic. Deontic modalities include the concepts of obligation, duty, permission, and prohibition (Hilpinen, 1981; Lozano, 1995; Pérez-Leroux, 1998). Epistemic modality refers to the truth of a given proposition in regard to the context of the real world and includes the semantic notions of doubt, probability, possibility and certainty. Mood is a grammatical category of verbs that includes the indicative and the subjunctive, and does not exist in all languages. Modality and mood are related inasmuch as modal markers are grammatical markers of modality. Although modal markers exist in Spanish, as well as in other romance languages (e.g., Portuguese, Italian, French), they are far less productive in English. To illustrate this point, consider the following examples.

(1.1) It is true that she reads music.
(1.2) It is possible that she reads music.

Sentence (1.1) expresses the epistemic modality of certainty, whereas (1.2) communicates the notion of possibility. However, both sentences are grammatical. In both examples, the subordinate verb ‘to read’ is marked with the third-person singular, present tense morpheme [s]. In short, this inflectional marker does not change depending on the modality expressed lexically in the main clause of (1.1) and (1.2). However, as the following section will illustrate, this is not the case in Spanish. Whitley (2002) therefore argues that because there is essentially no direct equivalent in English grammar, L1 English-L2 Spanish learners must approach the Spanish subjunctive on its own terms. This is echoed by Montrul (2004), who argues that difficulty with subjunctive morphology will be considerable for L1 English-L2 Spanish learners because English does not mark the subjunctive mood with formal semantic and syntactic features, whereas Spanish does.
The Spanish Subjunctive

There are three classes of verbs in Spanish: infinitives that end in –ar, –er, and –ir. Spanish is a morphologically rich language in which verbs are inflected for person, number, tense, aspect and mood. Spanish has two modal systems, the indicative and the subjunctive. With regular verbs, inflectional morphology for mood is expressed via verb suffixes. Table 1.1 illustrates the three classes of verbs in Spanish and highlights the difference in inflectional morphology (verb suffixes) for regular third-person singular present indicative and third-person singular present subjunctive forms. These are the target forms of this dissertation.

Table 1.1

_Mood Markers across Verb Classes in Spanish_

<table>
<thead>
<tr>
<th>Verb Classes</th>
<th>Infinitive</th>
<th>3rd Person Singular</th>
<th>3rd Person Singular</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Present Indicative</td>
<td>Present Subjunctive</td>
</tr>
<tr>
<td>–AR</td>
<td><em>hablar</em> (to speak)</td>
<td><em>habla</em></td>
<td><em>hable</em></td>
</tr>
<tr>
<td>–ER</td>
<td><em>comer</em> (to eat)</td>
<td><em>come</em></td>
<td><em>coma</em></td>
</tr>
<tr>
<td>–IR</td>
<td><em>sufrir</em> (to suffer)</td>
<td><em>sufre</em></td>
<td><em>sufra</em></td>
</tr>
</tbody>
</table>

Note that the subjunctive forms take the “opposite ending” of indicative forms. In other words, third-person singular indicative forms of –ar verbs take the morpheme [a], whereas the subjunctive forms of –ar verbs take the morpheme [e]. Similarly, third-person singular indicative forms of –er and –ir verbs take the morpheme [e], and subjunctive forms of –er and –ir verbs are marked with the suffix [a]. This too is the case with stem-changing verbs, as evidenced in Table 1.2.
<table>
<thead>
<tr>
<th>Infinitive</th>
<th>Stem-Change</th>
<th>3rd Person Singular</th>
<th>3rd Person Singular</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Present Indicative</td>
<td>Present Subjunctive</td>
</tr>
<tr>
<td><em>pensar</em> (to think)</td>
<td><em>e</em> → <em>ie</em></td>
<td><em>piensa</em></td>
<td><em>piense</em></td>
</tr>
<tr>
<td><em>dormir</em> (to sleep)</td>
<td><em>o</em> → <em>ue</em></td>
<td><em>duerme</em></td>
<td><em>duerma</em></td>
</tr>
<tr>
<td><em>servir</em> (to serve)</td>
<td><em>e</em> → <em>i</em></td>
<td><em>sirve</em></td>
<td><em>sirva</em></td>
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With few exceptions, such as formal direct commands (e.g., ¡Hable! – Speak!), the Spanish subjunctive appears in complex sentences. Complex sentences can be defined as having at least two clauses (Jordan & Pereiro-Otero, 2006), and the Spanish subjunctive is largely restricted to subordinate clauses. There are three types of subordinate clauses in Spanish (adverbial clauses, adjectival clauses, and nominal clauses), and the subjunctive can appear in all three syntactic constructions. Syntactic and semantic considerations regarding the use of the Spanish subjunctive in these three constructions and the modal contrast, where possible, are discussed in the following section.

**The Spanish Subjunctive: Semantic and Syntactic Considerations**

In their landmark article, Terrell and Hooper (1974) were the first to propose that different semantic criteria determine the use of indicative or subjunctive in the three types of subordinate clauses in Spanish (Montrul, 2004). Prior to their work, grammarians (e.g., Bello, 1847) held a purely syntactically-based view regarding the subjunctive. This view argued that subjunctive forms do not function meaningfully, but instead, mood choice is determined automatically by preceding information, for example, lexical cues of epistemic modality. This view of subjunctive morphology as a redundant marker of modality still prevails in much of L2 Spanish instruction (Collentine, 2010). In contrast,
Terrell and Hooper argued that the semantic distinction behind the modal contrast in complement clauses resides in whether the main clause is [±Assertion]. The notion of [±Assertion] can be expressed via the main verb of a sentence (e.g., Creo – I believe, Dudo – I doubt), or by way of lexical items in impersonal matrices (e.g., Es cierto – It is true, Es dudoso – It is doubtful). Their work noted correlation between the use of the indicative mood in subordinate clauses and the semantic notion of assertion. In short, if a sentence expresses [+Assertion], the subordinated verb is marked indicative. If on the other hand, the sentence expresses [–Assertion], the subordinated verb is marked subjunctive. This notion of the indicative mood as the mood of assertion and the subjunctive mood as the mood of non-assertion has since come to be accepted and is echoed by Bybee (1985), Palmer (2001), and Montrul (2004), among others.

In the following sections of this chapter, I will consider further both semantic and syntactic criteria of the Spanish subjunctive. I begin by examining the subjunctive mood and the modal contrast (where possible) in subordinate adverbial clauses. I then turn attention to mood markers in subordinate adjectival clauses, and finally to mood markers in subordinate nominal clauses. The latter is the syntactic structure that is of primary interest to this dissertation.

**Subordinate Adverbial Clauses**

Subordinate adverbial clauses are often introduced by a conjunction. Numerous L2 textbooks note that certain conjunctions, such as para que (so that), trigger what is often referred to as the “obligatory subjunctive”, as in (1.3a) and (1.3b). Important to note for these and later examples is that the main verb of a complex sentence that expresses [±Assertion] always receives the indicative marking because they are always asserted (Terrell & Hooper, 1974).

(1.3)  

a. *Estudio para que pueda pasar el examen.*  
[Study-1 Sg IND so that can-1 Sg SUB pass the exam]  
‘I study/am studying so that I can pass the exam.’

b. *Estudio para que *puedo pasar el examen.*  
[Study-1 Sg IND so that can-1 Sg IND pass the exam]
‘I study/am studying so that I can pass the exam.’

Among adult native speakers, there is no modal contrast in subordinate clauses introduced by the conjunction *para que* (so that), meaning that only the subjunctive is possible, not the indicative. Sentence (1.3b) is ungrammatical because the embedded verb cannot be marked indicative. Therefore, mood selection in this type of subordinate clause can be seen as being dependent on obligatory grammatical processes. This analysis is considered syntactically-based; that is, mood selection is based on purely syntactic criteria (i.e., an adverbial conjunction serving as a lexical trigger for subjunctive mood morphology). However, Terrell and Hooper (1974) noted that in sentences in which the embedded verb is marked subjunctive, the meaning of the sentence is always [–Assertion]. They and others (e.g., Blake, 1985; Jordan & Pereiro-Otero, 2006) have argued that these sentences are not asserted because they are contingent on another event. In other words, if an action has not yet taken place, it cannot be asserted as reality.

To further illustrate this point, although subjunctive morphology is obligatory in subordinate adverbial clauses after numerous conjunctions (e.g., *para que* – so that), it can also be used as an optional marker with special meaning after other conjunctions. For example, in (1.4a) and (1.4b) from Jordan and Pereiro-Otero (2006), the only syntactic difference is the inflectional morphology for mood on the embedded verb.

(1.4)  
a. *No voy a salir con ese chico aunque me pide cita todos los días.*

\[
\text{NEG go-1 Sg IND to to go out-INF with that boy even though me-OBJ asks-3 Sg IND date all the days}
\]

‘I won’t go out with that boy even though he asks me out every day.’

b. *No voy a salir con ese chico aunque me pida cita todos los días.*

\[
\text{NEG go-1 Sg IND to to go out-INF with that boy even if me-OBJ asks-3 Sg SUB date all the days}
\]

‘I won’t go out with that boy even if he asks me out every day.’

In (1.4a), the embedded verb *pedir* (to ask) is marked indicative because it expresses an assertion: The boy asks the girl out every day. On the other hand, the meaning of (1.4b) is
equivalent to saying “although the boy does not ask the girl out every day, if he were to do so, she would still not accept”. Therefore, modal markers on the subordinate verb change the semantics of the conjunction aunque from “even though” to “even if”. As opposed to example (1.4a), in which the girl affirms that the boy asks her out every day (+Assertion), in (1.4b), his asking her out every day is not affirmed, but rather, is hypothetical (–Assertion). In other words, the overall meaning of (1.4b) is future-oriented. In fact, Blake (1983, 1985) notes that the subjunctive in subordinate adverbial clauses functions largely as a substitute for the future tense. Similar semantic distinctions are possible with other conjunctions, such as cuando (when) and tan pronto como (as soon as). Regardless of whether the subjunctive mood in a subordinate adverbial clause is “obligatory” after one conjunction, or whether it can be used as an optional marker with special meaning after another conjunction, these types of sentences are –Assertion and +Future-orientation. To this end, Whitley (2002) argues that it is “semantic compatibility and not a syntactic feature that is responsible for mood choice” (p. 130).

Another commonality of sentences in which the subjunctive appears in a subordinate adverbial clause is that they express deontic, as opposed to epistemic modalities. Recall that deontic modalities include the concepts of obligation, duty, permission, and prohibition (Hilpinen, 1981; Lozano, 1995; Pérez-Leroux, 1998). This stands in contrast to the modal contrast in subordinate adjectival clauses, as will be discussed in the next section.

**Subordinate Adjectival Clauses**

In subordinate adjectival clauses, inflectional morphology for mood can be used as an optional marker with special meaning (Blake, 1983; Bybee, 1985; Jordan and Pereiro-Otero, 2006; Pérez-Leroux, 1998), as in (1.5).

(1.5)  

a. *Busco un libro que explica el subjuntivo.*  
[Search-1 Sg IND a book that explains-IND the subjunctive]  
‘I look/am looking for a book that explains the subjunctive.’

b. *Busco un libro que explique el subjuntivo.*  
[Search-1 Sg IND a book that explains-SUB the subjunctive]
‘I look/am looking for a book that explains the subjunctive.’

Terrell and Hooper (1974) noted, as with adverbial clauses, indicative morphology in subordinate adjectival clauses yields a meaning that is always [+Assertion], whereas subjunctive morphology in the same contexts yields a meaning that is always [–Assertion]. In (1.5a), the book that explains the subjunctive is known to exist, rendering the sentence [+Assertion]. It is not the book’s existence, but its whereabouts at the moment of speech that are brought into question. In contrast, in (1.5b), the existence of the book that explains the subjunctive is brought into question, rendering the sentence [–Assertion]. In other words, the speaker can not affirm whether they will indeed find the type of book that they are looking for. Therefore, the semantic equivalent of (1.5a) is “I know that there is a book that explains the subjunctive here somewhere, but I am not certain where it is”. On the other hand, the meaning of (1.5b) is “I would like to find a book that explains the subjunctive”. In short, in (1.5b), doubt is cast upon the existence of the antecedent, whereas this is not the case in (1.5a). Of note is that, as in subordinate adverbial clauses, the subjunctive is used in subordinate adjectival clauses of sentences that are [−Assertion] and [+Future-orientation]. However, in contrast to embedded adverbial clauses, which express deontic modalities (i.e., obligation, duty), mood selection in adjectival complements express epistemic modality. Epistemic modality refers to the truth of a given proposition in regard to the context of the real world, and includes the semantic notions of doubt, probability, possibility and certainty (Bybee, 1985). As illustrated in the next section, different types of subordinate nominal clauses express different modalities (deontic vs. epistemic).

**Subordinate Nominal Clauses**

As mentioned earlier, use of subjunctive morphology in subordinate clauses can be divided into sentences that express both deontic and epistemic modalities. Indirect commands, which are volutives that are usually introduced by *querer que* (to want that), are examples of deontic sentences, meaning that they express the concepts of obligation, duty, permission, and prohibition (Hilpinen, 1981; Lozano, 1995; Pérez-Leroux, 1998). As with many adverbial clauses that are introduced by specific conjunctions (e.g., *para*
*que* – so that), subordinate verbs in indirect commands are invariably marked subjunctive. Therefore, from a syntactic point of view, there is no modal contrast in indirect commands. Instead, they always take subjunctive morphology in a subordinate clause, as in (1.6a) and (1.6b).

(1.6) a. *Quiero que me llame.*

[Want-1 Sg that me-OBJ calls-SUB]

‘I want him/her to call me.’

b. *Quiero que me *llama.*

[Want-1 Sg that me-OBJ calls-IND]

‘I want him/her to call me.’

Although the speaker asserts something (*Quiero* – I want), the subordinate verb is marked subjunctive because there is no guarantee that the speaker will receive the call. Terrell and Hooper (1974) therefore argued that subjunctive mood morphology in (1.6a) is not merely a redundant marker of modality, but is consistent with the semantic notion of [–Assertion].

Apart from indirect commands, all other subordinate nominal clauses express epistemic, as opposed to deontic modalities (Pérez-Leroux, 1998). The following section will focus on inflectional morphology for mood in subordinate nominal clauses of sentences that express the epistemic modalities of doubt and assertion. These sentence types are the focus of the present study.

**Subordinate Nominal Clauses Expressing Epistemic Modality**

As mentioned earlier, prior to Terrell and Hooper’s (1974) work, grammarians (e.g., Bello, 1847) held a purely syntactically-based view regarding the subjunctive. This view argued that subjunctive forms do not function meaningfully, but rather that mood choice is determined automatically by preceding information. From a syntactic point of view, complex Spanish sentences that communicate epistemic modality do so in two ways:
1. via the main verb (e.g., Creo – I believe, Dudo – I doubt), or by way of lexical items in impersonal matrices (e.g., Es cierto – It is true, Es posible – It is possible), and
2. via inflectional morphology for mood that appears as a verb suffix in a subordinate clause.

With regard to the first point, recall that the main verb of a complex sentence that expresses [± Assertion] always receives the indicative marking because it is always asserted (Terrell & Hooper, 1974). With regard to the second point, the Spanish indicative is always associated with assertion, whereas the subjunctive is not (Terrell & Hooper; Bybee, 1985). Although it is true that certain matrices require the use of the indicative or the subjunctive mood in a subordinate clause (e.g., es cierto – it is true, es posible – it is possible), Terrell and Hooper argued for a semantically-based account of mood. According to their analysis, the distinction behind the modal contrast in subordinate clauses resides in whether the sentence expresses [±Assertion], as in (1.7a) and (1.7b).

(1.7) a. Es cierto que llueve.
   [Is-IND true that rains-IND]
   ‘It’s true that it rains/is raining/will rain.’

b. Es cierto que *llueva.
   [Is-IND true that rains-SUB]
   ‘It’s true that it rains/is raining/will rain.’

Sentence (1.7a) is grammatical because the matrix clause expresses the semantic notion of assertion, and the verb in the subordinate nominal clause is marked indicative. Sentence (1.7b) is therefore ungrammatical, because the subjunctive cannot be used in a subordinate nominal clause of a sentence in which the main verb expresses assertion. According to Terrell and Hooper (1974) and King and Suñer (1999), es cierto (it is true) is a strong assertive matrix that conveys a clear meaning of affirmation with no reservation. In contrast, in (1.8a) and (1.8b), the matrices convey doubt.
(1.8)  a. *Es posible que lllueva.*

[Is-IND possible that rains-SUB]

‘It is possible that it rains/is raining/will rain.’

b. *Es posible que llueva.*

[Is-IND possible that rains-IND]

‘It is possible that it rains/is raining/will rain.’

According to Butt and Benjamin (2000), subordinate verbs are marked subjunctive when the main clause includes a statement of possibility, probability, or plausibility. Sentence (1.8a) is therefore grammatical because the epistemic modality of possibility (i.e., doubt) is communicated by the matrix *es posible* (it is possible) and is grammaticalized using the subjunctive mood in the subordinate clause. Sentence (1.8b), on the other hand, is ungrammatical because the semantic notion of [–Assertion] is expressed in the main clause, but the subordinate verb is marked indicative.

**Summary of Modality and Mood**

To summarize thus far, there are two macro-modalities: deontic and epistemic. Deontic modalities include the concepts of obligation, duty, permission, and prohibition (Hilpinen, 1981; Lozano, 1995). Epistemic modality refers to the truth of a given proposition in regard to the context of the real world, and includes the semantic notions of doubt, probability, possibility and certainty. There are three types of subordinate clauses in Spanish (adverbial clauses, adjectival clauses, and nominal clauses), and the modal contrast (indicative vs. subjunctive) can appear in all three syntactic constructions. Subjunctive mood markers in subordinate adverbial clauses and indirect commands (one type of subordinate nominal clause) appear in complex sentences that express deontic modalities. The subjunctive in subordinate adjectival clauses and subordinate nominal clauses (with the exception of indirect commands) appears in sentences that express epistemic modalities. Although it is true that there are certain lexical items that co-occur with the subjunctive, such as *es posible* (it is possible), there are contexts in which mood markers are optional and convey different meanings. To this end, it has been argued that the subjunctive is not merely a redundant marker of modality, but that the use of the
indicative or subjunctive by adult native speakers depends on the semantic notions of [+Assertion]. The question that remains is whether lexical markers of modality, and the lexical-semantics of the embedded verb, override inflectional morphology for mood during L2 comprehension. In other words, do L2 learners rely on form (i.e., mood), or do they rely on meaning (i.e., lexical expressions of modality) only during online sentence processing?

The questions posited above capture the essence of what motivated this dissertation. Before turning attention to L2 comprehension of the Spanish subjunctive, I will first briefly consider L1 acquisition of the Spanish subjunctive. As mentioned in the introduction of this dissertation, studies of L1 acquisition suggest that children do not fully acquire the Spanish subjunctive until adolescence (Montrul, 2004). In an effort to better understand why this may be so, and how this can inform L2 acquisition of the Spanish subjunctive, the following section considers two seminal studies: Blake (1983), and Pérez-Leroux (1998). The rationale behind selecting these studies is as follows: Blake’s study was the first to use Terrell and Hooper’s (1974) semantic analysis of mood to investigate a potential order of L1 acquisition of the Spanish subjunctive. Pérez-Leroux investigated whether Blake’s proposed order of acquisition is dependent on cognitive factors; namely children’s comprehension of deontic and epistemic modalities. These studies will each be addressed in turn.

### L1 Acquisition of the Spanish Subjunctive

Blake (1983) was the first to use the semantic criteria proposed by Terrell and Hooper (1974) to establish a possible order of L1 acquisition of the subjunctive mood in Spanish. In supporting Terrell and Hooper’s semantic analysis that the subjunctive mood appears in sentences that are [–Assertion], Blake noted that a unifying semantic feature of indirect commands, adverbials and adjectivals, is that the Spanish subjunctive functions as a substitute for the future tense. In other words, they characterize events that are not yet realized. In contrast, the subjunctive mood in embedded nominal clauses (with the exception of indirect commands) does not necessarily convey future-orientation.

Blake (1983) investigated error rates in oral production of complex sentences among children. He hypothesized that adult-like usage of the Spanish subjunctive would
first emerge in indirect commands signaled by deontic matrices such as *querer que* (to want that), and in adverbials for which adult native speakers invariably use the subjunctive (e.g., *para que* – so that). Blake also hypothesized that the first syntactic structure in which modal choice (indicative vs. subjunctive) would emerge would be in subordinate adverbial clauses after conjunctions such as *cuando*, and then in adjectivals. He hypothesized that adult-like mood selection in nominal clauses (excluding indirect commands) would be last to emerge as in these sentences the subjunctive is not necessarily associated with events that are not yet realized, but rather refer to false beliefs.

In Blake’s (1983) study, 134 child L1 Spanish speakers from a Mexico City school completed an oral sentence completion task. Adult L1 Spanish speakers from a Mexican university (*n* = 39) completed the same task in written format. Children ranged in age from 4 to 12 years, and were characterized socio-economically as middle to upper middle class. Participants were verbally presented with a situation (1.9) at the same time that they saw an illustration depicting the same situation. Next, children were presented with a verbal prompt about the situation (1.10) before being asked to complete a third utterance already begun for them (1.11).

(1.9) Mom and son are in the kitchen. The boy reaches for some sweets high atop the refrigerator which seem to be out of his reach.

(1.10) ¿Va a alcanzar los pasteles? Mamá lo duda.
‘Will he reach the sweets? Mom doubts it.’

(1.11) Mamá duda que el niño __________.
‘Mom doubts that the boy __________.’

An appropriate response to (1.11) would be *alcance*; the third-person singular form of the –*ar* verb *alcanzar* (to reach).

Results confirmed Blake’s (1983) hypotheses. Error rates for indirect commands, signaled by matrices such as *querer que* (to want that), were nearly non-existent. As mentioned above, there is no modal contrast in such sentences, but rather, the embedded verb is invariably marked subjunctive. Children next approached adult-like behavior with
adverbial clauses, particularly with *para que* (so that); another example of a subordinate clause in which native speakers invariably use the subjunctive. In short, younger children associated subjunctive morphology with specific lexical items in sentences that express future-orientation.

In regard to adult-like use of the modal contrast, first to emerge was adult-like usage of mood markers in subordinate adverbial clauses introduced by a conjunction (e.g., *cuando* – when), and then with adjectival clauses. Blake (1983) characterized this next step in development as a semantic strategy, in which use of the subjunctive was limited to events that are not yet realized. Adult-like use of the subjunctive in nominal clauses (with the exception of indirect commands) did not emerge until age 12. Unlike in other contexts, these sentences do not necessarily communicate future-orientation, but rather, false beliefs.

One important commonality between the use of subjunctive mood markers in indirect commands and subordinate adverbial clauses is that these markers grammaticalize deontic modality (obligation, duty, permission and prohibition), as opposed to epistemic modality (doubt, probability, possibility and certainty). Based on evidence that the ability to discern between real and false beliefs is a landmark in child cognitive development (Wellman, 1990), Pérez-Leroux hypothesized that L1 child speakers would not be able to master mood choice in subordinate clauses of sentences that express epistemic modality (with the exception of indirect commands) until they were cognitively able to discern between real and false beliefs.

Pérez-Leroux (1998) used as a theoretical framework representational theory of mind (de Villiers & Pyers, 1997; Premack & Woodruff, 1978; Wellman, 1990). According to Astington and Jenkins (1999), theory of mind is a broad term that “conveys the idea of understanding a social interaction by attributing beliefs, desires, intentions, and emotions to people” (p. 1311), and it is during the preschool years that the ability to (a) attribute false beliefs to the self and others and (b) distinguish between appearance and reality develop. In order to investigate whether representational theory of mind can explain late emergence of the modal contrast in sentences that express epistemic modality, as opposed to those that express deontic modalities, Pérez-Leroux (1998) interviewed 22 child L1 Spanish speakers from a private school in Santo Domingo,
Dominican Republic. Children ranged in age from 3;5 (three years, five months) to 6;11, and were characterized socio-economically as middle to upper middle class. Participants completed two tasks with the researcher on an individual basis.

The first task was a false belief story that was read to children, accompanied by a drawing. Stories were followed by comprehension questions designed to assess understanding of false beliefs without requiring that complex sentences be produced. Children were told a story (1.12), which was followed by a question (1.13).

(1.12) *El bebé puso su chupete en la despensa y salió a jugar. Cuando él se fue su mamá llegó y abrió la despensa. Sacó el chupete y lo puso en la gaveta. El bebé volvió al rato a buscar el chupete.*

‘The baby put his pacifier in the pantry and went out to play. When he left, his mom came and opened the pantry. She took out the pacifier and put it in the drawer. The baby came back later to look for the pacifier.’

(1.13) *¿Dónde va a buscar el bebé su chupete?*

‘Where will the baby look for his/her pacifier?’

Pérez-Leroux (1998) hypothesized that children who were able to understand false beliefs would answer “the pantry”, as that is where the baby still believed the pacifier to be. In contrast, she hypothesized that children who were not yet able to understand false beliefs would answer “the drawer”, which is where the pacifier had been moved to, but without the baby’s knowledge.

In the second task, children were told subjunctive elicitation stories, each of which was accompanied by an illustration. Participants were told that in each instance there was always a character that was looking for someone or something, and that their job was to identify who or what this character was looking for. Each response was designed to elicit production of a subordinate relative (adjectival) clause in which the verb would need to be marked subjunctive. For example, students would see the illustration in Figure 1.1, would hear the story (1.14), which would be followed by the prompt (1.15).
La cocinera necesita huevos para el desayuno. Salió a buscar las gallinas. Esa gallina no pone huevos porque está comiendo. Esta otra no pone huevos porque está sentada en la cerca y es muy haragana.

‘The cook needs eggs for breakfast. She went out to look for the hens. This hen does not lay eggs because she is eating. This other one does not lay eggs because she is sitting on the fence and is very lazy.’

¿Qué busca la cocinera?

‘What is the cook looking for?’

The desired response was the following:

una gallina que ponga huevos

[a hen that lays- SUB eggs]

‘a hen that lays/will lay eggs.’

Although correct production of subjunctive mood morphology in subordinate adjectival clauses increased with age, age was not the best predictor of mastery of mood selection. Results demonstrated that children’s scores on the false belief story were more reliable predictors of performance on the subjunctive elicitation story. Pérez-Leroux (1998) therefore argued that acquisition of mood choice is dependent on semantic development, and that semantic development can be linked to development of children’s cognitive capacities.
In summary, findings in Blake (1983) and Pérez-Leroux (1998) suggest an order of L1 acquisition of the Spanish subjunctive. These stages of L1 acquisition of the Spanish subjunctive are summarized in Table 1.3.

Table 1.3

_Hypothesized Order of L1 Spanish Acquisition of the Subjunctive_

<table>
<thead>
<tr>
<th>Syntactic Structure</th>
<th>Modality</th>
<th>Semantic Notion(s) Grammaticalized with Subjunctive Morphology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Indirect commands</td>
<td>Deontic</td>
<td>–Assertion, +Future-orientation</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Quiero que me llame.</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[Want that me-OBJ calls-SUB]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>‘I want him/her to call me.’</td>
</tr>
<tr>
<td>2. Adverbial clauses</td>
<td>Deontic</td>
<td>–Assertion, +Future-orientation</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Estudio para que pueda pasar el examen.</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[Study so that can-1 Sg SUB pass the exam]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>‘I study/am studying so that I can pass the exam.’</td>
</tr>
<tr>
<td>3. Adjectival clauses</td>
<td>Epistemic</td>
<td>–Assertion, +Future-orientation</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Busco un libro que explique el subjuntivo.</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[Search a book that explains-SUB the subjunctive]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>‘I am looking for a book that explains the subjunctive.’</td>
</tr>
<tr>
<td>4. Nominal clauses(^1)</td>
<td>Epistemic</td>
<td>–Assertion, ±Future-orientation, +False beliefs</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Es posible que llueva.</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[Is possible that rains-SUB]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>‘It is possible that it is raining/will rain.’</td>
</tr>
</tbody>
</table>

As shown in Table 1.3, adult-like usage of subjunctive mood morphology in subordinate clauses has been demonstrated to first emerge with indirect commands (e.g.,

\(^1\) Excluding indirect commands
Next to emerge is the subjunctive in subordinate adverbial clauses introduced by conjunctions such as *para que* (so that), also referred to as the “obligatory subjunctive”. There is no modal contrast in either of these sentence types. Although a purely syntactic analysis would suggest that subjunctive morphology in these sentences is a redundant marker of modality that is expressed lexically in the main clause of the sentence, a semantic analysis reveals that these sentences are [–Assertion], future-oriented, and express deontic modality.

Adult-like modal choice (indicative vs. subjunctive) has been demonstrated to emerge first in adverbial clauses introduced by conjunctions such as *cuando* (when). Although there are numerous adverbial conjunctions that do not occur invariably with subjunctive morphology, these sentences are also [–Assertion], future-oriented, and express deontic modality. Modal choice emerges next in subordinate adjectival clauses, which express epistemic, as opposed to deontic modalities. As with indirect commands and adverbials, semantic commonalities with embedded adverbial clauses include the notions of [–Assertion] and future-orientation.

Last to emerge in L1 acquisition is adult-like usage of modal choice in subordinate nominal clauses (with the exception of indirect commands). Like adjectivals, use of the subjunctive in these syntactic structures expresses [–Assertion] and epistemic modality. However, unlike all other syntactic structures considered, subordinate nominal clauses express false beliefs, and not necessarily future-orientation. Findings in Blake (1983) suggest that it is not until age 12 that adult-like usage of the subjunctive in these sentences emerges. This is echoed by Montrul (2004), according to whom mood selection in subordinate nominal clauses does not solidify until adolescence.

Important in considering L2 acquisition of the Spanish subjunctive in sentences that communicate epistemic modalities is that it is during the preschool years that the ability to attribute false beliefs to the self and others, as well as the ability to distinguish between appearance and reality develop (Wellman, 1990; Pérez-Leroux, 1998). These observations characterize acquisition of the Spanish subjunctive in subordinate nominal clauses of sentences that express epistemic modality as a sophisticated cognitive skill. With regard to adult SLA, an issue that emerges is whether the Spanish subjunctive in these types of complex sentences presents challenges for learners who are already able to
(a) attribute false beliefs to the self and others, and (b) distinguish between appearance and reality. In short, if adult L2 learners are already cognitively developed, why is the Spanish subjunctive in subordinate nominal clauses of sentences that express epistemic modality late to emerge in SLA, if at all? The next section, therefore, considers studies of L2 acquisition of the Spanish subjunctive. I begin with Collentine (1995), who investigated intermediate learners. I then consider Gudmestad (2006), who investigated intermediate and advanced level learners. Finally, I turn attention to Bruhn de Garavito (1995, 1997), who studied advanced L2 Spanish learners.

Considerations in L2 Acquisition of the Spanish Subjunctive

Collentine (1995) examined the abilities of L2 Spanish learners to produce the subjunctive upon completion of intermediate level courses. He asked whether intermediate-level learners of Spanish are “generally limited to producing simplistic syntax, such as single-clause utterances and coordinate structures; or, can they also readily produce complex syntax, such as subordinate structures?” (p. 126). Participants saw 44 images, each of which contained a written caption. They were then asked a question for each drawing, to which they were asked to provide an oral response. For example, participants saw a picture of a man and a woman wearing business attire, seated at a desk. The names “María” and “Carlos” appeared above their heads. In the drawing, Maria is showing Carlos some paperwork. The caption read as follows.

(1.17) *María: Carlos, no vendiste casi nada el mes pasado.*

‘María: Carlos, you sold almost nothing last month.’

*Carlos: Entiendo, trabajaré más horas este mes.*

‘Carlos: I understand, I will work more hours this month.’

The participants were then asked questions and told that their responses must relate to the image. One such question was ¿Qué están haciendo los dos empleados? (What are the two employees doing?), to which Collentine (1995, p. 127) states an appropriate answer might be a simple, single-clause utterance, such as *María está hablando con Carlos* (Maria is speaking with Carlos). An additional question was ¿Qué
*quiere María?* (What does Maria want?), which could only be answered correctly with a nominal clause requiring the subjunctive, such as in (1.18).

(1.18) *María quiere que Carlos trabaje más.*

[María wants that Carlos works–SUB more]

‘Maria wants Carlos to work more.’

Through conducting oral interviews with 38 undergraduates enrolled in a fourth-semester Spanish course, Collentine (1995) found that 64% of learner utterances consisted of a single clause. In complex sentences, Collentine found that learners were able to provide the indicative in all obligatory contexts, but that they supplied the subjunctive in only 13% of contexts where it was needed. The data suggests that despite having received instruction on the Spanish subjunctive in its different contexts, learners exhibited high error rates in production of this form. In addition, learners did not produce many complex sentences, which are the types of sentences in which the subjunctive is most likely to appear.

Gudmestad (2006) investigated the lexical and grammatical factors that predict subjunctive use. To this end, she proposed three research questions, which are as follows: 1) How frequently do English speaking adult intermediate level and advanced level learners of Spanish select the subjunctive in a written preference task? 2) Do particular linguistic features predict intermediate and advanced level learners’ selection of the subjunctive? When considered together, which factors predict subjunctive selection? 3) If linguistic features predict the selection of the subjunctive, are the same features selected across proficiency levels?

L1 English-L2 Spanish learners included 17 intermediates enrolled in a fourth semester Spanish course, and 20 advanced learners enrolled in an Introduction to Applied Linguistics course. Six native speakers from six different Spanish-speaking countries served as a control. Gudmestad (2006) included four “linguistic features” through which to investigate modal choice: irregular verbs, futurity, desire, and emotion.

Participants read 35 situations in English, after each of which they were provided with two Spanish sentences, identical in every way except for modal markers on the
target verb. The subjunctive was possible in 20 of these sentences, and the indicative was possible in 15. Participants were asked to read each item and then to select the sentence they preferred, or whether they liked both. An example of the English language situation may be found in (1.19), followed by the Spanish sentences in (1.20a) and (1.20b).

(1.19) Isabel and Xavier have met for lunch to discuss where they will go on vacation over the summer. Isabel is interested in traveling to a different country. She has brought a couple of travel books with her and shows them to Xavier. She says:

(1.20) a. Quiero que viajamos en Italia, en España o en México.
[Want-1 Sg IND that *travel-2 Pl IND in Italy, Spain or Mexico]
‘I want us to travel in Italy, Spain or Mexico.’

b. Quiero que viajemos en Italia, en España o en México.
[Want-1 Sg IND that travel-2 Pl SUB in Italy, Spain or Mexico]
‘I want us to travel in Italy, Spain or Mexico.’

The data demonstrated that the advanced level learners performed significantly better than the intermediate level learners. The advanced group selected the subjunctive in 77.8% of the possible subjunctive contexts, whereas the intermediate level learners selected the subjunctive in 59.4% of the possible subjunctive contexts. Gudmestad (2006) concluded that although both L2 learners groups have “the linguistic ability to make mood selections” (p. 180), this ability improves significantly with proficiency level.

Next, Gudmestad (2006) conducted separate analyses for the four “linguistic features”: irregular verbs, futurity, desire, and emotion. She found that only with irregular forms did intermediate L2 learners select the sentences with the correct modal markers significantly more than those with the incorrect modal markers, independent of the linguistic features. In contrast, advanced learners selected the sentences with the correct modal markers significantly more often than those with incorrect modal markers, regardless of the linguistic feature. Gudmestad concluded that as L2 Spanish learners progress from an intermediate language course to a fourth year content course, they improve in their ability to select the subjunctive in possible subjunctive contexts.
Bruhn de Garavito (1995) investigated whether advanced L2 Spanish learners acquire subjunctives that occur after modals (e.g., poder – can) and after certain conjunctions (e.g., cuando – when) can be anterior to the main verb. She based her study on the assertion that “it is a well-known fact that the subject of a subjunctive dependent clause cannot co-refer with the subject of the matrix clause”, which she argues is “mentioned as a condition for use of the subjunctive in almost all grammar-based textbooks” (p. 83). However, she notes at least two cases in which this does not hold: when the subjunctive is introduced by a conjunction, and when the embedded verb is a modal. In both cases, co-reference is permitted, as in (1.21) and (1.22).

(1.21) \(\text{PRO, Voy a llamarte } \text{[cp cuando [ip PRO \text{i/j] llegue.}]
\]
\[\text{Go-}1 \text{ Sg IND to call him [CP when arrive-}1 \text{ Sg SUB/3 Sg SUB].}\]
\[\text{‘I will call you when I arrive /he/she arrives.’}\]

(1.22) \[\text{PRO, Espero que PRO i/j pueda hablar con él hoy.}\]
\[\text{[Hope-}1 \text{ Sg IND that can-}1 \text{ Sg SUB/3 Sg SUB to speak-INF with him today]}\]
\[\text{‘I hope I/she/he can speak to him today.’}\]

In (1.21) and (1.22), the matrix and subordinate verbs can co-refer. It is also possible that the matrix verb and embedded verb can refer to two people: a first-person singular subject and third-person singular direct object, respectively.

Twenty target sentences were created, which were all grammatical, but ambiguous (i.e., could refer to either the subject or the object). The distinction was that in 10 sentences co-reference between the subject of the main clause and the subordinate verb was possible, whereas in the other 10 sentences the embedded pronoun (PRO) had to reference a third person, as per Chomsky’s (1988) Binding Principle B, which states that a pronoun must be free (i.e., not bound) of its governing category (e.g., clause). In other words, in the sentence ‘Mary saw her’, ‘her’ cannot refer to ‘Mary’, but rather, must refer to another person.

Thirty-nine participants (27 advanced L2 learners and 12 L1 Spanish speakers) took part in the study. L2 learners were enrolled in advanced Spanish courses in a continuing education program and came from varied L1 backgrounds. Participants
completed a written truth value task in which they read 50 situations (short stories), each of which was followed by a statement that one of the characters in the story could have said. The task was to determine whether what was said was reasonable given the corresponding situation. Sentences included 20 targets in which the subordinate verb was marked subjunctive: 10 sentences in which co-reference was possible, and 10 in which it was not. Consider the situation in (1.23) and the statement in (1.24). In the latter, the modal verb *poder* (can) permits co-reference.

(1.23) *María le pide a Pepe que le ayude pero tiene que disculparse porque está ocupado. Pepe dice:*

‘Maria asks Pepe to help her but he must excuse himself because he is busy. Pepe says:’

(1.24) *Siento mucho que no pueda ayudarte. (sí) (no)*

‘I regret very much that *PRO* not be able-*1st SG SUB* to help you. (yes) (no)’

Also take for example the situation in (1.25) and the statement in (1.26). In the latter, the conjunction *cuando* (when) permits co-reference.

(1.25) *Paquita se va de viaje y su mamá está preocupada.*

*Paquita dice:*

‘Paquita is going on a trip and her mother is worried.

Paquita says:’

(1.26) *No te preocupes. Te mandaré un telegrania cuando llegue. (sí) (no)*

‘Don't worry. I will send you a telegram when *PRO* arrive-*1 SG SUB*. (yes) (no)’

In contrast, the situation in (1.27) is followed by an indirect command, (1.28), which does not permit co-reference.
Mencha cumple años el viernes. Desea recibir muchos regalos.

*Mencha dice:*

‘It is Mencha’s birthday on Friday. She wants to get a lot of presents.

Mencha says:’

Quiero que reciba muchos regalos. (sí) (no)

*I want that get-*1st Sg SUB/3rd Sg SUB a lot of presents. (yes) (no)*

Results demonstrated that native speakers of Spanish were able to reject sentences in which co-reference was not possible, and accept sentences in which it was. In contrast, L2 learners were not. Only when attention was turned to L2 learners who scored at least 90% on a proficiency measure (within native speaker range) were five L2 learners identified who performed as native speakers. Based on the task used, findings suggest that native-like performance is possible, although not uniform.

In a partial replication study, Bruhn de Garavito (1997) recruited 43 L2 Spanish learners: 15 of whom represented a variety of L1 backgrounds, and 28 of whom were L1 English speakers. In addition, 10 native speakers served as controls. Results did not show any significant differences among L2 learners, regardless of L1. Individual results showed that 26 L2 participants performed at or below chance (50%), whereas the remaining 17 scored within the range of native speakers. Therefore, as observed in her earlier study, Bruhn de Garavito found that native-like performance is possible, although not uniform, regardless of L1.

**Summary and Significance of the Present Study**

To summarize, studies in L1 acquisition have found that adult-like usage of the Spanish subjunctive in its variety of contexts is acquired late. Based on early emergence of the subjunctive in indirect commands and adverbials in which no modal contrast exists, it could be argued that children first associate the subjunctive with specific lexical items (e.g., *quiero que* – I want that, *para que* – so that). Pérez-Leroux (1998) argued that mood choice is dependent on semantic development and that semantic development can be linked to development of children's cognitive capacities. L2 studies also suggest that errors with the Spanish subjunctive persist well into the advanced stages of language
learning. As mentioned earlier in this chapter, the issue that emerges with regard to SLA is whether the Spanish subjunctive in these types of complex sentences presents challenges for learners who are already able to (a) attribute false beliefs to the self and others, and (b) distinguish between appearance and reality. In short, if adult L2 learners are already cognitively developed, why is the Spanish subjunctive in subordinate nominal clauses of sentences that express epistemic modality late to emerge in SLA, if at all? One possibility is that adult L2 Spanish learners may derive meaning solely from lexical expressions of modality and the lexical-semantics of the embedded verb, and not from subjunctive mood markers. In other words, are L2 learners processing for meaning and not form? If so, is this different from adult L1 Spanish speakers?

In order to know whether this is the case, it is imperative to measure real time comprehension to determine whether there exist fundamental differences in processing. Note that the subjunctive studies considered in this chapter used tasks during which learners had the time and opportunity to draw upon metalinguistic information regarding grammar rules. These types of tasks are also referred to as being offline in nature. A question that has arisen in SLA is how can researchers avoid providing learners with opportunities to draw upon metalinguistic information, as to not confound this type of knowledge with the moment-by-moment processes that occur during real-time comprehension? Real-time comprehension is also referred to as online processing, and data regarding online processing is collected via online methodologies. Online methodologies provide millisecond-precise accounts of processing difficulties, sensitivity (or insensitivity) to grammaticality violations, and/or sensitivity to structurally ambiguous sentences.

The present study used an online methodology of data collection (self-paced reading) to measure (in)sensitivity to mood violations in subordinate nominal clauses of sentences that express epistemic modalities. Sensitivity in online experiments refers to increased reading times at ungrammatical regions of sentences, as compared to the same regions in grammatical control sentences. To illustrate this point, consider Figure 1.2.
Figure 1.2 clearly depicts a person who is seated at a desk or table and is writing on a piece of paper. What is not clear in whether he is in his room, at the library, at the office, etc. Now, consider the following sentences and how they relate to this image.

(1.29)  a. *Es posible que *escribe en el cuarto.
        [Is possible that *writes-{IND} in the room]
        ‘It’s possible that he writes/is writing in the room.’

b. *Es posible que escriba en el cuarto.
   [Is possible that writes-{SUB} in the room]
   ‘It’s possible that he writes/is writing in the room.’

In both (1.29a) and (1.29b) we have a sentence-image match with Figure 1.2 because the lexical-semantics of the verb (*escribir – to write) matches the picture. Furthermore, it is possible that the person writing is in his room. However, only in (1.29b) is there a modality-mood match. As outlined earlier in this chapter, when the notion of possibility is expressed lexically in the main clause of a sentence (*es posible – it’s possible), the subordinate verb must be marked subjunctive. This is evidenced by the subjunctive morpheme [a] on the –ir verb (*escribir – to write). In contrast, in (1.29b) there is modality-mood mismatch as the embedded verb is marked third-person singular present indicative (*escribe – writes-{IND}). In short, (1.29b) is ungrammatical. If L2 learners take longer to read the subordinate verb in (1.29b), as opposed to same verb in (1.29a), it can be argued that they are sensitive to the modality-mood mismatch. If on the other hand they do not, it can be argued that during online processing of these types of complex sentences, L2 learners derive meaning from lexical items (e.g., lexical markers of
modality in the main clause and lexical-semantics of the embedded verb), but not from inflectional morphology for mood on the embedded verb.

Online methodologies can provide millisecond-precise accounts of (in)sensitivity to grammaticality violations, and hence, help researchers to better understand processing difficulties. The following section, therefore, considers three such methodologies and how they have informed processing.

**Online Methodologies**

**Self-Paced Reading**

Self-paced reading (Just, Carpenter, & Wooley, 1982) is the most common online methodology, and was the method of data collection employed in the present study. In a non-cumulative, moving window self-paced reading task participants are seated at a computer, where they initially see a blank screen, save a series of underscores. These underscores indicate where words (or phrases) will later appear. When a participant presses a key on a keypad, the first word is revealed. A second key press causes the first word to disappear, and the second word to appear. A third key press causes the second word to disappear, and the third word to appear, and so forth. The advantage of self-paced reading tasks is that time spent reading an individual word is recorded in milliseconds. Online methodologies assume that ungrammatical sentences may take longer for native speakers to read because the parser may attempt reanalyses before finally assigning ungrammatical status to a given stimulus (Juffs, 2001). Regarding the target form of this dissertation, consider (1.30).

(1.30) *Es posible que *llueve hoy.*

[Is possible that *rains-IND today]

‘It’s possible that it rains/is raining today.’
In a non-cumulative self-paced reading task, this sentence would appear as follows.

Button Press 1. __ _______ ___ ______ ___.
Button Press 2. Es _______ ___ ______ ___.
Button Press 3. __ posible ___ ______ ___.
Button Press 4. __ ______ que ______ ___.
Button Press 5. __ ______ ___ llueve ___.
Button Press 6. __ ______ ___ ______ hoy.
Button Press 7. __ ______ ___ ______ ___.

L1 speakers of Spanish would be expected to demonstrate longer reading times on ungrammatical regions of a sentence. Therefore, in (1.30), native speakers would be expected to take longer to push the button after reading llueve (rains-IND) than if the verb were marked subjunctive (llueva – rains-SUB). Although an L2 learner who has received instruction on the Spanish subjunctive may have metalinguistic knowledge that (1.30) is ungrammatical, and therefore may be able to identify the error on an offline measure, they may not demonstrate online sensitivity to the grammaticality violation. In other words, even a more advanced L2 learner may not register significantly different reading times after reading llueve (rains-IND) than if the verb were marked subjunctive (llueva – rains-SUB). In fact, L2 research employing self-paced reading has found that forms for which learners have linguistic information do not show up at the level of processing until the advanced stages of language acquisition, if at all. Such studies include Foote (2010), Jiang (2004, 2007), and Sagarra and Herschensohn (2010), which will be reviewed in more detail in Chapter 2.

**Event-Related Potentials**

Event-Related Potentials are used to measure neural activity as it relates to the online processing of syntactic and semantic anomalies. Active neurons in the brain produce electrical activity that can be measured by electrodes placed on the scalp. Event-
Related Potential (ERP) research is often concerned with N400 and P600 effects, which are believed to be indicative of sensitivity to semantic and syntactic anomalies, respectively. ERP research has found that beginning L2 learners are sensitive only to grammaticality violations for structures similar to those in the L1 (Tokowicz & MacWhinney, 2005), and that even at the advanced stages of language acquisition, neural patterns of L2 learners differ from those of native speakers (Chen, Shu, Liu, Zhao, & Li, 2007). The studies cited in this section will be reviewed in greater detail in the following chapter.

**Eye-Tracking**

Eye-tracking is a way of examining participants’ sensitivity to grammatical violations by recording eye movements during reading. This methodology uses a camera to record the exact points on which a participant focuses as they read sentences in real-time. L2 research employing eye-tracking research (e.g., Keating, 2009) has found that learners are sensitive only to adjacent (localized) grammaticality violations (*casa *pequeño – house-FEM small-MASC), but not to violations that are separated by intervening material (e.g., *la casa es bastante *pequeño – the house-FEM is quite small-MASC). Keating’s study will also be reviewed in more detail in Chapter 2.

Previous sections of this chapter noted that findings in studies of L1 acquisition suggest that adult-like usage of the Spanish subjunctive may be linked to the ability to discern between real and false beliefs, which Wellman (1990) cites as a landmark in child cognitive development. The issue that arises, therefore, is how can researchers better understand why the subjunctive in subordinate nominal clauses of sentences that express epistemic modality is late to emerge in adult SLA, if ever, if learners are already cognitively developed? One possibility is that L1 Spanish speakers and L2 Spanish learners differ in their online processing of these types of sentences. To this end, and based on findings from online studies of L2 sentence processing, the purpose of this dissertation is to investigate intermediate-advanced L2 Spanish learners’ (in)sensitivity to modality-mood mismatches via a self-paced reading methodology.
Outline of the Dissertation

This dissertation is organized as follows. In Chapter 2, I begin by discussing VanPatten’s (2004, 2007) model of input processing, paying specific attention to the model’s Lexical Preference Principle. Next, I consider the body of offline research that has provided support for the Lexical Preference Principle, and argue for the necessity to use online methodologies to test this hypothesis’ predictions regarding (in)sensitivity to violations in mood morphology. I then consider studies that used online methodologies to investigate L1 and L2 (in)sensitivity to violations in agreement morphology. Next, I turn attention to additional considerations in investigating the Spanish subjunctive, and in so doing, consider predictions made in Clahsen and Felser’s (2006a, 2006b) Shallow Structures Hypothesis. I conclude by stating the research questions and hypotheses that guided the present study. The third chapter describes the methodology used to conduct this study, including information about the participants, materials, and statistical analyses. The fourth chapter presents the results for the present study. Lastly, the fifth chapter provides a critical analysis of the results.

Definition of Terms

Deontic: a broad term referring to the types of modality that are concerned with actions performed by others and by oneself (Palmer, 1986). Deontic modalities contain an element of will, and include the semantic notions of obligation, duty, permission, and prohibition.

Epistemic: derived from the Ancient Greek word for “knowledge” or “understanding”, epistemic modality refers to the truth of a given proposition in regard to the context of the real world and includes the semantic notions of doubt, probability, possibility, and certainty.

Indicative: one of the two sets of verb systems in Spanish. The indicative mood signals that the speaker perceives an event as fact or as an objective reality (Whitley,
2002), or when the speaker wants to affirm the veracity of a situation with no reservations (King & Suñer, 1999).

**Input Processing:** the making of form-meaning connections during real-time comprehension.

**Lexical Preference:** a hypothesis that L2 learners will prefer to derive meaning from lexical items, as opposed to verb morphology, when both encode the same semantic information.

**Modality:** referring to the semantic notions of opinion or attitude. Although all languages allow for the expression of modality (e.g., via lexical items or modal verbs), not all languages express modality within verbal morphology.

**Mood:** a morphosyntactic category of the verbs that is found in some, but not in all languages. Unlike other morphosyntactic categories (e.g., tense and aspect), the semantic function of mood morphology relates to the content of a whole sentence (Palmer, 1986).

**Offline:** a term that can refer to tasks without a time constraint, during which one has the opportunity to draw upon metalinguistic information.

**Online:** in the process of; a term that can refer to psycholinguistic tasks that incorporate millisecond-precise accounts of real-time language processing.

**Online Sensitivity:** referring to slower reading times at ungrammatical or ambiguous regions when compared to grammatical or unambiguous regions of control sentences, as measured by online methodologies.

**Processing:** the construction of structural representations for sentences, phrases and morphologically complex words in real-time language comprehension and production (Clahsen & Felser, 2006a).

**Shallow Structures Hypothesis:** the argument that L1 and adult L2 processing are fundamentally different inasmuch as the syntactic representations that adult L2 learners compute during comprehension contain less syntactic detail than those of child and adult native speakers.

**Subjunctive:** one of the two sets of verb systems in Spanish. Used by speakers to express that a particular event is beyond their experience or knowledge, or to express
wish or will (Whitley, 2002). It is also used to express some reservations on the veracity of situations (King & Suñer, 1999).
CHAPTER 2
BACKGROUND AND MOTIVATION FOR THE PRESENT STUDY

The goal of this chapter is to review the literature related to two factors that may impact L2 processing of the Spanish subjunctive: lexical preference and syntactic distance. First, I begin by considering the model of input processing, which is the framework motivating the study, with a primary focus on the model’s Lexical Preference Principle. Second, I discuss the findings and limitations of studies that have investigated the effects of lexical preference on L2 comprehension. Then, I consider the Shallow Structures Hypothesis, which makes predictions regarding L1 and L2 online sentence processing. Next, I present studies that have investigated online processing of agreement morphology, and summarize the findings that are pertinent to the present study. Lastly, I state the research questions and hypotheses that guided this dissertation.

Input Processing

Input processing (VanPatten, 1996, 2004, 2007) is concerned with how L2 learners make form-meaning connections during comprehension. Based the assumption that L2 learners’ processing capacity is limited, input processing research investigates what strategies L2 learners use during real-time comprehension of input, and how and what part of that input becomes intake. Consider Figure 2.1, which is a shorthand sketch of the hypothesized language acquisition process and the aspects of it with which input processing research is concerned.

\[
\text{input} \rightarrow \text{intake} \rightarrow \text{developing system} \rightarrow \text{output} \\
\uparrow \\
\text{input processing}
\]

*Figure 2.1. Primary Interest of Input Processing Research (VanPatten & Cadierno, 1993)*
The notion of input becoming (or not becoming) intake is paramount because from intake learners may engage in further processing in order to build and restructure their linguistic systems (VanPatten, 1996). Given that all humans have limited processing capacity, input processing investigates how L2 learners “choose” what to process from the input to which they are exposed. VanPatten contends that learners are driven to look for propositional content in the input before looking for how that message is grammatically encoded. In other words, it is hypothesized that L2 learners will process input for meaning before they process input for form. In the most recent version of input processing, VanPatten (2007) lists three fundamental questions with which the model is concerned:

1. Under what conditions do learners make initial form-meaning connections?

2. Why, at any given moment in time, do they make some and not other form-meaning connections?

3. What integral strategies do learners use in comprehending sentences and how might this affect acquisition (VanPatten, p.116)?

According to VanPatten (2007), there exist universal, default L2 processing strategies. These “non-optimal” strategies are outlined in the model’s various principles, which seek to explain how learners go about making form-meaning connections in their construction of an L2 linguistic system. One particular principle of input processing, the Lexical Preference Principle, makes specific predictions that may explain why the Spanish subjunctive is a difficult form for L2 learners to process. This principle is discussed in the following section.

**The Lexical Preference Principle**

The Lexical Preference Principle hypothesizes that during comprehension, L2 learners prefer to derive meaning from lexical items as opposed to verb morphology when both carry the same meaning, as in (2.1).

\[(2.1) \quad \text{He walked to class yesterday.}\]
The Lexical Preference Principle predicts that L2 learners will derive the sense of pastness communicated by the word *yesterday* as opposed to the [ed] morpheme on the end of *walked*. In short, an L2 learner may comprehend the lexical adverb *yesterday*, and the lexical-semantics of the verb *to walk*, and not realize that the sentence is ungrammatical. According to the Lexical Preference Principle, because the sense of pastness the sentence in (2.1) is encoded lexically, the past tense morpheme [ed] is redundant, and therefore, less salient to L2 learners during processing.

With regard to the target form of this dissertation, recall that if the main clause of a sentence expresses probability or possibility, the verb in a subordinate nominal clause must be marked subjunctive. In order to illustrate this point, consider (2.2a) and (2.2b).

(2.2)  

a. *Es posible que llueva.*  
   [Is possible that rainy-SUB]  
   ‘It’s possible that it will rain.’

b. *Es posible que *llueve.*  
   [Is possible that *rains-IND]  
   ‘It’s possible that it will rain.’

Sentence (2.2a) is grammatical because epistemic modality (*es posible* – it is possible) is grammaticalized using the subjunctive mood in the subordinate clause. Sentence (2.2b), on the other hand, is ungrammatical because the semantic notion of possibility expressed in the main clause is grammaticalized in the subordinate nominal clause with the indicative mood. According to the Lexical Preference Principle, L2 learners will prefer to derive the epistemic modality of possibility from the lexical item *posible* (possible) in the matrix than from inflectional morphology for mood in the subordinate clause.

This relationship between lexical markers and inflectional morphology for mood provides an exciting area in which to test the tenability of the Lexical Preference Principle during online sentence comprehension, and is the focus of this dissertation. As discussed in Chapter 1, at least for native speakers of Spanish, it can be argued that the subjunctive is not merely a redundant reflection of modality expressed elsewhere in a
sentence, but is dependent upon semantic factors. The question that remains is whether this is the case for adult L2 Spanish learners. In order to help motivate this research direction, the following section considers studies that have investigated the effects of the lexical preference on L2 comprehension.

**Research Investigating the Lexical Preference Principle**

Lee (1987) investigated whether the comprehension of the Spanish present subjunctive is necessarily a function of instruction in the subjunctive, or if comprehension of a novel form can be achieved without instruction. Lee asked: 1) can certain uses of the subjunctive mood be comprehended by learners who have never been instructed in the subjunctive? 2) How does their comprehension of the subjunctive mood compare to the comprehension of learners who have been instructed in the subjunctive? 3) Do learners perform differentially on a variety of comprehension assessment tasks? 4) Does performance on these assessment tasks change over time?

First and second semester L2 Spanish learners (N = 180), completed one of five comprehension assessment tasks: modified cloze passage, probe questions in Spanish, probe questions in English, a recall task in Spanish, and a recall task in English. Learners were assigned to one of two groups: a group that received no instruction on Spanish subjunctive forms and uses, and a group that did receive any such instruction.

Although results demonstrated that second-semester learners performed better than first-semester learners, no significant differences were observed between groups, regardless of task. In other words, learners in both groups were able to comprehend passages equally. Lee (1987) concluded that prior instruction of the Spanish subjunctive and its uses is not necessary for comprehension. In other words, participants were able to derive meaning from lexical markers of modality and the lexical-semantics of embedded verbs, and did not make use of subjunctive morphology. These findings lend support to the notion of lexical preference being a factor in L2 comprehension.

Lee, Glass, Cadierno, and VanPatten (1997) conducted a study that examined the effects of lexical and grammatical cues on the comprehension of the Spanish preterite;
one of the forms that express past temporal reference. L1 English-L2 Spanish learners ($N = 102$) enrolled in first, third, and fifth semester Spanish courses listened to a tape recorded, biographical narrative. Participants listened to one of two versions of the narrative: one containing both lexical and grammatical cues for temporal reference (e.g., yesterday and walked), and one containing grammatical cues only. Apart from this distinction, both narratives were identical in content. Afterwards, learners were asked to provide a written recall (in English) of what they heard.

Learners exposed to the narrative that contained both grammatical and lexical cues were able to reconstruct more propositional content during free, written recall then those exposed to the grammatical cues only. In other words, learners demonstrated greater comprehension when lexical cues for pastness were present. Lee et al. (1997) therefore argued that results supported the lexical preference principle, which states that L2 learners will prefer to derive meaning from lexical items, as opposed to verb morphology, when both encode the same semantic information.

Lee (2002) investigated the effects of the presence or absence of lexical cues (temporal adverbs) on the incidental acquisition of the Spanish future tense; a form that was novel for participants. Data was analyzed from L1 English-L2 Spanish learners ($N = 181$) enrolled in either a second-semester Spanish course, or a first-year review course. Participants read a passage adapted from *El hogar electrónico* (The Electronic Home), which appeared in the students’ textbook ¿Sabías que…? (VanPatten, Lee, & Ballman, 2000).

In order to assess comprehension, immediately after reading the passage learners were asked to engage in an English language free recall task. In this task, participants were asked to write down everything they could remember about what they had just read. Lee (2002) found that the inclusion of temporal adverbs at the outset of each paragraph helped to orient a general future-oriented context, as demonstrated in free recalls. In other words, learners who received lexical markers of tense outperformed those who received morphological markers of tense only. Because L2 learners preferred to derive meaning from words, as opposed to inflectional morphology, when both encoded the same meaning, results lend support to the lexical preference principle.
Rossomondo (2007) conducted a partial replication of Lee (2002). L1 English-L2 Spanish learners ($N = 140$) enrolled in accelerated elementary Spanish university courses took part in the study. As in Lee, the target form (the Spanish future tense) was a novel form for learners. Participants read one of two versions of the same text as in Lee: one version contained future lexical temporal indicators (LTI), and the other did not. Written input in the +LTI condition included lexical and grammatical cues for future tense, whereas only grammatical cues were present in the –LTI condition. Apart from this distinction, the semantic content of the passages was identical. Afterwards, participants were given an English language multiple choice comprehension task, a form recognition task, and a form production task.

Learners whose passage was in the +LTI condition performed significantly better on the multiple choice comprehension task than those who read the –LTI passage. However, for the form recognition task, no significant differences were observed, regardless of ±LTI condition. The same held true for the form production task, on which there were no significant differences between participants who read the +LTI or the –LTI version of the passage. Therefore, lexical temporal cues enhanced comprehension of propositional content, but not the comprehension or production of inflectional morphology for the Spanish future tense. These results are taken as evidence for support of the Lexical Preference Principle.

In summary, the studies reviewed here suggest that L2 learners’ comprehension of propositional content is strengthened by the presence of lexical cues for mood (Lee, 1987) and tense (Lee, 2002; Lee et al., 1997; Rossomondo, 2007). This held true for learners who had metalinguistic information regarding target forms, as well as for those who did not. L2 learners’ observed tendency to derive meaning from lexical items, as opposed to inflectional morphology, is taken as evidence for the tenability of the Lexical Preference Principle.
Limitations of Lexical Preference Studies

As mentioned at the beginning of this chapter, input processing is concerned with explaining how L2 learners choose what to process. Sentence processing research focuses on the interpretation of sentence-level meaning, and deriving meaning for the words and syntactic structure as a unit Harrington (2001). According to Mitchell (1994), sentence comprehension can therefore be viewed as a structure-building activity in which the reader or listener builds structure from the input in real-time. For the purpose of the present study it is therefore important to note that the lexical preference studies considered in the previous section were not online measurements of processing, but rather, were offline tasks. Although all of the studies engaged learners in meaning-based comprehension, it is difficult to know whether the participants relied solely on the meaning of lexical items and lexical-semantics of verbs, or whether they made use of inflectional morphology during real-time comprehension.

In their review of processing research, Clahsen and Felser (2006a) argued that “non-native language processing has long been the subject of much speculation and little empirical investigation” (p. 564). Based on this, they proposed that sentence processing research address the following questions:

1. How do L2 learners process complex grammatical phenomena?
2. How do L2 grammatical processing abilities change over time?
3. Can grammatical processing become fully native-like in advanced L2 learners?

As mentioned in Chapter 1, the Spanish subjunctive is a complex grammatical phenomenon. The Spanish subjunctive appears largely in complex sentences (i.e., sentences that have at least two clauses), and this form is largely restricted to subordinate clauses. There are both semantic and syntactic considerations regarding the use of the Spanish subjunctive. Semantic considerations include modality (deontic vs. epistemic), and the notion of $[\pm \text{Assertion}]$. Syntactic considerations include the co-occurrence of lexical expressions of modality in a main clause (e.g., es posible – it’s possible) with subjunctive mood markers on a verb in a subordinate clause. Therefore, in addition to the lexical-morphological relationship that is endemic to the Spanish subjunctive, the relationship is also cross-clausal in nature. In order to better understand the challenges
that complex grammatical phenomena pose during L2 online processing, the next section looks at long distance agreement. I first begin by briefly considering the Shallow Structures Hypothesis, which makes predictions regarding long distance agreement, as opposed to local agreement.

**The Shallow Structures Hypothesis**

The Shallow Structures Hypothesis (Clahsen & Felser, 2006a, 2006b, 2006c) arose from the observation that although successful acquisition of a language is based on being able to process linguistic input in real time, little is known about the actual processes that language learners employ during real time comprehension. In their review of studies that have investigated online processing of morphology and syntax by child and adult L1 speakers, and adult L2 learners, Clahsen and Felser (2006c) argued that observed differences in L1 and L2 processing are attributed to adult L2 learners’ comparatively shallow computations of syntactic representations during comprehension. They characterize these computations as shallow based on evidence that adult L2 learners tend to rely more heavily on lexical-semantic information, associative patterns and other surface cues to interpretation (Clahsen and Felser, 2006a). In the words of Clahsen and Felser (2006b), “L2 learners who have learned their L2 after acquiring their native language process the L2 differently from native speakers (p. 111)”. The core idea of the Shallow Structures Hypothesis, therefore, is that grammatical processing in the L2 is fundamentally different from grammatical processing in the L1.

An outgrowth of the Shallow Structures Hypothesis is the general prediction that L2 learners can demonstrate native-like sensitivity to agreement errors, but only in local domains. According to Clahsen and Felser (2006a), the Shallow Structures Hypothesis “claims that the L2 grammar does not provide the type of syntactic information required to process non-local grammatical phenomena in native-like ways (p. 565)”. They note that although L2 learners can achieve native-like processing in the areas of lexical-semantics and localized agreement, even more advanced L2 learners have been found to differ from L1 speakers in their processing of non-local dependencies. As this
dissertation examines L1 and L2 online processing of cross-clausal, modality-mood violations, the next section of this chapter reviews studies that have used online methodologies to investigate online sentence processing of local and long distance violations of agreement morphology.

**Online Processing of Agreement Morphology**

In a self-paced reading study, Jiang (2004) investigated whether highly proficient L1 Chinese-L2 English adult learners and L1 English speakers would demonstrate (in)sensitivity to the English number morpheme. He designed grammatical and ungrammatical sentences that targeted both number agreement (e.g., “The bridges to the island were about ten miles away” vs. “The bridge to the island *were about ten miles away”). Although L2 learners were able to correctly identify errors regarding the number morpheme on an offline measure, no statistically different reading times were obtained for these sentences. In other words, although highly proficient L1 Chinese-L2 English learners had explicit knowledge regarding the number morpheme in English, they were not sensitive to the plural morpheme during online comprehension. In contrast, L1 English speakers were sensitive to such violations. These differences were evidenced by native English speakers’ increased reading times at the verb “were” in sentences such as “The bridge to the island *were about ten miles away”, whereas this was not the case with L2 participants.

Of note is that in the sentences that tested learners’ (in)sensitivity to the English number morpheme, there was intervening material (e.g., the prepositional phrase “to the island”) between subject-verb number agreement. Therefore, in order to assess whether learners were sensitive to localized grammaticality violations, Jiang (2004) created sentences that targeted person agreement (e.g., “I told you I am a professor of psychology” vs. “I told you she *am a professor of psychology”). In contrast to the sentences that targeted long-distance agreement, L2 learners did demonstrate sensitivity to adjacent pronoun-verb agreement violations. These differences were evidenced by
increased reading times at the verb “am” in sentences such as “‘I told you she *am a professor of psychology” by both L1 English and L1 Chinese-L2 English participants.

Tokowicz and MacWhinney (2005) reported an ERP study that investigated whether similarity between the L1 and the L2 determines the extent to which online L2 processing is native-like. Beginning level L1 English-L2 Spanish adult learners ($N = 20$) participated in the study. Each participant read 120 critical sentences on a computer screen in a word-by-word fashion and rendered a grammaticality judgment immediately after each stimulus. Spanish sentence stimuli targeted three L2 syntactic constructions: one similar to the L1 (auxiliary omission), one unique to the L2 (determiner number), and one different from the L1 (determiner gender). The following are examples of these three structures from the study.

(2.3) Auxiliary omission (Similar):

$Su$ $abuela$ *cociendo/cocina muy bien.
[His grandmother *cooking/cooks very well]

(2.4) Determiner gender (Unique):

$Ellos$ $fueron$ a *un/una fiesta.
[They went to *a-MASC/a-FEM party]

(2.5) Determiner number (Different):

*El/los niños están jugando.
[*The-Sg/The-Pl boys are playing]

Tokowicz and MacWhinney (2005) hypothesized that because both English and Spanish make use of the auxiliary before a participle, participants would be able to transfer their L1 knowledge to this ‘similar’ L2 structure. Therefore, they predicted that learners should be sensitive to syntactic violations in this condition. Regarding the ‘unique’ structure (determiner gender), because English makes no use of grammatical gender, the researchers hypothesized that the lack of negative L1 transfer and online competition would cause participants to demonstrate sensitivity to these violations. Finally, with regard to the ‘different’ structure (determiner number), because L1 English speakers have learned to pay attention to demonstratives that encode number information.
(these and those), but to ignore definite determiners (the), Tokowicz and MacWhinney expected that learners would not be sensitive to syntactic anomalies regarding the determiners el (the-MASC) and la (the-FEM).

The ERP data revealed that participants were indeed sensitive to auxiliary omission and violations in determiner gender. However, learners were not sensitive to violations in determiner number. Therefore, Tokowicz and MacWhinney (2005) concluded that beginning L2 learners are only sensitive to violations of certain types, namely, those that are similar to the L1, or completely unique to the L2.

Chen, Shu, Liu, Zhao and Li (2007) used ERP methodology to investigate morphosyntactic processing between L1 Chinese-L2 English learners (n = 18), whose first language does not encode grammatical morphology. L1 English speakers (n = 17) served as a control group. Four versions of each target sentence were created that manipulated number and congruency. Two versions were grammatical (e.g., “The price of the car was too high” vs. “The price of the cars was too high”), and two were ungrammatical (e.g., “The price of the car *were too high” vs. “The price of the cars *were too high”). After having read each sentence, participants were asked whether the sentence was grammatical.

L2 learners exhibited high scores on grammaticality judgments (88%) and were faster to reject ungrammatical sentences in the two ungrammatical conditions. However, ERP data revealed that L2 learners registered neural patterns distinct form those of native speakers. Because Chinese does not encode grammatical morphology, Chen et al. (2007) concluded that “language-specific experiences help to shape the functional and neural structures of the brain” (p. 172). The researchers hypothesized that the presence or absence of P600 effects, believed to be signatures of morphosyntactic anomalies, may be dependent on the degree to which the structures are similar in the L1 and the L2.

Jiang (2007) reported a self-paced reading task that investigated whether L2 English learners are sensitive to grammatical idiosyncrasies involving the plural morpheme and verb subcategorization. Based on findings from his 2004 study, Jiang hypothesized that L2 learners of English would not show sensitivity to violations involving the English plural morpheme [s], but would demonstrate sensitivity to ungrammatical sentences involving verb subcategorization. L1 speakers of English (n =
24) and L1 Chinese-L2 English adult learners \((n = 26)\) took part in the study. Participants read 64 critical sentences in a self-paced reading task, 32 of which targeted the plural morpheme, and 32 of which targeted verb subcategorization. Each of the 32 critical sentences had a grammatical, and an ungrammatical version. Results demonstrated that L2 learners’ reading times were longer for errors involving verb subcategorization than for those involving plural \([s]\). As in his earlier study, Jiang (2007) argued that because that verb subcategorization is integrated into L2 learners’ knowledge (i.e., readily available during online processing), whereas the English plural morpheme is not, integration of L2 knowledge is selective. It is to say, in contrast to one’s first language, learners cannot necessarily retrieve all L2 information and put it to use spontaneously and efficiently. However, Jiang notes that this does not necessarily mean that certain types of L2 information may never be integrated into one’s mental representation.

Keating (2009) conducted an eye-tracking study that investigated whether L2 learners would demonstrate sensitivity to gender agreement (noun-adjective) violations, and if so, whether syntactic distance affects this sensitivity. Eighteen native speakers of Spanish and 44 L1 English-L2 Spanish adult learners took part in the study. L2 learners were divided among three groups: beginning \((n = 18)\), intermediate \((n = 14)\), and advanced \((n = 12)\). Thirty-six critical sentences manipulated the following three conditions: (dis)agreement within a determiner phrase, immediately following the noun, as in (2.6); (dis)agreement in the verb phrase following the copular verb \(es\) (is), and the adverb \(bastante\) (quite, very), as in (2.7); and (dis)agreement in a subordinate clause preceded by \(si\) (if) or \(cuando\) (when), as in (2.8).

(2.6)  \textit{Un\textsuperscript{a} casa peque\textsuperscript{a}/peque\textsuperscript{n}o cuesta mucho en San Francisco.}  
\begin{itemize}
\item [A\textsubscript{FEM} house\textsubscript{FEM} small\textsuperscript{a}/small\textsuperscript{n}MASC costs much in San Francisco]
\end{itemize}
‘A small house costs a lot in San Francisco.’

(2.7)  \textit{La casa es bastante peque\textsuperscript{a}/peque\textsuperscript{n}o y necesita muchas reparaciones.}  
\begin{itemize}
\item [The\textsubscript{FEM} house\textsubscript{FEM} is quite small\textsuperscript{a}/small\textsuperscript{n}MASC and needs many repairs]
\end{itemize}
‘The house is quite small and needs a lot of repairs.’
Keating (2009) found that although advanced L2 Spanish learners and L1 Spanish speakers demonstrated sensitivity to gender agreement violations within a determiner phrase, as in (2.6), only native speakers were sensitive to gender violations across phrase boundaries or clause boundaries, as in (2.7) and (2.8). The data suggest that although gender agreement violations is acquirable for learners who began study of the L2 in adulthood, syntactic distance separating nouns and adjectives may affect the degree to which sensitivity to grammaticality violations becomes native-like.

Foote (2010) conducted a self-paced reading study that investigated whether L1 Spanish speakers \( (n = 20) \), heritage Spanish speakers \( (n = 20) \) and advanced L2 Spanish learners \( (n = 20) \) would demonstrate online (in)sensitivity to subject-verb number agreement and noun-adjective agreement. In sentences that targeted subject-verb number agreement, (dis)agreement was either localized, as in (2.9), or long distance, as in (2.10).

(2.9) \textit{Veo que tu padre es/*son de Texas.}  
\[\text{See-1 Sg that your father is/*are-3 Pl from Texas}\]  
‘I see that your father is from Texas’.

(2.10) \textit{El reloj del hombre es/*son de Suiza.}  
\[\text{The watch of the man is/*are-3 Pl from Switzerland}\]  
‘The man’s watch is from Switzerland’.

Similarly, in sentences that targeted noun-adjective agreement, (dis)agreement was either localized, as in (2.11), or long distance, as in (2.12).

(2.11) \textit{Dicen que el libro blanco/*blanca está en la mesa.}  
\[\text{Say-3 Pl that the book white-MASC/*white-FEM is on the table}\]  
‘They say that the white book is on the table’.
(2.12) *El pollo del taco está muy rico/*rica pero picante.*

[The chicken of the taco is very delicious-MASC/* delicious -FEM but spicy]

‘The chicken in the taco is delicious, but spicy’.

All participants registered reading times that were significantly longer for the ungrammatical, as opposed to the grammatical condition for all sentence types. In other words, L1 Spanish speakers, Spanish heritage speakers, and advanced L2 Spanish learners demonstrated online sensitivity to violations in subject-verb number agreement, and noun-adjective agreement, regardless of syntactic distance. However, Foote (2010) noted that reading times were larger in magnitude for all groups when the agreement violation occurred between adjacent constituents than when they were separated by intervening material. In short, results suggest that syntactic distance is a factor during L1, heritage, and L2 online sentence processing.

Sagarra and Herschensohn (2010) employed a self-paced reading task to investigate whether L2 Spanish adult learners would demonstrate sensitivity to gender agreement violations. Their study was based on the prediction that animate nouns are more difficult to access than inanimate nouns (Barber & Carreiras, 2005; Domínguez, Cuetos, & Segui, 1999; Igoa, García-Albea, & Sánchez-Casas, 1999). Gender in inanimate nouns is assigned arbitrarily, whereas animate gender is connected to biological sex. Sagarra and Herschensohn, therefore, hypothesized that the processor will need more time to retrieve words such as *esposo* (spouse-MASC) than *libro* (book-MASC) because *esposo* will activate the referent *esposa* (spouse-FEM). In other words, L2 learners may require more time to decide between the masculine and feminine suffixes for an animate noun than for single-gendered inanimate nouns.

Participants (*N* = 196) included L1 Spanish speakers (*n* = 63), beginning L2 Spanish learners (*n* = 69), and intermediate L2 Spanish learners (*n* = 64). The self-paced reading task included 40 critical sentences that were counterbalanced across four conditions: two for animate gender (grammatical, ungrammatical), as in (2.13), and two for inanimate gender (grammatical, ungrammatical), as in (2.14).
The data showed that both intermediate L2 learners and native Spanish speakers showed sensitivity to gender agreement violations with both animate and inanimate nouns. In other words, they spent more time reading adjectives that disagreed with a noun than those that agreed with it. This was not the case, however, for beginning L2 Spanish learners, for whom no significant differences were observed. Therefore, Sagarra and Herschensohn (2010) concluded that with increased proficiency online processing of grammatical gender can become native-like.

**Summary of Online Studies of Agreement Violations**

In summarizing findings of studies that have employed online methodologies to measure L2 learners’ (in)sensitivity to agreement morphology, the following are of importance to the present study.

- Although L2 learners can recognize grammaticality violations on metalinguistic tasks, they do not always demonstrate sensitivity to these same violations during online sentence processing.
- L2 learners appear to demonstrate online sensitivity only to certain types of violations, whereas native speakers appear to be sensitive to a full range of violations.
- Long-distance agreement seems to present special challenges for L2 learners of different L1 backgrounds and varying proficiency levels.

What is now needed is online evidence for the presence or absence of difficulties in online processing of the Spanish subjunctive. As mentioned earlier in this chapter,
there currently exists no data regarding whether L2 Spanish learners rely on lexical expressions of epistemic modality (e.g., *es posible – it’s possible) and the lexical-semantics of embedded verbs or inflectional markers for mood on the embedded verb for meaning during online sentence processing. The Lexical Preference Principle would predict that, at the earlier stages of acquisition, L2 learners will prefer to derive meaning from lexical markers of modality and the lexical-semantics of subordinate verbs as opposed to mood markers on the subordinate verb.

To investigate this issue, the present study employed a self-paced reading study to investigate whether L2 Spanish learners would demonstrate online sensitivity to modality-mood mismatches, as shown in (2.15).

(2.15) *Es posible que *limpia en la sala.

[It’s possible that he cleans/is cleaning in the living room]

In addition, to ensure that participants would read the sentences for meaning, participants viewed an image prior to reading the sentence. After reading each sentence, they were asked whether the meaning of the sentence matched the corresponding image. Therefore, sentence stimuli in the present study used sentences that manipulated two conditions: ±Form and ±Meaning. Although the conditions will be described in detail in Chapter 3, ±Form refers to modality-mood (mis)matches, and ±Meaning refers to sentence-image (mis)matches. Online sensitivity is operationalized as registering slower reading times at the subordinate verb region of sentences in which there is either a modality-mood mismatch, or a sentence-image mismatch. The primary research questions and hypotheses for these tasks are proposed in the following section.

**Primary Research Questions and Hypotheses**

As mentioned in Chapter 1, it has been argued that the subjunctive is not merely a redundant marker of modality, but that the use of the indicative or subjunctive by adult
L1 Spanish speakers depend on the semantic notions of [±Assertion]. The question that remains is whether lexical markers of modality, and the lexical-semantics of the embedded verb, override inflectional morphology for mood during L2 comprehension. In other words, do L2 learners rely on form, or do they rely primarily on meaning during comprehension? To this end, the research questions and hypotheses that guided the present study are threefold:

**Research Question 1**

Do L1 Spanish speakers demonstrate online sensitivity to modality-mood (Form) mismatches, or are they sensitive to sentence-image (Meaning) mismatches only?

**Hypothesis 1.** L1 speakers of Spanish will demonstrate sensitivity to anomalies in lexical expressions of epistemic modality and inflectional morphology for mood during online sentence processing. A disconnect between lexical expressions of epistemic modality (e.g., *es posible* – it’s possible) in a main clause of a sentence and the lexical-semantics of the embedded verb will not override processing of inflectional morphology for mood on the embedded verb.

**Research Question 2**

Do intermediate and high intermediate L2 Spanish learners demonstrate online sensitivity to modality-mood (Form) mismatches, or are they sensitive to sentence-image (Meaning) mismatches only?

**Hypothesis 2.** Intermediate and high intermediate L2 Spanish learners will demonstrate sensitivity to disconnects between lexical expressions of epistemic modality and the lexical semantics of embedded verbs, and to disconnects to modal markers on the embedded verb during online sentence processing.

**Research Question 3**

Do advanced L2 learners’ demonstrate online sensitivity to modality-mood (Form) mismatches, or are they sensitive to sentence-image (Meaning) mismatches only?
**Hypothesis 3.** Yes. Based on findings in Foote (2010) that advanced L2 Spanish learners were sensitive to long-distance agreement violations, I predict that advanced learners will demonstrate native-like sensitivity to modality-mood (Form) mismatches.

**Additional Research Questions and Hypotheses**

Because this modality-mood relationship is often cross-clausal, the Shallow Structures Hypothesis would predict that L2 learners, even those who are more advanced, may not be sensitive to these violations. To be sure, there is little linear distance (i.e., the number of words between constituents that must agree) in sentences such as (2.16), in which only the complementizer *que* (that) intervenes between the lexical marker of modality and the subordinate verb.

(2.16) *Es posible que *limpia en la sala.*

[Is possible that *cleans-*IND in the living room]

‘It’s possible that he cleans/is cleaning in the living room.’

Although this relative lack of linear distance stands in contrast to Keating’s (2009) sentences that targeted cross-clausal violations (e.g., *una casa cuesta menos si es *pequeño – a-*FEM house-*FEM costs less if is *small-*MASC), in terms of syntactic distance, the modality-mood (mis)match in (2.16) occurs across clauses, as *que* (that) introduces the subordinate nominal clause. Therefore, if intermediate through advanced-level L2 learners are not sensitive to this type of cross-clausal agreement, the issue arises as whether they are at least sensitive to localized agreement errors. To this end, a secondary experiment was included to investigate whether L1 Spanish speakers and L2 Spanish learners would be sensitive to localized or intra-clausal violations of subject-verb agreement morphology.
Research Question 4

Do L1 speakers of Spanish demonstrate online sensitivity to localized violations of subject-verb agreement morphology?

Hypothesis 4. Yes. L1 speakers of Spanish will demonstrate sensitivity to localized subject-verb agreement violations during online processing.

Research Question 5

Do intermediate through advanced-level L2 Spanish learners demonstrate online sensitivity to localized violations of agreement morphology?

Hypothesis 5. Yes. Based on findings in Foote (2010) and Keating (2009), intermediate through advanced-level L2 Spanish learners will demonstrate sensitivity to localized subject-verb agreement violations during online processing.
CHAPTER 3
RESEARCH DESIGN AND METHODOLOGY

This chapter describes the experiments that were conducted to answer the research questions posed in Chapter 2. I begin by providing a design overview of the subjunctive task (the main task of this dissertation). Next, I discuss general characteristics of the L1 and L2 participants in the present study, and detail how L2 proficiency levels were operationalized. Then, I discuss how the subjunctive task materials and the local agreement task materials were created and counterbalanced. Afterwards, I outline the procedure of the present study. I conclude by presenting the analyses used in this dissertation.

Design Overview

The main purpose of the present study was to determine whether L2 speakers of Spanish process inflectional morphology for mood similarly to native Spanish speakers during online sentence comprehension. As mentioned in Chapters 1 and 2, verbs marked subjunctive in subordinate nominal clauses of sentences that express epistemic modality co-occur with lexical items in the main clause. Therefore, the Lexical Preference Principle predicts that L2 learners will prefer to derive meaning from the lexical expressions of epistemic modality, as opposed to mood markers that encode this modality. In order to illustrate this point, let us return to an example from Chapter 1 (see Figure 3.1).

Figure 3.1. Image of a Person Writing at a Desk
Figure 3.1 clearly depicts a person who is seated at a desk with a desk lamp and is writing on a piece of paper. However, a lack of background information makes it impossible for us to know whether the desk is in a dorm room, a library, an office, etc. Although we cannot say definitively where he is, it is certainly possible that he is writing in his bedroom/dorm room. Now, consider the following sentence and how it relates to this image.

(3.1) *Es posible que *escribe en el cuarto.*

[Is possible that *writes-IND in the room]

‘It’s possible that he writes/is writing in the (dorm) room.’

Although a sentence-image match exists between (3.1) and Figure 3.1, the sentence is ungrammatical because of a modality-mood mismatch. In terms of online processing, if L2 learners register latencies in reading times between the subordinate verb in ungrammatical sentences (e.g., *escribe – writes-IND*) and the verb in grammatical sentences (e.g., *escriba – writes-SUB*), it can be argued that they are sensitive to the modality-mood mismatch. If on the other hand they do not, it can be argued that during online sentence processing L2 learners may derive sentential meaning from the lexical markers of epistemic modality in the main clause (*posible – possible*) and the lexical-semantics of the embedded verb (*escribir – to write*), but not from the mood marker on the embedded verb. Keeping this in mind, the following section outlines the variables of this dissertation.

**Variables**

The independent variables and their corresponding levels were as follows:

1. Form
   a. modality-mood match
   b. modality-mood mismatch
2. Meaning
   
a. sentence-image match

   b. sentence-image mismatch

The variable “Form” was operationalized as a (mis)match between the lexical expression of modality in the main clause of a sentence and the mood marker (indicative or subjunctive) on the subordinate verb. The variable “Meaning” was operationalized as a (mis)match between the lexical-semantics of the subordinate verb in a sentence and the action or situation depicted in its corresponding image. More specific information is provided in the “Subjunctive Task Materials” section of this chapter.

The dependent variable was reading times (in milliseconds) at three regions of interest: the inflected verb in the subordinate clause, the first word following the inflected verb, and the second word following the inflected verb. As mentioned in Chapter 2, self-paced reading is a time-sensitive measure that can provide millisecond-precise accounts of processing difficulties, and is an ideal methodology with which to measure (in)sensitivity to the types of grammaticality violations in sentences such as *Es posible que *escribe en el cuarto (It’s possible that he *writes-IND in the dorm room). If learners are sensitive to form, we can expect to observe slower reading times at the regions of interest in sentences in which there is a modality-mood mismatch, as opposed to the same region of a sentence in which there is a modality-mood match. If learners are processing for meaning only, we can expect to observe slower reading times at the regions of interest in sentences in which there is a sentence-image mismatch, as opposed to the same region of a sentence in which there is a sentence-image match, regardless of grammaticality. This is explained in greater detail in the “Sentence-Picture Combinations” section of this chapter.
General Method

Participants

Data was collected from 127 participants. On the language history questionnaire (described in the “Pre/Post Materials” section), 14 participants self-identified as native Spanish speakers who were either born in the U.S. or who had been living in the United States before having reached age 12. Five self-identified as native English speakers, but indicated that they were exposed to Spanish in the home from birth. These 19 participants were coded as heritage speakers and were removed from the data pool. The rationale behind excluding these data was based on findings by Silva-Corvalán (1994), who observed a correlation between time in the U.S. and a decline in subjunctive abilities.

An additional four participants were excluded because they self-identified as being L1 speakers of a language other than Spanish or English on the language history questionnaire. Furthermore, six participants indicated that either they were not familiar with the Spanish subjunctive, or were not able to provide, in writing, a short description of at least one of the functions of the target form (see information on language history questionnaire in the “Pre/Post Materials” section for a rationale). Data for these participants was also removed from the data pool. In total, the data from 29 participants was excluded, resulting in a final participant pool of 98 participants (17 native speakers of Spanish and 81 L1 English-L2 Spanish learners).

All of the L2 learners were recruited from advanced Spanish language and content-based courses that are required for Spanish majors, and/or courses for graduate students seeking an M.A. or a Ph.D. in Spanish. L1 Spanish speakers were recruited from these same populations, as well as from Florida State University’s Center for Intensive English Studies, which prepares nonnative speakers of English for U.S. university study.

The following sub-sections detail the characteristics that L1 speakers of Spanish and L1 English-L2 Spanish learners had to have met in order for their data to be included in the present study.
L1 Spanish speakers. In order to be included in the present study, an L1 Spanish speaker had to meet the following criteria, as reported on the language history questionnaire:

- the participant must have reported having learned Spanish as an L1 in a Spanish-speaking country other than the U.S.;
- the participant must have reported having moved to the U.S. as a teenager or an adult;
- the participant must not have reported having any uncorrected vision problems;
- the participant must have reported having familiarity with basic use of a computer.

L2 Spanish learners. In order to be included in the study, an L2 Spanish learner had to meet the following criteria, as reported on the language history questionnaire:

- the participant must have reported being a native speaker of English;
- the participant must not have reported speaking a language other than English in the home as a child;
- the participant must have reported studying Spanish at the college level;
- the participant must have reported familiarity with the Spanish subjunctive, and have been able to provide, in writing, a short description of at least one of the functions of the target form;
- the participant must not have reported having any uncorrected vision problems;
- the participant must have reported having familiarity with basic use of a computer.

In order to distinguish between various levels, all L2 learners completed portions of the Diploma del Español como Lengua Extranjera (DELE) proficiency test (see “Pre/Post Materials” section).

Determining L2 levels. The scores on the DELE exam ranged from 34% to 96% ($M = 56\%$, $SD = 13.7$). In order to create three groups with approximately the same sample size, the following cutoffs were used:
• Intermediate = Less than 50% ($n = 29, M = 43\%, SD = 3.8$)
• High Intermediate = 50%-60% ($n = 27, M = 54\%, SD = 3.1$)
• Advanced = Greater than 60% ($n = 25, M = 72\%, SD = 9.7$)

In order to ensure that the three groups were significantly different from one another, the exam scores were submitted to a one-way ANOVA. The results revealed a significant effect for Group $F(2, 78) = 161.64, p < .001$. Bonferroni post hoc analyses for multiple comparisons revealed that each L2 group was significantly different from the other L2 groups ($p < .001$).

Pre/Post Experimental Materials

The pre and post experimental materials included the consent form (pre experiment), the language history questionnaire (post experiment), and the DELE exam (post experiment). Each of these is described in the following subsections.

Consent form. The consent form was provided to learners before they began the experiment. It informed them that their participation was completely voluntary, and that if they chose to take part, they would spend approximately one hour reading sentences on a computer screen and answering comprehension questions. Participants were also informed that they would receive $15 for their time. The consent form can be found in Appendix A.

Language history questionnaire. A two-sided language history questionnaire was provided to learners after completing the experiment. They were asked to complete the side that pertained to them (native speaker of English or native speaker of Spanish). The full questionnaire can be found in Appendix B.

The questionnaire for L1 English speakers gathered information regarding participants’ ages, how old they were when they began studying Spanish, whether they had lived or studied abroad in a Spanish-speaking country, and whether they could demonstrate having metalinguistic information regarding the Spanish subjunctive. This last point is important given findings that learners who have metalinguistic information regarding certain forms and structures do not necessarily demonstrate sensitivity to these
forms and structures during online sentence processing (e.g., Chen, Shu, Liu, Zhao, & Li, 2007; Jiang, 2004, 2007).

The questionnaire for L1 Spanish speakers gathered information regarding participants’ ages, how old they were when they moved to the U.S., and how long they had lived in the U.S. Information regarding age of arrival and years spent in the U.S. is important because of evidence that adult-like usage of the subjunctive in all of its contexts has been demonstrated not to emerge until adolescence (Bybee, 1985), and because of an observed correlation between time in the U.S. and a decline in subjunctive abilities (Silva-Corvalán, 1994).

**DELE exam.** The DELE is a standardized, accredited proficiency test used by the Spanish Ministry of Education. Portions of the DELE have been used as proficiency measures in numerous SLA studies (e.g., Foote, 2010; Montrul, 2002, 2008, 2010; Sagarra & Herschensohn, 2010). This dissertation used 50 items from the DELE test: 30 from the intermediate level grammar and vocabulary exam and 20 items from the superior level grammar and vocabulary exam. Permission to use the materials, which are available for free download at (diplomas.cervantes.es/candidatos/modelo.jsp), was granted via e-mail from the Instituto Cervantes offices in Chicago, with the condition that they would not be published or reproduced.

**Subjunctive Task Materials**

The subjunctive task consisted of a non-cumulative, self-paced reading task in which participants saw an image and then read a corresponding sentence. There were a total of 96 black-and-white line drawings, each followed by a sentence (48 critical and 48 fillers). Critical sentences were either grammatical (+Form) or ungrammatical (–Form), and either semantically-related to their corresponding image (+Meaning), or not related (–Meaning). As mentioned earlier in this chapter, a ±Meaning condition was included in order to investigate whether learners process for meaning only. If so, then we can expect to observe slower reading times at the target region if the lexical-semantics of the embedded verb do not match the image, regardless of grammaticality.
Because there were two levels to the variable “Form” and two levels to the variable “Meaning”, there were four sentence conditions:

- +Form, +Meaning (modality-mood match, sentence-image match)
- +Form, – Meaning (modality-mood match, sentence-image mismatch)
- – Form, +Meaning (modality-mood mismatch, sentence-image match)
- – Form, – Meaning (modality-mood mismatch, sentence-image mismatch)

The stimuli for the subjunctive task are discussed in the following sections. Although all participants saw the same 48 images, each saw only one of four possible sentence conditions. The stimuli used in these conditions are discussed in the following sub-sections.

**Verbs.** Each of the 48 critical sentences included a different subordinate (target) verb marked either correctly or incorrectly for mood. Of these, 41 verbs were regular verbs that followed the “opposite ending” pattern for modal contrast explained in Chapter 1. The remaining seven were stem changers that also followed the standard “opposite ending” pattern. Following Collentine (1997) and Gudmestad (2006), these verbs were not considered irregulars because the third-person present indicative and subjunctive forms are identical, except for the modal marker. These seven verbs included:

- three “o → ue” verbs (dormir – to sleep, llover – to rain, volar – to fly)
- two “e → i” verbs (servir – to serve, pedir – to order, to ask)
- one “e → ie” verb (pensar – to think)
- one “u → ue” verb (jugar – to play)

Based on findings in Gudmestad (2006) that intermediate level learners may acquire irregular subjunctive forms before regulars, no irregular verbs were used. Irregulars do not necessarily follow the “opposite ending” pattern for modal contrast.

Similarly, because psycholinguistic research suggests that cognates may be processed differently from non-cognates (see Dijkstra, 2005 for a full account), every effort was made to avoid using verbs that had English language cognates. Although this was the case for 40 of the 48 verbs, eight verbs did have English language cognates. These included, esquiar (to ski), operar (to operate), estudiar (to study), aplaudir (to applaud), responder (to respond), robar (to rob), acampar (to camp), and boxear (to
box). The decision to use these verbs was based on the readiness of images that matched the meaning of these verbs.

**Matrix clauses.** Each sentence began with one of four impersonal matrices: two that trigger subjunctive morphology in a subordinate clause (*Es probable* – It is probable), and (*Es posible* – It is possible), and two that trigger indicative morphology in a subordinate clause (*Es cierto* – It is true), and (*Es obvio* – It is obvious). In order to create four different lists, an Excel file was created, as in Table 3.1.

Table 3.1

*Counterbalancing of Matrices and Conditions across Four Lists*

<table>
<thead>
<tr>
<th>Sentence Condition</th>
<th>+Form, +Meaning</th>
<th>–Form, +Meaning</th>
<th>+Form, –Meaning</th>
<th>–Form, –Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Es probable</em></td>
<td><em>Es obvio</em></td>
<td><em>Es cierto</em></td>
<td><em>Es posible</em></td>
<td></td>
</tr>
<tr>
<td>(It’s probable)</td>
<td>(It’s obvious)</td>
<td>(It’s true)</td>
<td>(It’s possible)</td>
<td></td>
</tr>
<tr>
<td><em>Es obvio</em></td>
<td><em>Es cierto</em></td>
<td><em>Es posible</em></td>
<td><em>Es probable</em></td>
<td></td>
</tr>
<tr>
<td><em>Es cierto</em></td>
<td><em>Es posible</em></td>
<td><em>Es probable</em></td>
<td><em>Es obvio</em></td>
<td></td>
</tr>
<tr>
<td><em>Es posible</em></td>
<td><em>Es probable</em></td>
<td><em>Es obvio</em></td>
<td><em>Es cierto</em></td>
<td></td>
</tr>
</tbody>
</table>

The four-row, four-column chart above was repeated 12 times in the Excel file so that there were a total of 48 rows and four columns. In order to create four lists, the first 12 rows in Column 1, the second set of 12 rows (rows 13-24) in Column 2, the third set of 12 rows (rows 25-36) in Column 3, and the fourth set of 12 rows (rows 37-48) in Column 4 were copied to List 1. Lists 2, 3, and 4 were compiled similarly, using 12 alternating rows of the matrices. This guaranteed that out of 48 critical sentences, each participant would see each of the four matrices 12 times, and receive 12 sentences in each
of the four conditions (+Form, +Meaning; –Form, +Meaning; +Form, –Meaning; and – Form, –Meaning).

**Sentence length.** All critical sentences were seven words long. The first and third words of each critical sentence were always *es* (is-IND) and *que* (that), respectively. The second word was always one of the four lexical expressions of modality mentioned in the previous section of this chapter (*probable* – probable; *posible* – possible; *cierto* – true; *obvio* – obvious). The fourth word was always the target verb (marked either third-person singular present indicative or subjunctive). The fifth and sixth words were included in the analyses to account for spillover effects (Rayner & Duffy, 1986; Rayner, Sereno, Morris, Schmauder, & Clifton, 1989). Spillover effects refer to the phenomenon that readers often process verbal morphology after the eyes have proceeded to subsequent words. Therefore, words 4, 5 and 6 were the regions of interest where latencies (or lack thereof) in reading times (i.e., button pushes) were measured. In order to control for word type and length, the fifth word was always a one syllable preposition, and the sixth words was always a one syllable article. In addition, in order to minimize syntactic distance, only the complementizer *que* (that) intervened between the lexical expression of modality and the subordinate verb (marked indicative or subjunctive). The following is an example of a critical picture stimulus (Figure 3.2) and accompanying sentence divided into seven regions.

![Figure 3.2. Image of a Person Vacuuming and Dusting](image)
It is probable that he cleans/is cleaning in the living room.

Pictures. A total of 96 black-and-white line drawings were used for the present study (one per sentence). Over half of the images used were published by the International Picture Naming Project (IPNP) at the University of California, San Diego. These drawings have been normed for frequencies, latencies, familiarity, goodness-of-depiction, and visual complexity in picture naming studies conducted among native speakers of seven languages, including English and Spanish (Szekley, et al., 2004). The images included were selected from among 129 pictures designed to elicit the names of actions, and are available for free download at the International Picture Naming Project website: (http://crl.ucsd.edu/~aszekely/ipnp/index.html). Permission to use these images was granted via e-mail by the IPNP. The remaining drawings were also available for free download and use within educational contexts from the websites www.edupics.com, and www.thecolor.com.

Picture-sentence match plausibility. Every effort was made to ensure that there was a clear sentence-image match between line drawings and the target verbs selected for each +Meaning sentence. Similarly, every effort was made to ensure that the semantic notion of the matrix clause for each critical sentence matched each image, as in Figure 3.3.

*limpia*  
Es probable que *limpia en la sala.*

‘It is probable that he cleans/is cleaning in the living room.’

Figure 3.3. Image of a Person Walking Three Dogs
Figure 3.3 clearly depicts a woman walking three dogs. However, it is not clear as to whether she is walking in a park, in her neighborhood, on a beach, etc. Therefore, a sentence such as *Es posible que camine en el parque* (It is possible that she walks-\textsubscript{SUB} in the park) was judged to be a better fit than *Es cierto que camina en el parque* (It is true that she walks-\textsubscript{IND} in the park). In order to create critical stimuli that were plausible, a power point was created that included each image with its corresponding +Form, +Meaning sentence. This power point was presented to two sections of a third-year Spanish language course, and learners were asked to rate each image-sentence combination using a 5 point, likert-type plausibility scale. This scale was as follows.

<table>
<thead>
<tr>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>very plausible</td>
<td>plausible</td>
<td>neutral</td>
<td>implausible</td>
<td>very implausible</td>
</tr>
</tbody>
</table>

Items that received a mean score of 3 or less were revised. The revised list was shown to the same learners again several weeks later. During the second viewing, all items received a mean score of 4 (plausible) or 5 (very plausible).

**Picture-sentence combinations.** In order to create the 48 sentences across the four sentence conditions, the 48 critical picture stimuli were set up as 24 image pairs. Figures 3.1 and 3.2 use one image pair to demonstrate how sentences across the four sentence conditions were created. Figure 3.4 illustrates how sentences across the two +Meaning conditions (±Form) were designed and counterbalanced.

<table>
<thead>
<tr>
<th>Image Pair</th>
<th>+Form, +Meaning</th>
<th>−Form, +Meaning</th>
</tr>
</thead>
</table>
| **Image A** | *Es cierto que escribe en el cuarto.*  
[Is true that writes-\textsubscript{IND} in the room] | *Es posible que escribe en el cuarto.*  
[Is possible that *writes-\textsubscript{IND} in the room] |
| **Image B** | *Es posible que limpie en la sala.*  
[Is possible that cleans-\textsubscript{SUB} in the living room] | *Es probable que limpie en la sala.*  
[Is probable that *cleans-\textsubscript{IND} in the living room] |

*Figure 3.4. Combining Pictures and Sentences across +Meaning Conditions*
In order to create and counterbalance the sentences for the –Meaning conditions (+Form, –Meaning and –Form, –Meaning), the sentences and images were switched. This is illustrated in Figure 3.5.

<table>
<thead>
<tr>
<th>Image Pair</th>
<th>+Form, –Meaning</th>
<th>–Form, –Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image A</td>
<td><em>Es obvio que limpia en la sala.</em></td>
<td><em>Es cierto que limpia en la sala.</em></td>
</tr>
<tr>
<td></td>
<td>[Is obvious that cleans-IND in the living room]</td>
<td>[Is true that *cleans-SUB in the living room]</td>
</tr>
<tr>
<td>Image B</td>
<td><em>Es probable que escriba en el cuarto.</em></td>
<td><em>Es obvio que escriba en el cuarto.</em></td>
</tr>
<tr>
<td></td>
<td>[Is probable that writes-SUB in the room]</td>
<td>[Is obvious that *writes-SUB in the room]</td>
</tr>
</tbody>
</table>

*Figure 3.5. Combining Pictures and Sentences across –Meaning Conditions*

This use of image pairs was repeated 24 times until there were 48 images, each with 4 corresponding sentences, one for each condition (+Form, +Meaning; –Form, +Meaning; +Form, –Meaning; and –Form, –Meaning). Each image occurred once on each of the four lists with one of the corresponding sentences. Because each participant saw all 48 images, but only one of the four possible sentences, each participant received exactly 12 sentences in each of the four conditions, and 12 sentences that started with each of the four matrix clauses. All images used in the experiment and their corresponding four sentence conditions can be found in Appendix C.

In considering what possible results may mean, let us return to one of the images and two of the sentences from Figure 3.4. The image of a person cleaning is displayed again in Figure 3.6 and its corresponding +Form, +Meaning and –Form, +Meaning sentences are displayed in (3.2) and (3.3), respectively.
Figure 3.6. Image of a Person Vacuuming and Dusting

(3.2)  *Es posible que limpie en la sala.*

[Is possible that cleans-*SUB* in the living room]

‘It is possible that he cleans in the living room.’

(3.3)  *Es probable que *limpia en la sala.*

[Is probable that *cleans-*IND* in the living room]

‘It is probable that he cleans in the living room.’

In (3.2), we see that the semantic notion of possibility is encoded lexically in the main clause (*es posible* – it’s possible). In addition, the lexical-semantics of the embedded verb *limpiar* (to clean) and the phrase *en la sala* (in the living room) result in a sentence-image match. Furthermore, because the notion of possibility expressed in the main clause is grammaticalized using the subjunctive mood in the subordinate clause, as reflected by the “opposite ending” morpheme [e] on the verb *limpiar* (to clean), there is a modality-mood match. The sentence condition for (3.2) is therefore +Form, +Meaning.

In (3.3), however, although the overall meaning relates to the picture, the sentence is ungrammatical because the lexical expression of probability in the main clause is grammaticalized using indicative mood morphology in the subordinate clause, as evidenced by the morpheme [a] on the verb *limpiar* (to clean). Because sentence (3.3), is ungrammatical, it is an example of a sentence in the –Form, +Meaning condition.

If lexical preference is a factor, then we would not expect to see reading times that are statistically different across the +Form, +Meaning and –Form, +Meaning conditions at the target region (fourth, fifth and sixth words). In other words, if learners are not sensitive to a modality-mood mismatch when there is a sentence-image match, this would lend support to the hypothesis that learners will prefer to derive meaning from lexical
items, as opposed to verb morphology, when both encode the same meaning. If, on the other hand, lexical preference is a not a factor, we would expect to see increased reading times at the target region in (3.3). In other words, if learners are sensitive to a modality-mood mismatch when there is a sentence-image match, it can be inferred that participants derive meaning from inflectional morphology for mood.

Figure 3.7 again shows a person cleaning, but accompanied by sentences in the +Form, –Meaning condition (3.4) and the –Form, –Meaning condition (3.5).

![Image of a Person Vacuuming and Dusting](image)

*Figure 3.7. Image of a Person Vacuuming and Dusting*

(3.4) *Es probable que escriba en el cuarto.*

[Is probable that writes—SUB in the room]
‘It’s probable that he writes in the room.’

(3.5) *Es obvio que escriba en el cuarto.*

[Is obvious that *writes—SUB in the room]
‘It’s obvious that he writes in the room.’

According to sentence (3.4), the corresponding image is one of a person writing in their bedroom. Although this sentence is not related to the picture (–Meaning), it is grammatical (+Form). Grammaticality is indicated by lexical expression of probability, as well as by the “opposite ending” subjunctive mood marker [a] on the verb *escribir* (to write). Therefore, (3.4) is an example of a sentence in the +Form, –Meaning condition. Similarly, in (3.5), because the lexical-semantics of the embedded verb are not related to the picture, this sentence is also –Meaning. In addition, the epistemic modality of assertion, as communicated by the lexical item *obvio* (obvious) in the main clause, is in conflict with the morpheme [a] on the subordinate verb *escribir* (to write). Because (3.5)
is neither grammatical, nor related to the picture, it is an example of a sentence in the –Form, –Meaning sentence condition.

If L2 learners exhibit longer reading times at the target region in these –Meaning sentences than in the +Meaning sentences, but reading times are not significantly different across the +Form and –Form sentences, it could be argued that learners are sensitive to the lexical-semantics of subordinate verbs, but not to inflectional morphology for mood. In other words, it could be inferred that learners process sentences for meaning, but not for form. This would lend support to the Lexical Preference Principle.

**Filler items.** All participants received the same 48 filler items, regardless of which of the four lists they received. All filler sentences were grammatical, but either matched or did not match their corresponding images (see Appendix D). By making filler sentences grammatical, but either a sentence-image match or a sentence-image mismatch, it was possible to ensure that participants were reading sentences for meaning. Critical and filler sentences were randomized and were all part of the same self-paced reading task. After each sentence, regardless of whether it was a critical or a filler item, participants were asked “Does the picture match the sentence?”, to which they responded either “yes” or “no” by pressing the corresponding button on a button box.

As mentioned in Chapter 2, the modality-mood relationship is inherently cross-clausal in the types of sentences that are the focus of this dissertation. The Shallow Structures Hypothesis would predict that even more advanced L2 learners will not be sensitive to non-local agreement violations during online sentence processing. In order to minimize linear distance (i.e., the number of words between constituents that must agree), only the complementizer *la* (that) intervened between lexical markers of modality and the subordinate verb in the critical sentences of the subjunctive task (e.g., *posible* que *limpia* – possible that *cleans*-IND). That said, in terms of syntactic distance, this modality-mood mismatch is cross-clausal, as *que* (that) introduces the subordinate nominal clause. Recall Jiang’s (2004) findings from Chapter 2 that advanced L2 English learners did not demonstrate sensitivity to non-localized violations in number agreement (e.g., the bridge to the island *were*), but were sensitive to adjacent pronoun-verb agreement violations (e.g., she *am*). Similarly, Keating (2009) found that advanced L2
Spanish learners did not demonstrate sensitivity to long-distance gender agreement violations (e.g., *una casa cuesta menos si es *pequeño – a-FEM house-FEM costs less if is *small-MASC), but were sensitive to localized gender agreement violations (e.g., *casa *pequeño – house-FEM *small-MASC). Therefore, a secondary experiment was conducted in order to investigate whether intermediate to advanced-level L2 Spanish speakers are sensitive to localized violations of subject-verb agreement morphology. This experiment is discussed in the following section.

Local Agreement Task Materials

The same participants that completed the subjunctive task were those who completed the local agreement task. The purpose of the local agreement task was to determine whether L1 speakers and L2 learners demonstrated online sensitivity to localized subject-verb agreement violations. The materials used were taken from VanPatten, Leeser and Keating (in press), and are described in the following section.

Stimuli for local agreement task. The local subject-verb agreement task was a self-paced reading experiment in which participants read sentences via a non-cumulative, moving window presentation. Sentence stimuli included of 100 sentences assessing online sensitivity to temporal reference, localized subject-verb agreement, wh-questions, and adverb placement. The critical sentences for the present study were those that tested (in)sensitivity to localized subject-verb agreement. These sentences are considered here.

Sixty four sentences (16 sentence quadruplets) were designed. Eight of the quadruplets (32 sentences) manipulated first-person singular and third-person singular agreement mismatches. An example of this type of sentence quadruplet is available in (3.6a-d).

(3.6) a. Ahora Isabel mira el programa con varios amigos.
    [Now Isabel watches the program with various friends]

    b. Ahora Isabel *miro el programa con varios amigos.
    [Now Isabel watch-1_Sg the program with various friends]
c. Ahora yo miro el programa con varios amigos.
[Now I watch-1 Sg the program with various friends]

d. Ahora yo *mira el programa con varios amigos.
[Now I watches the program with various friends]

The eight remaining quadruplets (32 sentences) manipulated second-person singular and third-person plural agreement mismatches. An example of this type of sentence quadruplet is available in (3.7a-d). All critical sentences for the local agreement task are available in Appendix E.

(3.7)  a. Ahora tú tocas el piano para muchas personas.
[Now you play-2 Sg the piano for many people]

b. Ahora tú *tocan el piano para muchas personas.
[Now you play-3 Pl the piano for many people]

c. Ahora ellos tocan el piano para muchas personas.
[Now they play-3 Pl the piano for many people]

d. Ahora ellos *tocas el piano para muchas personas.
[Now they play-2 Sg the piano for many people]

Sentences were distributed across four lists such that each participant only read one sentence of the four possible conditions. Each test item began with an asterisk. At the press of a button the first word of a sentence appeared on the left side of the computer monitor. As soon as participants finished reading a word, they pressed a button to proceed to the next word. Each following word appeared to the right of the preceding word, which disappeared upon the presentation of the following word. Each sentence ended with the presence of another asterisk. Upon an additional button press, a “yes” or “no” comprehension measure appeared on the screen. If participants are sensitive to violations of local subject-verb agreement during online sentence comprehension, we would expect to obtain different reading times at the verb region.


**Procedure**

Data collection took place in a university computer lab reserved especially for the experiment, and each participant was seated at an individual computer. Half of the participants completed the subjunctive task first, whereas the other half completed the local agreement task first. Both tasks began with instructions and practice trials. For each task, participants received one of the four distinct lists. Upon completion of both self-paced reading tasks, participants were provided with the language history questionnaire and the proficiency test, which they completed onsite.

**Data Selection and Analyses**

**Subjunctive Task**

Although reading times were recorded on every single word region within each sentence, analyses were limited to data obtained from the region(s) of interest. For the subjunctive task, the critical region consisted of the embedded verb (word 4), the preposition that followed each verb (word 5), and the article that preceded the preposition (word 6). As mentioned earlier in this chapter, the rationale for including reading times for the two subsequent words (spillover regions) is because readers often process verbal morphology after the eyes have proceeded to subsequent words. Words 4, 5 and 6 will be referred to Verb, Verb + 1, and Verb + 2, respectively, when reporting the data from the subjunctive task in Chapter 4. Reading times on each word were tabulated automatically by the SuperLab software, and the mean reading times were calculated for the Verb, Verb + 1, and Verb + 2 for each participant for each of the four sentence types. Only items for correctly answered comprehension questions were included in the analysis. This resulted in the exclusion of 6.5% of the data. In addition, reading times that were less than 100 milliseconds (ms) and greater than 2000 ms were discarded. Furthermore, reading times that were not within two standard deviations of the mean reading times for each region of interest were not included in the analysis. This resulted in the exclusion of an additional 2.9% of the data. Overall, 9.4% of the data were excluded based on incorrect answers to
comprehension questions and reading time criteria. The data were analyzed in separate 2 × 2 ANOVAs for each region. The within subjects variables were Form and Meaning.

**Local Agreement Task**

For the local subject-verb agreement task, the target region of interest was the verb (word 3). In addition, reading times for the two subsequent words (spillover regions) were also analyzed. Therefore, words 3, 4 and 5 will be referred to Verb, Verb + 1, and Verb + 2, respectively, when reporting the data from the local subject-verb agreement task in Chapter 4. Reading times on each word were tabulated automatically by the SuperLab software. For each participant, the mean reading times were calculated for the Verb, Verb + 1, and Verb + 2 for each of the four sentence types. Only items for correctly answered comprehension questions were included in the analysis. This resulted in the exclusion of 8.2% of the data. In addition, reading times that were less than 100 milliseconds (ms) and greater than 2000 ms were discarded. Furthermore, reading times that were not within two standard deviations of the mean reading times for each region of interest were not included in the analysis. This resulted in the exclusion of an additional 7% of the data. Overall, 15.2% of the data were excluded based on incorrect answers to comprehension questions and reading time criteria. Separate paired-samples t-tests were conducted at each region of interest for each proficiency level.
CHAPTER 4
RESULTS AND ANALYSES

This chapter presents the analyses and the results of the two self-paced reading experiments described in Chapter 3. The first section considers the subjunctive task, beginning with a brief overview of the sentence conditions, methods of data analysis, and regions of interest for the main experiment of this dissertation. Next, descriptive statistics are provided for each group, beginning with L1 speakers of Spanish, then moving to intermediate, high intermediate, and advanced L2 learners of Spanish. The second section considers the local agreement task. An overview is provided of the sentence conditions, methods of data analysis, and regions of interest for this secondary experiment. Descriptive statistics are then provided for each group, beginning with L1 speakers of Spanish, then moving to intermediate, high intermediate, and advanced L2 learners of Spanish. This chapter ends with a summary of the results.

Data: Subjunctive Task

Sentence Conditions, Methods of Data Analysis, and Regions of Interest

The independent variables for the subjunctive task were Form and Meaning, each with two levels (±Form and ±Meaning). As a result, there were four sentence conditions:

- +Form, +Meaning (modality-mood match, sentence-image match)
- +Form, –Meaning (modality-mood match, sentence-image mismatch)
- –Form, +Meaning (modality-mood mismatch, sentence-image match)
- –Form, –Meaning (modality-mood mismatch, sentence-image mismatch)

Participants’ mean reading times at each region of interest were submitted to separate 2 × 2 ANOVAs with repeated measures. Form (modality-mood match vs. modality-mood mismatch) and Meaning (sentence-image match vs. sentence image mismatch) were the within-subjects variables. The regions of interest included:
• the embedded verb (Word 4) in either the indicative or subjunctive mood, also referred to as Verb
• the preposition that followed the verb (Word 5), also referred to as Verb +1
• the article that followed the preposition (Word 6), also referred to as Verb +2

**L1 Spanish**

**Descriptive statistics.** Descriptive statistics for L1 Spanish speakers are presented in Table 4.1. The means and standard deviations are presented by sentence condition and sentence region. The data in the table suggest that at the regions of interest, reading times were consistently slower in the –Form conditions (modality-mood mismatch) than in the +Form (modality-mood match) conditions. However, there do not seem to be consistent differences in reading times between the –Meaning (sentence-image mismatch) and the +Meaning (sentence-image match) conditions.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Word 4 (Verb)</th>
<th>Word 5 (Verb + 1)</th>
<th>Word 6 (Verb + 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>–Form, –Meaning</td>
<td>346</td>
<td>117</td>
<td>344</td>
</tr>
<tr>
<td>–Form, +Meaning</td>
<td>372</td>
<td>151</td>
<td>361</td>
</tr>
<tr>
<td>+Form, –Meaning</td>
<td>350</td>
<td>141</td>
<td>336</td>
</tr>
<tr>
<td>+Form, +Meaning</td>
<td>336</td>
<td>99</td>
<td>325</td>
</tr>
</tbody>
</table>

At Word 4 (Verb), the 2 × 2 ANOVA did not reveal a main effect for Form $F(1, 16) = 2.81, p = .133$, or a main effect for Meaning $F(1, 16) = 1.60, p = .224$. There was also no significant interaction between Form and Meaning $F(1, 16) = 1.80, p = .199$.

At Word 5 (Verb +1), the ANOVA revealed a main effect for Form $F(1, 16) = 5.79, p = .029$, but there was no main effect for Meaning $F(1, 16) = 0.55, p = .467$, nor was there a significant Form × Meaning interaction $F(1, 16) = 1.70, p = .212$. The main
effect for Form reflects that fact that L1 Spanish speakers’ reading times at the word immediately following the verb were significantly slower for sentences in which there was a modality-mood mismatch ($M = 356$, $SE = 16$) than for sentences in which there was a modality-mood match ($M = 330$, $SE = 11$).

At Word 6 (Verb + 2), there was also a main effect for Form $F(1, 16) = 4.6$, $p = .048$, but not for Meaning $F(1, 16) = 0.20$, $p = .660$. There was no significant interaction between Form and Meaning $F(1, 16) = 1.84$, $p = .193$. The main effect for Form again reflects that fact that L1 Spanish speakers’ reading times at the second spillover region were significantly slower for sentences in which there was a modality-mood mismatch (–Form: $M = 329$, $SE = 18$) than for sentences in which there was a modality-mood match (+Form: $M = 311$, $SE = 15$).

Intermediate L2

Descriptive statistics. Descriptive statistics for intermediate L2 Spanish learners are presented in Table 4.2. The data suggest that at the regions of interest, reading times were slower in the –Meaning conditions than in the +Meaning conditions. In contrast, this does not appear to be the case for reading times at the target region of –Form sentences when compared to the same region of +Form sentences.

Table 4.2

<table>
<thead>
<tr>
<th>Condition</th>
<th>Word 4 (Verb)</th>
<th>Word 5 (Verb + 1)</th>
<th>Word 6 (Verb + 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>–Form, –Meaning</td>
<td>537</td>
<td>193</td>
<td>387</td>
</tr>
<tr>
<td>–Form, +Meaning</td>
<td>491</td>
<td>181</td>
<td>360</td>
</tr>
<tr>
<td>+Form, –Meaning</td>
<td>524</td>
<td>206</td>
<td>375</td>
</tr>
<tr>
<td>+Form, +Meaning</td>
<td>478</td>
<td>142</td>
<td>370</td>
</tr>
</tbody>
</table>
The ANOVA did not reveal a main effect for Form $F(1, 28) = 1.16, p = .290$ at Word 4 (Verb), but did reveal a main effect for Meaning $F(1, 28) = 5.72, p = .024$. There was also no significant Form × Meaning interaction $F(1, 28) < 0.01, p = .998$. The main effect for Meaning reflects that fact that intermediate L2 learners’ reading times at the word immediately following the verb were significantly slower for sentences in which the lexical-semantics of the embedded verbs did not match their corresponding images (– Meaning: $M = 531, SE = 35$) than for sentences in which there was a sentence-image match (+Meaning: $M = 484, SE = 28$).

Similar results were observed at Word 5 (Verb +1). The ANOVA did not reveal a main effect for Form $F(1, 28) = 0.03, p = .885$, but did reveal a main effect for Meaning $F(1, 28) = 8.09, p = .008$. There was no significant interaction between Form and Meaning $F(1, 28) = 2.64, p = .115$. Again, the main effect for Meaning reflects that fact that intermediate L2 learners’ reading times at the second spillover region were significantly slower for sentences in which there was a sentence-image mismatch (–Meaning: $M = 381, SE = 12$) than for sentences in which there was a sentence-image match (+Meaning: $M = 365, SE = 12$).

At Word 6 (Verb + 2), the 2 × 2 ANOVA did not reveal a main effect for Form $F(1, 28) = 0.20, p = .655$, or for Meaning $F(1, 28) = 0.91, p = .349$. There was no significant interaction between Form and Meaning $F(1, 28) = 0.04, p = .836$.

**High Intermediate L2**

**Descriptive statistics.** Descriptive statistics for high intermediate L2 Spanish learners are presented by sentence condition and sentence region in Table 4.3. The data in the table suggest that reading times were slower in the –Meaning (sentence-image mismatch) than in the +Meaning (sentence-image match) conditions. However, there do not seem to be consistent differences in reading times between –Form (modality-mood mismatch) and +Form (modality-mood match) sentences.
Table 4.3

*High Intermediate L2 Spanish Learners’ Mean Reading Times in Milliseconds for Target and Spillover Regions*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Word 4 (Verb)</th>
<th>Word 5 (Verb +1)</th>
<th>Word 6 (Verb +2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( M )</td>
<td>( SD )</td>
<td>( M )</td>
</tr>
<tr>
<td>–Form, –Meaning</td>
<td>474</td>
<td>181</td>
<td>378</td>
</tr>
<tr>
<td>–Form, +Meaning</td>
<td>431</td>
<td>132</td>
<td>361</td>
</tr>
<tr>
<td>+Form, –Meaning</td>
<td>458</td>
<td>164</td>
<td>373</td>
</tr>
<tr>
<td>+Form, +Meaning</td>
<td>434</td>
<td>142</td>
<td>360</td>
</tr>
</tbody>
</table>

At Word 4 (Verb), the ANOVA did not reveal a main effect for Form \( F(1, 26) = 0.44, p = .515 \), but did reveal a main effect for Meaning \( F(1, 26) = 4.27, p = .049 \). There was no significant Form \( \times \) Meaning interaction \( F(1, 26) = 0.78, p = .386 \). The main effect for Meaning reflects that fact that high intermediate L2 learners’ reading times at the target region were significantly slower for sentences in which there was a mismatch between the lexical-semantics of the embedded verbs and their corresponding images (–Meaning: \( M = 466, SE = 33 \)) than for sentences in which the lexical-semantics of the embedded verbs matched their corresponding images (+Meaning: \( M = 432, SE = 25 \)).

In contrast, at Word 5 (Verb +1), the ANOVA did not reveal a main effect for Form \( F(1, 26) = 0.19, p = .666 \), or a main effect for Meaning \( F(1, 26) = 2.12, p = .158 \). There was no significant interaction between Form and Meaning \( F(1, 26) = 0.06, p = .814 \). This was also the case at Word 6 (Verb +2), for which the ANOVA did not reveal a main effect for Form \( F(1, 26) = 1.73, p = .200 \), a main effect for Meaning \( F(1, 26) = 0.12, p = .732 \), nor a significant Form \( \times \) Meaning interaction \( F(1, 26) = 0.05, p = .275 \).

**Advanced L2**

**Descriptive statistics.** Descriptive statistics for Advanced L2 Spanish learners are presented in Table 4.4. The data suggest that at the regions of interest, reading times were slower in the –Meaning sentences than in the +Meaning conditions. In contrast, this does
not appear to be the case for reading times at the target region of –Form sentences when compared to the same region +Form sentences.

Table 4.4

---

<table>
<thead>
<tr>
<th>Condition</th>
<th>Word 4 (Verb)</th>
<th>Word 5 (Verb + 1)</th>
<th>Word 6 (Verb + 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(M)</td>
<td>(SD)</td>
<td>(M)</td>
</tr>
<tr>
<td>–Form, –Meaning</td>
<td>416</td>
<td>178</td>
<td>365</td>
</tr>
<tr>
<td>–Form, +Meaning</td>
<td>415</td>
<td>200</td>
<td>344</td>
</tr>
<tr>
<td>+Form, –Meaning</td>
<td>423</td>
<td>185</td>
<td>352</td>
</tr>
<tr>
<td>+Form, +Meaning</td>
<td>419</td>
<td>169</td>
<td>341</td>
</tr>
</tbody>
</table>

At Word 4 (Verb), the ANOVA did not reveal a main effect for Form \(F(1, 24) = 0.19, p = .668\), or a main effect for Meaning \(F(1, 24) = 0.04, p = .838\). There was no significant interaction between Form and Meaning \(F(1, 24) = 0.04, p = .847\).

Although at Word 5 (Verb +1), the \(2 \times 2\) ANOVA did not reveal a main effect for Form \(F(1, 24) = 1.46, p = .238\), it did reveal a main effect for Meaning \(F(1, 24) = 4.26, p = .050\). There was no significant Form \(\times\) Meaning interaction \(F(1, 24) = 0.87, p = .360\).

The main effect for Meaning reflects that fact that advanced L2 learners’ reading times at the target region were significantly slower for –Meaning sentences, in which the lexical-semantics of the embedded verb did not match their corresponding images \((M = 359, SE = 11)\), than for +Meaning sentences \((M = 342, SE = 14)\).

The ANOVA did not reveal a main effect for Form \(F(1,24) = 0.03, p = .870\), or Meaning \(F(1, 24) = 0.27, p = .606\) at Word 6 (Verb + 2). Furthermore, there was no significant interaction between Form and Meaning \(F(1, 24) = 0.07, p = .793\).
Summary of Results on the Subjunctive Task

The findings of the subjunctive task can be summarized in the following way. L1 Spanish speakers demonstrated longer reading times at the regions of interest for –Form sentences than for +Form sentences. However, no significant differences emerged in the ±Meaning sentences. In contrast to the L1 speakers, intermediate, high intermediate and advanced L2 Spanish learners did not demonstrate longer reading times at the regions of interest for ±Form sentences, but did demonstrate longer reading times for –Meaning sentences than for +Meaning sentences. Table 4.5 summarizes observed differences in processing between L1 Spanish speakers and L2 Spanish learners.

Table 4.5

<table>
<thead>
<tr>
<th>Group</th>
<th>±Form</th>
<th>±Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 Spanish Speakers</td>
<td>–Form &gt; +Form</td>
<td>–Meaning ≈ +Meaning</td>
</tr>
<tr>
<td>All L2 Spanish Learners</td>
<td>–Form ≈ +Form</td>
<td>–Meaning &gt; +Meaning</td>
</tr>
</tbody>
</table>

Data: Local Agreement Task

Sentence Conditions, Methods of Data Analysis, and Regions of Interest

The independent variable for the local agreement task was Grammaticality, which contained two levels:

- grammatical (subject-verb match)
- ungrammatical (subject-verb mismatch)

Participants’ mean reading times at each region of interest were analyzed using paired samples t-tests. The regions of interest included:

- the embedded verb (Word 3), also referred to as Verb
- the article that followed the verb (Word 4), also referred to as Verb +1
- the noun that followed the article (Word 5), also referred to as Verb +2
**L1 Spanish**

**Descriptive statistics.** Descriptive statistics for L1 Spanish speakers are presented in Table 4.6. Results are presented by sentence condition and sentence region. The data suggest that at the target region, native speakers’ reading times were consistently slower in the ungrammatical sentences than at the same region in the grammatical sentences.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Word 3 (Verb)</th>
<th>Word 4 (Verb + 1)</th>
<th>Word 5 (Verb + 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Ungrammatical</td>
<td>616</td>
<td>289</td>
<td>773</td>
</tr>
<tr>
<td>Grammatical</td>
<td>496</td>
<td>169</td>
<td>602</td>
</tr>
</tbody>
</table>

The results of the paired samples *t*-tests revealed that L1 Spanish speakers’ reading times were significantly slower for ungrammatical sentences than for grammatical sentences at Word 3 (Verb), *t*(16) = 2.36, *p* = .031, and at Word 4 (Verb + 1), *t*(16) = 5.41, *p* < .001. The *t*-test did not reveal significant mean differences in reading times between ungrammatical and grammatical sentences at Word 5 (Verb + 2), *t*(16) = 0.99, *p* = .337.

**Intermediate L2**

**Descriptive statistics.** Descriptive statistics for Intermediate L2 Spanish learners are presented in Table 4.7. The data in the table suggest that at the regions of interest, mean reading times are slower in the ungrammatical, as opposed to the grammatical sentences.
### Table 4.7

*Intermediate L2 Spanish Learners’ Mean Reading Times in Milliseconds for Target and Spillover Regions*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Word 3 (Verb)</th>
<th>Word 4 (Verb + 1)</th>
<th>Word 5 (Verb + 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Ungrammatical</td>
<td>742</td>
<td>197</td>
<td>801</td>
</tr>
<tr>
<td>Grammatical</td>
<td>692</td>
<td>173</td>
<td>767</td>
</tr>
</tbody>
</table>

The results of the paired samples $t$-tests revealed did not reveal any significant differences in reading times in ungrammatical vs. grammatical sentences at Word 3 (Verb), $t(29) = 1.33, p = .194$, at Word 4 (Verb + 1), $t(29) = 0.92, p = .363$, or at Word 5 (Verb + 2), $t(29) = 0.44, p = .666$.

### High Intermediate L2

**Descriptive statistics.** Descriptive statistics for High Intermediate L2 Spanish learners are presented in Table 4.8. The data in the table suggest that at the regions of interest, high intermediate L2 learners’ reading times were generally slower in sentences that contained localized subject-verb agreement violations (ungrammatical), when compared to their grammatical counterparts.

### Table 4.8

*High Intermediate L2 Spanish Learners’ Mean Reading Times in Milliseconds for Target and Spillover Regions*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Word 3 (Verb)</th>
<th>Word 4 (Verb + 1)</th>
<th>Word 5 (Verb + 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Ungrammatical</td>
<td>650</td>
<td>191</td>
<td>791</td>
</tr>
<tr>
<td>Grammatical</td>
<td>619</td>
<td>156</td>
<td>687</td>
</tr>
</tbody>
</table>

At Word 3 (Verb), the $t$-test did not reveal significant differences in mean reading times between ungrammatical and grammatical sentences $t(25) = 1.02, p = .316$. 
However, at Word 4 (Verb + 1), reading times were significantly slower for ungrammatical sentences than for grammatical sentences $t(25) = 2.56, p = .017$. The $t$-test did not reveal significant mean differences in reading times across sentence conditions at Word 5 (Verb + 2), $t(25) = -0.43, p = .668$.

**Advanced L2**

**Descriptive statistics.** Descriptive statistics for Advanced L2 Spanish learners are presented in Table 4.9. The data in the table suggest that at the regions of interest, reading times for advanced learners were consistently slower in the ungrammatical sentences than at the same region in grammatical sentences.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Word 3</th>
<th>Word 4</th>
<th>Word 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Ungrammatical</td>
<td>622</td>
<td>239</td>
<td>895</td>
</tr>
<tr>
<td>Grammatical</td>
<td>617</td>
<td>260</td>
<td>679</td>
</tr>
</tbody>
</table>

Although the results of the paired samples $t$-tests did not reveal significant mean difference in reading times between ungrammatical and grammatical sentences at Word 3 (Verb), $t(23) = 0.16, p = .878$, reading times for ungrammatical sentences were significantly slower than those for grammatical sentences at Word 4 (Verb + 1) $t(23) = 5.46, p < .001$. No significant differences in mean reading times between ungrammatical and grammatical sentences were observed at Word 5 (Verb +2). $t(23) = 1.47, p = .155$. 
Summary of Results on the Local Agreement Task

The findings of the local agreement task can be summarized as follows. L1 Spanish speakers demonstrated longer reading times at the regions of interest for ungrammatical sentences than for grammatical sentences. In contrast to the L1 speakers, intermediate L2 learners did not demonstrate longer reading times at the regions of interest for ungrammatical sentences than for grammatical sentences. In contrast to the intermediate learners, but similarly to the L1 speakers, high intermediate and advanced L2 learners demonstrated longer reading times at the regions of interest for ungrammatical sentences than for grammatical sentences. Table 4.10 summarizes observed differences and commonalities in processing among L1 Spanish speakers and L2 Spanish learners.

Table 4.10
*Observed L1 and L2 Processing Differences and Commonalities*

<table>
<thead>
<tr>
<th>Group</th>
<th>±Grammatical</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 Spanish</td>
<td>Ungrammatical &gt; Grammatical</td>
</tr>
<tr>
<td>L2 Intermediate</td>
<td>Ungrammatical ≈ Grammatical</td>
</tr>
<tr>
<td>L2 High Intermediate</td>
<td>Ungrammatical &gt; Grammatical</td>
</tr>
<tr>
<td>L2 Advanced</td>
<td>Ungrammatical &gt; Grammatical</td>
</tr>
</tbody>
</table>

Summary of Results

If we understand online sensitivity to reflect significant differences between sentence conditions at the target and spillover regions, the main findings of this chapter can be summarized as follows:

1. L1 Spanish speakers demonstrated sensitivity to modality-mood mismatches during online sentence processing, but not to sentence-image mismatches. They demonstrated online sensitivity to localized violations of subject-verb agreement.
2. Intermediate L2 Spanish learners did not demonstrate sensitivity to modality-mood mismatches during online sentence processing, but were sensitive to
sentence-image mismatches. They did not demonstrate online sensitivity to localized violations of subject-verb agreement.

3. High intermediate L2 Spanish learners did not demonstrate sensitivity to modality-mood mismatches during online sentence processing, but were sensitive to sentence-image mismatches. They demonstrated online sensitivity to localized violations of subject-verb agreement.

4. Advanced L2 Spanish learners did not demonstrate sensitivity to modality-mood mismatches during online sentence processing, but were sensitive to sentence-image mismatches. They demonstrated online sensitivity to localized violations of subject-verb agreement.
CHAPTER 5
DISCUSSION AND CONCLUSIONS

This chapter discusses the results of the two tasks conducted in the present study. The subjunctive task was conducted in order to determine whether intermediate through advanced-level L2 Spanish learners process inflectional morphology for mood similarly to native Spanish speakers during online sentence comprehension. The local agreement task was conducted in order to determine whether intermediate through advanced-level L2 Spanish learners process localized subject-verb agreement violations similarly to native Spanish speakers. The first section of the chapter summarizes and explains the findings of the subjunctive task and of the local agreement task. Next, I discuss implications for L2 processing research. I then discuss the limitations of the present study. Afterwards, I consider implications for L2 instruction. This chapter ends with the conclusion of the dissertation.

Summary and Explanation of Findings

Hypothesis 1

The results of the subjunctive task partially supported Hypothesis 1, which predicted that L1 speakers of Spanish would demonstrate sensitivity to modality-mood mismatches (±Form) during online sentence processing. Sensitivity to modality-mood mismatches was evidenced by slower reading times at the regions of interest in the –Form sentences when compared to the same regions in +Form sentences.

However, L1 Spanish learners were not sensitive to sentence-image mismatches (±Meaning). They did not register slower reading times at the regions of interest in the –Meaning sentences when compared to the same regions in +Meaning sentences. Furthermore, because L1 speakers were sensitive to cross-clausal agreement violations, results suggest that native speakers’ sensitivity to grammaticality violations is not limited to local domains, but rather, that they are sensitive to a full range of violations. These findings indicate that L1 Spanish speakers process syntactically and engage in syntactic
processing, as opposed to shallow processing. Clahsen and Felser define shallow processing as relying more heavily on lexical-semantic information, associative patterns and other surface cues to interpretation during online comprehension, and argue that this is not a factor during L1 sentence processing.

The question that arises is why did native speakers not demonstrate online sensitivity to sentence-image mismatches? Can it be said that L1 speakers are not sensitive to meaning? Given the fact that 100% of native speakers’ responses to the comprehension question “Did the sentence match the picture?” were correct, the answer is no; native speakers processed sentences for meaning. Why then were no significant reading times observed between –Meaning and +Meaning sentences? Possibilities as to why this may be the case include the nature of the task and sample size, and are addressed in the following subsections.

**Nature of the task.** One possibility is the nature of the task itself. From the outset, the instructions and five practice trials for the subjunctive task explained to participants that the objective was to determine whether each sentence matched its corresponding image. It was also explained to participants that the same comprehension question would follow each item (Did the sentence match the picture?). Therefore, all participants expected that sentences would either match the picture (+Meaning) or would not (–Meaning). It may be the case that native speakers’ processing was not disrupted in the ±Meaning condition because not only did they know what the objective of the task was, but because L1 comprehension is highly automatized. Therefore, when the lexical-semantics of a target verb did not match its corresponding image, native speakers’ reading times did not slow down, but rather they parsed the remainder of the sentence, correctly answered the comprehension question, and moved on to the next item.

**Sample size.** An additional possibility as to why L1 Spanish speakers did not register significantly slower reading times in the –Meaning sentences than in the +Meaning sentences is the relatively small sample size ($n = 17$) when compared to the larger sample of L2 Spanish learners ($n = 81$). That said, the sentence conditions of primary interest in this dissertation were +Form, +Meaning vs. –Form, +Meaning, as these are the conditions in which evidence for the presence or absence of lexical
preference were hypothesized to manifest. The sample size of 17 native Spanish speakers demonstrated that lexical preference was not a factor during online sentence processing. Therefore, future study is required in order to determine whether it is the nature of the task, sample size, or some other factor that may be responsible for L1 speakers’ lack of online sensitivity to ±Meaning.

**Hypothesis 2**

The results of the study supported Hypothesis 2, which predicted that intermediate and high intermediate L2 Spanish learners would not derive epistemic modality from modal markers on embedded verbs during online sentence processing (±Form), but rather, from lexical expressions of epistemic modality and the lexical semantics of embedded verbs (±Meaning). In other words, Hypothesis 2 predicted that learners would be sensitive to sentence-image mismatches, but not to modality-mood mismatches. Intermediate and high intermediate learners demonstrated significantly slower reading times at the target regions in –Meaning sentences when compared to +Meaning sentences, regardless of whether the sentences were ±Form. This demonstrates that they derived meaning primarily from the lexical-semantics of embedded verbs, and lexical expressions of modality in corresponding sentences; not inflectional morphology for mood. These findings lend support to the Lexical Preference Principle, which predicts that, at least at the earlier stages of language acquisition, learners will prefer to derive meaning from lexical items, as opposed to form, when both encode the same meaning. The results for intermediate and high intermediate learners also lend support to the Shallow Structures Hypothesis, which argues that L2 learners rely more heavily on lexical-semantic information, associative patterns and other surface cues to interpretation during online comprehension (i.e., shallow, as opposed to syntactic processing). In addition, because intermediate and high intermediate L2 participants were not sensitive to cross-clausal agreement violations, results suggest that these learners process non-adjacent syntactic anomalies differently than native speakers, also predicted by the Shallow Structures Hypothesis.
Hypothesis 3

The results of the present study did not support Hypothesis 3, which predicted that advanced L2 learners would demonstrate native-like sensitivity to modality-mood mismatches during online sentence processing. This hypothesis was based on conflicting findings that advanced L2 learners are sensitive to non-local agreement violations, as reported in Chapter 2. On the one hand, Foote (2010) found that advanced Spanish learners were sensitive to non-local violations such as el pollo del taco está muy *rica (The chicken of [in] the taco is very * delicious-FEM). On the other hand, Jiang (2004, 2007) found that advanced L2 English learners were not sensitive to non-local violations in number agreement (e.g., the bridge to the island *were), and Keating (2009) found that syntactic distance hindered advanced Spanish learners’ sensitivity to gender agreement violations (e.g., una casa cuesta menos si es *pequeño – a-FEM house-FEM costs less if is *small-MASC). However, in these studies, linear distance (i.e., the number of words between constituents that must agree) included prepositional phrases (e.g., to the island, del taco – of [in] the taco), and clausal boundaries (e.g., cuesta menos si es – costs less if it is). Although modality-mood mismatches in the subjunctive task were cross-clausal, in terms of linear distance, only the complementizer que (that) intervened between lexical expressions of modality and subordinate verbs. The question still remains, however, as to why these advanced learners did not demonstrate sensitivity to modality-mood mismatches during online sentence processing. Is it the non-optimal processing strategy of lexical preference, the cross-clausal nature of the dependencies, or other factors that play a role? These questions will be addressed in the “Implications for L2 Processing” section of this chapter.

Hypotheses 4 and 5

The results of the local agreement task supported Hypothesis 4 and partially supported Hypothesis 5. These hypotheses predicted, respectively, that native speakers of Spanish and intermediate through advanced-level L2 Spanish learners would demonstrate sensitivity to localized subject-verb agreement violations during online processing. L1 Spanish speakers, high intermediate and advanced L2 learners demonstrated online
sensitivity to local agreement anomalies, but the intermediate L2 learners did not. The finding that intermediate-level learners were not sensitive to adjacent subject-verb agreement violations lends support to the Lexical Preference Principle because violations occurred between lexical items (subject pronouns and proper names) and verb morphology for person (e.g., yo *mira – I *watches; Isabel *miro – Isabel *watch\(_1\) _Sg_). Therefore, it can be argued that online sensitivity to grammatical anomalies did not emerge because learners were able to derive meaning from lexical pronouns (i.e., person/number information) and not from inflectional morphology. However, because high intermediates and advanced learners were sensitive to grammatical anomalies between adjacent constituents, the data suggest that lexical preference can be overcome with increased proficiency.

These findings also lend support to the Shallow Structures Hypothesis, which makes the general prediction that native-like processing of grammar is restricted to “local” domains such as morphosyntactic agreement between closely adjacent constituents (Clahsen & Felser, 2006b). In other words, native-like processing is possible, at least at the local level. These findings mirror those in Jiang (2004, 2007) and Keating (2009). Jiang found that advanced L2 English learners demonstrated sensitivity to adjacent pronoun-verb agreement violations (e.g., she *am). Keating found that advanced L2 Spanish learners were sensitive to localized gender agreement violations (e.g., casa *pequeño – house\(_{FEM}\) *small\(_{MASC}\)).

As mentioned in Chapter 2, up until now, online evidence supporting the tenability of the Lexical Preference Principle had been lacking. However, when taken together, the results from the subjunctive task and the local agreement task raise the issue of whether it is lexical preference or syntactic distance that affects processing of the Spanish subjunctive during online sentence comprehension. This issue is addressed in the following section.

**Implications for L2 Processing**

Is Native-Like Processing of the Subjunctive Attainable?
Given the findings from the subjunctive task, the issue arises whether native-like processing of the subjunctive is possible for L2 Spanish learners. Based on the ANOVA results, an initial answer to this question is “no”; even advanced learners, behaving as a group, did not demonstrate native-like processing of the target form. Recall from Chapter 3 that all L2 participants possessed metalinguistic knowledge about the subjunctive. The subjunctive is presented formally by the second year of university-level instruction, and all learners were recruited from third- and fourth-year, advanced Spanish language and content-based courses that are required for Spanish majors, and/or courses for graduate students seeking an M.A. or a Ph.D. in Spanish. Yet, as research has reported (e.g., Chen, Shu, Liu, Zhao, & Li, 2007; Jiang, 2004, 2007), possessing metalinguistic knowledge about form does not mean that learners are able to use this knowledge during online sentence processing. That said, it would be premature to conclude that native-like processing of the subjunctive is unattainable without further exploring processing considerations related to syntactic distance. This issue is explored in the next section.

**Syntactic Distance**

As discussed in Chapter 1, with few exceptions, such as formal direct commands (e.g., ¡Hable! – Speak!), the Spanish subjunctive appears in complex sentences. Complex sentences can be defined as having at least two clauses (Jordan & Pereiro-Otero, 2006), and the Spanish subjunctive is largely restricted to subordinate clauses.

One of the fundamental constructs of Pienemann’s (1998, 2007) Processability Theory is processing distance. Although a production model, Processability Theory formally predicts which structures of a given L2 can be acquired at a particular point in L2 development via the Processability Hierarchy, which is comprised of the following six stages:

1. No procedure (e.g., producing a simple word such as yes).
2. Category procedure (e.g., adding a past-tense morpheme to a verb).
3. Noun phrase procedure (e.g., matching plurality as in “two kids”).
4. Verb phrase procedure (e.g., moving an adverb out of the verb phrase to the front of a sentence (“I went yesterday/yesterday I went”).
5. Sentence procedure (e.g., subject-verb agreement).
6. Subordinate clause procedure (e.g., use of the subjunctive in subordinate clauses triggered by information in the main clause).

Central to Processability Theory is the argument that the processing stages are cumulative. In other words, learners will only be able to acquire the forms and structures of one stage when they have acquired the forms and structures associated with the previous stage(s). According to Pienemann (1998, 2007), the subordinate clause procedure, which encompasses use of the subjunctive in subordinate clauses triggered by information in the main clause, is last to emerge because it involves the exchange of grammatical information across clausal boundaries. Within comprehension, there is nothing as predictive as Processability Theory. However, insights by O’Grady (2003) suggest that the computational system of L2 learners is “underpowered” (p. 52), inasmuch as it may be “sensitive to the number of intervening clause boundaries” (O’Grady, 2010, p. 2709). This may explain why evidence of native-like processing of long-distance dependencies is not consistent. Among the studies reviewed in both Chapter 2 and the “Summary and Explanation of Findings” section of this chapter, Foote (2010) concluded that native-like processing of non-local agreement violations is possible at the advanced L2 level, whereas Jiang (2004, 2007) and Keating (2009) did not.

Recently, O’Grady (2010) has proposed the “Distance Law”, which states that the burden of working memory increases with the distance over which information must be maintained. O’Grady cites as evidence studies that have investigated filler-gap dependencies (e.g., Gibson & Warren, 2004; Frazier & Clifton, 1989; Marinis, Roberts, Felser, & Clahsen, 2005). Take the following example (5.1) from Gibson and Warren’s self-paced reading study.

(5.1) The manager who the consultant claimed e’i that the new proposal had pleased e’i will hire five workers tomorrow.

Example (5.1) provides an intermediate gap for the fronted wh-pronoun (filler) before crossing a clausal boundary. Findings from Gibson and Warren (2004) and Marinis, et al. (2005) suggest that L1 English speakers register faster reading times in
sentences that have an intermediate gap than in those that do not. It is hypothesized that L1 speakers are able to use intermediate gaps as “landing sites” that provide the opportunity to break up long dependencies into a series of shorter dependencies (Frazier & Clifton, 1989). However, evidence from L2 processing research (e.g., Marinis et al.) suggests that highly proficient L2 learners do not postulate intermediate gaps during online sentence processing. Because L2 learners do not make use of these landing sites, it is hypothesized that they do not reintegrate fillers until they reach the filler’s ultimate gap. Marinis et al. argue that this incurs processing cost. Similarly, O’Grady’s (2010) Distance Law argues that the burden for working memory increases with the distance over which information must be maintained. I return to this issue of processing cost and working memory in the “Limitations of the Present Study and Directions for Future Research” section of this chapter.

O’Grady’s (2010) Distance Law is similar to Clahsen and Felser’s (2006a, 2006b, 2006c) Shallow Structures Hypothesis, which argues that native-like processing of grammar is restricted to “local” domains, such as morphosyntactic agreement between closely adjacent constituents. If we take non-local to mean cross-clausal, then the Shallow Structures Hypothesis would predict that even highly proficient learners of Spanish may not evidence native-like sensitivity to grammatical violations, regardless of the number of intervening constituents. These predictions are open to empirical investigation.

**Syntactic distance, lexical preference or both?** In the subjunctive task, intermediate, high intermediate, and advanced L2 learners demonstrated slower reading times at the regions of interest in –Meaning sentences than in the +Meaning sentences. In this sense, findings lend support to the Lexical Preference Principle, as meaning was derived from the lexical-semantics of target verbs and lexical expressions of modality, and not from inflectional morphology for mood. However, in sentences in which the lexical-semantics of the embedded verb matched their corresponding images (+Meaning), no sensitivity was observed for modality-mood mismatches. Can these findings be explained by syntactic distance being a factor in modality-mood agreement? One way to potentially tease apart cross-clausal dependency with the target sentences of the
subjunctive task is to manipulate the variable ±Distance. To illustrate this point, consider the image in Figure 5.1 and the sentences in (5.1) and (5.2).

![Figure 5.1. Image of a Person Vacuuming and Dusting](image)

(5.1)  *Es posible que limpie/*limpia en la sala.*

[Is possible that cleans-*SUB*/*cleans-*IND in the living room]

‘It’s possible that he cleans/is cleaning in the living room.’

(5.2)  *Posiblemente limpie/*limpia en la sala.*

[Possibly cleans-*SUB*/*cleans-*IND in the living room]

‘He possibly cleans/is cleaning in the living room.’

Sentence (5.1) is an example of a +Distance sentence because the modality-mood (mis)match crosses clausal boundaries. In contrast, (5.4) is an example of a –Distance sentence because (dis)agreement occurs within an adverbial clause. If in a self-paced reading task, learners who have metalinguistic information regarding the Spanish subjunctive are not sensitive to agreement violations in (5.1) or (5.2), results would lend support to the Lexical Preference Principle, but not necessarily to the Shallow Structures Hypothesis. In other words, it could be inferred that L2 learners derive meaning from lexical cues for epistemic modality and the lexical-semantics of the target verb, and not derive meaning from inflectional morphology for mood. If, on the other hand, learners are sensitive to a modality-mood mismatch in the –Distance (5.2), but not in the +Distance condition (5.1), results would lend support to the Shallow Structures Hypothesis, and not necessarily to the Lexical Preference Principle. It is to say, it could be inferred that learners process modality-mood violations that occur in the same clause, but not across clausal boundaries.
Similarly, with adverbial conjunctions that introduce the “obligatory subjunctive” (e.g., *para que* – so that), it is possible to minimize intervening material between lexical expressions of modality and subjunctive mood morphology. Take for example (5.3), (5.4), and (5.5).

(5.3) *Para que pueda/*puede pasar el examen de matemáticas, el muchacho estudia mucho.*

[So that can-3 Sg SUB/*can-3 Sg IND to pass the exam of math the boy studies much]
‘The boy studies a lot so that he can pass the math exam’.

(5.4) *Para que el muchacho pueda/*puede pasar el examen, el muchacho estudia mucho.*

[So that the boy can-3 Sg SUB/*can-3 Sg IND to pass the exam the boy studies much]
‘The boy studies a lot so that he can pass the exam’.

(5.5) *Para que el muchacho que es estudiante de matemáticas pueda/*puede pasar el examen, el muchacho estudia mucho.*

[So that the boy that is student of math can-3 Sg SUB/*can-3 Sg IND to pass the exam the boy studies much]
‘The boy who is a math student studies a lot so that he can pass the exam’.

Sentence (5.3) is an example of a –Distance sentence because (dis)agreement occurs within an adverbial clause. Example (5.4), in contrast, is an example of a +Distance sentence because of an intervening noun phrase between the lexical marker of deontic modality *para que* (so that) and the target verb. Example (5.5) is also an example of a +Distance sentence because the modality-mood (mis)match crosses clausal boundaries. If in a self-paced reading task, learners who have metalinguistic information regarding the “obligatory subjunctive” do not register significantly longer reading times at the target region in the –Form sentences across the ±Distance conditions this would provide evidence that lexical preference is a factor during online sentence processing. In other words, it could be inferred that L2 learners derive meaning from lexical items (conjunctions) and the lexical-semantics of the target verb, and not from inflectional morphology for mood. If, on the other hand, learners are sensitive to modality-mood
mismatches in the –Distance, but not in the +Distance condition, results would lend support to the Shallow Structures Hypothesis. In this case, it would necessarily not be lexical preference, but rather an inability to process non-local dependencies that affects online sensitivity to long distance modality-mood mismatches.

**Limitations of the Present Study and Directions for Future Research**

This section focuses on three limitations of the present study and directions for future research. The first addresses the fact that proficiency, as operationalized in this dissertation, did not account for online sensitivity to cross-clausal mood violations. The second limitation considers the fact that the current study did not include a measure of working memory. The third limitation addresses the fact that the subjunctive task investigated the indicative-subjunctive contrast in only one syntactic structure. These issues are addressed in turn in the following sections.

**Measuring Proficiency**

One issue that arises is whether the advanced learners in the present study were truly advanced. The present study included only one measure of proficiency, which was comprised of 50 items from the *Diploma del Español como Lengua Extranjera* (DELE) test: 30 from the intermediate level grammar and vocabulary exam and 20 items from the superior level grammar and vocabulary exam. Recall from Chapter 3 that the DELE exam is a standardized, accredited proficiency test used by the Spanish Ministry of Education, portions of which have been used as proficiency measures in numerous SLA studies (e.g., Foote, 2010; Montrul, 2002, 2008, 2010; Sagarra & Herschensohn, 2010). The three L2 groups in this dissertation were operationalized according to their results on the DELE test, and each L2 group (intermediate, high intermediate, advanced) was significantly different from the other two.

In the interest of exploring the relationship between this proficiency measure and native-like processing of the subjunctive, attention was turned to the high intermediate and advanced participants (the two L2 groups that demonstrated online sensitivity to
adjacent subject-verb agreement errors). From these two groups, individual learners were identified whose mean differences were greater than or equal to 100 milliseconds at regions of interest for ungrammatical vs. grammatical sentences in both tasks. The 100 millisecond mark was chosen based on findings that this is an indication of early onset of online sensitivity (Ditman, Holcomb, & Kuperberg, 2007; Gunter, Schmidt, & Besson, 2003), and the minimum time that it takes for users to perceive a change on a computer screen (Card, Moran, & Newell, 1983; Miller, 1968).

Of the 26 high intermediates that took part in the local agreement task, 17 (65%) registered mean differences ≥100 milliseconds for at least one of the regions of interest in the local agreement task (±Grammatical). Of the 24 advanced learners who completed this task, 20 (88%) registered mean differences greater than or equal to the 100 millisecond mark for at least one of the regions of interest for this task.

Of the 27 high intermediates that took part in the subjunctive task, only four (15%) registered mean differences ≥100 milliseconds for at least one of the regions of interest (±Form). Of the 25 advanced learners who completed this task, only two (8%) registered mean differences greater than or equal to the 100 millisecond mark for at least one of the regions of interest in this task. Both of the advanced participants reached this criterion for both tasks, however, of the four high intermediates, two demonstrated mean differences ≥100 milliseconds at the target region in the subjunctive task only.

In order to explore possible commonalities and differences among these six learners, attention was turned proficiency test scores. The two advanced learners who were sensitive to modality-mood mismatches at the 100 millisecond mark in both tasks scored 62% and 70% on the proficiency measure, respectively. Of the 25 advanced learners who completed the subjunctive task, 19 scored higher than 62% \( (M = 76\%, SD = 8.62) \), and of these, 12 scored higher than 70% \( (M = 81\%, SD = 7.00) \). Because the proficiency test cutoff for high intermediates was 60%, all 25 of the advanced learners scored higher than the four high intermediates who demonstrated sensitivity to ±Form at the ≥100 millisecond mark. Therefore, although proficiency, as operationalized in the present study, may have accounted for online sensitivity to local subject-verb agreement violations, it may not have accounted for online sensitivity to cross-clausal mood violations.
These findings raise the issue of how to define and measure L2 proficiency. In SLA research, the term proficiency is defined in numerous ways. VanPatten (2003) notes that when someone asks whether a person knows a given language, they are asking whether that person speaks that language. He notes that for many, speaking ability is the “hallmark” of language acquisition (p. 61). However, this raises the issue of whether it is fluency or accuracy that define proficiency, both of which native speakers possess (Davies, 2000). Thomas (1994) defines proficiency as “a person’s overall competence and ability to perform in L2” (p. 330), and can refer to phonological, syntactic, morphological, lexical, and/or discourse skills. The question that arises, therefore, is how should proficiency be operationalized? The fact is that there is no standardized proficiency measure that takes into account phonological, syntactic, morphological, lexical, and discourse skills. Therefore, perhaps measures of oral proficiency, lexical knowledge, and grammatical knowledge should be used in order to operationalize the term “advanced” L2 learners, who by extension, may demonstrate sensitivity to the subjunctive during online processing of complex sentences? This is an issue that future processing research needs to address.

**Working Memory**

Working memory is the ability to actively hold information in the mind needed to do complex tasks, such as comprehension (Baddeley, 1992). O’Grady notes that there is no one agreed-upon metric of working memory. Although there are a number of working memory measures, one of the most commonly used measures are reading span tasks (Daneman & Carpenter, 1980). In these tasks, participants read aloud a series of sentences and then recall the final word of each sentence. The reading span equals the number of final words recalled, and has been found to correlate with reading comprehension measures (Daneman & Carpenter).

According to Baddeley (1992), working memory has been found to require the simultaneous storage and processing of information. Because the critical sentences of the subjunctive task targeted (mis)matches between lexical expressions of modality in the main clauses of sentences and inflectional morphology for mood on the verb in subordinate clauses, limitations of working memory may have been a factor. That said, of
the 81 L2 learners who took part in the subjunctive task, only six (7%) demonstrated mean differences in reading times greater than or equal to 100 milliseconds in at least one of the regions of interest in ±Form sentences. Although it may be unlikely that only 7% of the L2 participants had high working memory, as operationalized via a reading span task, a lack of such a measure makes it impossible to conclude whether this is the case.

Based on the findings of filler gap studies considered in the “Syntactic Distance” section of this chapter, O’Grady (2010) argues that it is plausible that processing cost is sensitive to the number of intervening clause boundaries between two constituents. In his proposed Distance Law, O’Grady states that “the burden of working memory increases with the distance over which information must be maintained” (p. 2709). Therefore, future research investigating online processing of cross-clausal dependencies may benefit from including measures of working memory, in order to investigate the relationship between this construct and processing cost.

**Investigating the Subjunctive in Other Syntactic Structures**

The current study targeted regular third-person singular present indicative vs. subjunctive forms in subordinate nominal clauses of sentences that express epistemic modality. Studies of L1 acquisition suggest that adult-like use of the subjunctive mood it last to emerge in subordinate nominal clauses of sentences that express epistemic modality (Blake, 1983, Pérez-Leroux, 1998). Given the lack of significant findings for online sensitivity to modality-mood violations in these types of sentences, the issue arises whether native-like processing of the modality-mood mismatches in this syntactic structure may be last to emerge in L2 acquisition.

With regard to L1 acquisition, findings in Blake (1983) and Pérez-Leroux (1998) suggest an order of acquisition of the Spanish subjunctive. Adult-like usage of subjunctive mood morphology in subordinate clauses has been demonstrated to first emerge with indirect commands (e.g., *querer que* – to want that), and second in subordinate adverbial clauses introduced by conjunctions such as *para que* (so that), also referred to as the “obligatory subjunctive”. There is no modal contrast in either of these sentence types, but rather, they invariably take the subjunctive. Furthermore, both of these sentence types express deontic modalities (Pérez-Leroux, 1998) and are future-
oriented (Blake). Adult-like modal choice (indicative vs. subjunctive) has been demonstrated to emerge first in adverbial clauses introduced by conjunctions such as \textit{cuando} (when), followed by modal choice emerges next in subordinate adjectival clauses. Although the latter express epistemic, as opposed to deontic modalities, use of the subjunctive in subordinate adverbial clauses still communicates future-orientation. Last to emerge in L1 acquisition is adult-like usage of modal choice in subordinate nominal clauses (with the exception of indirect commands). Like adjectivals, these sentences express epistemic modalities. However, in contrast to all other syntactic structures considered in this section, these sentences express false beliefs, and not necessarily future-orientation.

Pérez-Leroux (1998) hypothesized that later emergence of modal choice in sentences that communicate epistemic, as opposed to deontic abilities, may depend on the ability of L1 child speakers to (a) attribute false beliefs to the self and others and (b) distinguish between appearance and reality. According Wellman (1990), to the ability to discern between real and false beliefs is a landmark in child cognitive development, and it is during the preschool years that the ability to attribute false beliefs to the self and others, as well as the ability to distinguish between appearance and reality, develop. Given that the participants in the present study were cognitively developed adults, it may be the case that it is lexical preference and/or shallow processing that hinders native-like processing of modality-mood violations in subordinate nominal clauses of sentences that express epistemic modality, as detailed in the “Syntactic Distance, Lexical Preference or Both?” section of this chapter. However, based on the hypothesized order of L1 acquisition, the following question arises: Do adult L2 learners demonstrate sensitivity to modality-mood violations in other syntactic structures first? Unfortunately, because this dissertation examined online (in)sensitivity to the subjunctive in only one syntactic structure, it is impossible to draw conclusions regarding a possible order of L2 acquisition of mood in Spanish. Future research, therefore, needs to investigate whether native-like processing of the subjunctive is possible in the other syntactic structures in which it occurs (direct commands, indirect commands, adverbial clauses, and adjectival clauses), even when lexical preference and syntactic distance are factors.
Given the issues surrounding the operationalization of proficiency, the role of working memory, and the possibility that there may be an order of L2 acquisition of the subjunctive in different syntactic structures, it is too early to answer the question of whether native-like processing of the subjunctive is attainable for L2 learners. That said, the findings of this study underscore the difficulty that this form poses for learners, even after years of formal instruction.

**Implications for L2 Instruction**

The opening paragraph of this dissertation noted that it has long been observed by L2 practitioners that the Spanish subjunctive is difficult for learners to acquire. Although the findings of this dissertation cannot provide clear evidence that it is lexical preference only, and not shallow processing that affects online processing of mood, we do know that the Spanish subjunctive co-occurs with certain lexical items, and that this co-occurrence is often cross-clausal. Based on this dissertation’s findings that L2 Spanish learners were sensitive to disconnects between referential meaning and the lexical-semantics of target verbs, and until future research can shed light upon the role of ±Distance in processing modality-mood (mis)matches, we can hypothesize that the Lexical Preference Principle is tenable: L2 learners will prefer to derive meaning from lexical items, as opposed to verb morphology when both encode the same meaning. Therefore, in considering implications for language teaching, the issue that arises is whether instructors can increase opportunities for learners to derive meaning from modal markers on embedded verbs, and minimize opportunities for learners to derive meaning from the lexical-semantics of those verbs and lexical markers of modality. I will address these opportunities from within a processing instruction perspective.

Processing instruction is an instructional treatment informed by input processing (VanPatten, 1996, 2004). The goal of processing instruction is to alter “non-optimal” processing strategies, which learners are hypothesized to use as default processing strategies, at least at the earlier stages of SLA. These non-optimal processing strategies are those that are outlined in the various input processing principles, which include the
Lexical Preference Principle. As originally operationalized by VanPatten and Cadierno (1993), processing instruction consists of two elements: explicit information and structured input. Explicit information consists of two components: specific rules regarding a target grammatical form, and specific processing strategies for the form in question. Structured input refers to activities that are designed to provide learners with form and meaning-focused practice on the target structure. Structured input activities consist of input that has been manipulated to increase the frequency and saliency of the target form, but in which meaning is kept in focus. Although the role of explicit information has been debated in the processing instruction literature (e.g., VanPatten & Oikkenon, 1996; Farley, 2001, 2004; Fernández, 2008), research has consistently shown that learners who receive structured input activities during treatment yield comprehension rates superior to those of those who receive output-based instruction only. In addition, those who receive processing instruction and perform just as well on production measures as learners who receive output-based instruction only, despite never having to produce language during treatment.

Farley (2001) conducted the first processing instruction study that targeted the third-person singular present subjunctive. Learners in his study heard target verbs, marked subjunctive or indicative, followed by a phrase (e.g., *coma en casa mucho* – eats-*SUB* at home often). Participants then had to match these subordinate clauses with one of two matrices (e.g., *Es obvio que* – It’s obvious that, *No creo que* – I don’t believe that). Although Farley’s studies sought to alter the non-optimal processing strategy of lexical preference (deriving meaning from lexical items and not verb morphology when both encode the same meaning), Doughty (2004) has argued that Farley’s materials were metalinguistic in nature and did not guarantee that participants had to keep meaning in focus.

One option for potentially minimizing lexical preference while keeping meaning in focus is to show to learners images, each accompanied by one subordinate clause and multiple matrices (or optionally, adverbs in order to lessen syntactic distance). However, when matched with the subordinate clause, it is imperative that only one of the main clause/adverb options make a sentence that is both a sentence-image (+Meaning) and a
modality-mood match (+Form). Take for example the image in Figure 5.2, the subordinate clause in (5.5) and the main clause/adverb options in (5.6a-c).

![Figure 5.2. Image of Three Kids Playing in a Pool](image)

(5.5) *estén de vacaciones.*

[are-*SUB at the North Pole]

(5.6) a. *Es dudoso que/Dudablemente*

[Is doubtful that/Doubtfully]

b. *Es obvio que/Obviamente*

[Is true that/Obviously]

c. *Es posible que/Posiblemente*

[Is possible that/Possibly]

Only one of the main clause/adverb options provided in (5.6a-c), when matched with the subordinate clause in (5.5), will create a sentence that is both +Form and +Meaning. Let us consider each option in turn.

(5.7) *Es dudoso que/Dudablemente estén de vacaciones.*

[Is doubtful that/Doubtfully are-*SUB on vacation]

‘It’s doubtful that/Doubtfully they are on vacation.’

Sentence (5.7) is perfectly grammatical, as evidenced by the modality-mood match between the semantic notion of doubt and inflectional morphology for the subjunctive mood on the embedded verb. However, there exists a sentence-image mismatch. If the children are playing in a pool, it is not necessarily doubtful that they are
on vacation. Therefore, (5.7) is a sentence-image mismatch, but a modality-mood match. Now consider (5.8).

(5.8) *Es obvio que/Obviamente estén de vacaciones.*

[Is obvious that/Obviously are-*SUB on vacation]

‘It’s obvious that/Obviously they are on vacation.’

Although this sentence conveys a plausible sentence-image match, the semantic notion conveyed in the man clause/adverb is in conflict with the subjunctive mood marker on the verb *estar* (to be). Therefore, although (5.8) is a sentence-image match (+Meaning), it is a modality-mood mismatch (–Form). Lastly, consider (5.9).

(5.9) *Es posible que/Posiblemente estén de vacaciones.*

[Is possible that/Possibly are-*SUB on vacation]

‘It’s possible that/Possibly they are on vacation.’

As the children are playing in a pool, it is certainly possible that they are on vacation. Because this notion of possibility is expressed in the main clause (or alternatively, by the adverb) and is grammaticalized with the subjunctive mood marker in the verb *estar* (to be), (5.9) is a from-meaning match. Therefore, of the three options provided, only (5.9) is +Form, +Meaning.

**Conclusion**

This dissertation investigated whether L2 Spanish learners process inflectional morphology for mood similarly to native Spanish speakers during online sentence comprehension. The results of this dissertation provide some answers, but also raise new questions. Intermediate, high intermediate, and advanced L2 Spanish learners were sensitive to sentence-image mismatches (–Meaning), but not to modality-mood mismatches (–Form). Sensitivity to sentence-image mismatches implies that learners
processed target verbs for lexical-semantics, but not for mood morphology. However, when there was a sentence-image match, L2 learners were not sensitive to cross-clausal violations between lexical expressions of modality and inflectional morphology for mood. Results from L1 Spanish speakers were the complete opposite. Native speakers were sensitive to modality-mood violations (−Form), but not to sentence-image mismatches (−Meaning). When conflicts arose between referential meaning and the lexical-semantics of target verbs, no delays in online processing were observed. It can therefore be inferred that lexical preference is not a factor during L1 processing of the Spanish subjunctive, but is a factor during L2 processing.

However, because agreement violations in critical sentences occurred across clausal boundaries, it cannot be determined whether L2 learners’ insensitivity to modality-mood mismatches was due to lexical preference, shallow processing, or both. Therefore, two self-paced reading experiments were proposed that would take into account the variable ±Distance in the investigation of online processing of the Spanish subjunctive. Limitations regarding the notions of measuring proficiency and working memory were also addressed. The issue was also raised whether native-like processing of the subjunctive in the target sentences of the subjunctive task may emerge after native-like processing emerges for the subjunctive in other syntactic structures. In addition, suggestions were made for ways that L2 practitioners and researchers can create structured input activities that can potentially alter the non-optimal processing strategy of lexical preference while keeping a focus on both form and meaning. In sum, this study has opened the door for understanding, isolating and testing potential factors that make the Spanish subjunctive a notoriously difficult form for L2 learners to process, and thus acquire.
The study “Processing Spanish sentences for form and meaning” is part of research intended to provide information about the way people learn and process language.

If you agree to participate in this study, you will be asked to perform two tasks in one session (approximately 45 minutes). In one task, you will see a series of images accompanied by sentences that either accurately or inaccurately describe what is represented by each image. The images and their corresponding sentences will appear on the screen for a pre-determined number of seconds, and you will be asked to decide as quickly as possible whether the sentences are representative of what is represented by each image by pushing buttons that say “yes” and “no”. In the second task, you will read sentences and answer comprehension questions by pushing buttons that say “yes” and “no”.

These tasks will be conducted on a computer, with the presentation of the sentences and pictures appearing on the screen. The computer will record the data, and your confidentiality will be protected. In addition, you will also complete a questionnaire asking about your past experience learning language. You may decline to answer specific questions.

Your participation is totally voluntary and you may stop participation at anytime. There is no expected risk during the session. However, you have the right to terminate the session at any time without any penalty.

Your performance and any information obtained during the course of the study will remain confidential, to the extent allowed by law. Your name will be replaced with a number for the purposed of coding and analysis of data. Only the primary researchers will have access to the codes and this will be destroyed after data analysis is complete.

You are encouraged to ask any questions that you might have about this study before, during and after your participation in the study. However, answers that could influence the results of the experiment will be deferred to the end of the experiment. You will also receive a debriefing form upon completion of the study, fully explaining the goals of the research.

There are benefits for participating in the research project. You will be providing second language acquisition researchers with valuable information about how individuals process a foreign language. This knowledge will assist researchers to improve second language learning methods.

You will be assigned a code, and at no time will your name or any other personal information be recorded. This de-identified data will be kept for a period of at least 10
years, as suggested by the American Psychological Association. Results will be kept in an SPSS file on the principle investigator’s work and personal computers.

The principle investigator, Robert Cameron, is a doctoral student in the Department of Modern Languages working under the supervision of his advisor, Dr. Michael Leeser. If you have any questions about this research or your rights as a participant in this study, or if you feel you have been placed at risk, please contact the Chair of the Human Subjects Committee, Institutional Review Board, through the Vice President for the Office of Research at (850) 644-8633 and/or humansubjects@magnet.fsu.edu. You may also contact the principle investigator’s advisor, Dr. Michael Leeser, at (850) 644-4938 and/or mleeser@fsu.edu.

I understand that I am free to discontinue participation at any time without explanation. I understand that this form will not be used in conjunction with the results of the study so that my identity will be protected. I understand that I will receive a signed copy of this consent form.

Signature _____________________________________ Date ___________________
APPENDIX B
LANGUAGE HISTORY QUESTIONNAIRE

IF YOU ARE A NATIVE SPEAKER OF ENGLISH, PLEASE FILL OUT THIS SIDE OF THIS QUESTIONNAIRE.
IF YOU ARE A NATIVE SPEAKER OF SPANISH, PLEASE FILL OUT THE OTHER SIDE OF THIS QUESTIONNAIRE.

Language History Questionnaire for Non-native Speakers of Spanish

1. Age: __________

2. Is English your native language?  □ Yes  □ No

3. How old were you when you began to study Spanish? __________

4. Do /Did you study Spanish in college (as an undergraduate)?  □ Yes  □ No

5. Have you ever taken graduate courses in Spanish?  □ Yes  □ No

6. What is the language that you use most often in your home? ________________

7. Do you currently study Spanish at FSU?  □ Yes  □ No

8. Do you currently teach Spanish at FSU?  □ Yes  □ No

9. Are you familiar with the Spanish subjunctive?  □ Yes  □ No

10. If so, what do you know about its uses?
____________________________________________________________________________
____________________________________________________________________________

11. Have you lived and/or studied in a Spanish speaking country?  □ Yes  □ No

   If so, where and for how long? __________________________________________________

12. Apart from English and Spanish, do you speak any other languages?  □ Yes  □ No

   If so, which language(s)? __________________

13. Do you have any known visual problems (corrected or uncorrected)?  □ Yes  □ No

   If so, please explain _________________________________________________________

14. Are you familiar with the basic uses of a computer?  □ Yes  □ No
Language History Questionnaire for Native Speakers of Spanish

1. Age: __________

2. Is Spanish your native language?  ☐ Yes  ☐ No

3. How old were you when you moved to the U.S.? _________

4. How long have you lived in the U.S.? _________

5. What is the language that you use most often in your home? ____________________

6. Apart from Spanish and English, do you speak any other languages?  ☐ Yes  ☐ No
   If so, which language(s)? ____________________

7. Do you have any uncorrected vision problems?  ☐ Yes  ☐ No

8. Are you familiar with the basic uses of a computer?  ☐ Yes  ☐ No
APPENDIX C
SUBJUNCTIVE TASK: CRITICAL SENTENCES ACROSS FOUR CONDITIONS
WITH IMAGE PAIRS

+Meaning, +Form
Es probable que compre en el mercado.
[Is probable that buys-SUB in the market]
‘It is probable that he shops/is shopping in the market.’

+Meaning, +Form
Es obvio que compre en el mercado.
[Is obvious that *buys-SUB in the market]
‘It is obvious that he shops/is shopping in the market.’

+Meaning, +Form
Es posible que esquíe en el invierno.
[Is possible that skis-IND in the winter]
‘It is possible that he skis/is skiing in the winter.’

+Meaning, +Form
Es cierto que esquíe en el invierno.
[Is true that *skis-IND in the winter]
‘It is true that s/he skis/is skiing in the winter.’

+Meaning, -Form
Es probable que compre en el mercado.
[Is probable that buys-IND in the market]
‘It is possible that he shops/is shopping in the market.’

+Meaning, -Form
Es obvio que compre en el mercado.
[Is obvious that *buys-IND in the market]
‘It is probable that he shops/is shopping in the market.’

-Meaning, +Form
Es posible que esquíe en el invierno.
[Is possible that skis-IND in the winter]
‘It is possible that he skis/is skiing in the winter.’

-Meaning, +Form
Es cierto que compra en el mercado.
[Is true that buys-IND in the market]
‘It is true that he shops/is shopping in the market.’

-Meaning, -Form
Es probable que esquíe en el invierno.
[Is probable that *skis-IND in the winter]
‘It is probable that he skis/is skiing in the winter.’

-Meaning, -Form
Es cierto que compra en el mercado.
[Is true that *buys-IND in the market]
‘It is possible that s/he shops/is shopping in the market.’
+Meaning, +Form
Es cierto que piensa en una idea.
[Is true that thinks-IND in an idea]
‘It is true that he thinks/is thinking of an idea.’

+Meaning, -Form
Es posible que piensa en una idea.
[Is possible that *thinks-IND in an idea]
‘It is possible that he thinks/is thinking of an idea.’

-Meaning, +Form
Es obvio que saluda a un amigo.
[Is obvious that greets-IND to a friend]
‘It is obvious that he says/is saying hi to a friend.’

-Meaning, +Form
Es cierto que saluda a un amigo.
[Is true that *greets-IND to a friend]
‘It is true that he says/is saying hi to a friend.’

+Meaning, +Form
Es posible que saluda a un amigo.
[Is possible that *greets-IND to a friend]
‘It is possible that he says/is saying hi to a friend.’

+Meaning, -Form
Es probable que saluda a un amigo.
[Is probable that *greets-IND to a friend]
‘It is probable that he says/is saying hi to a friend.’

-Meaning, +Form
Es obvio que piense en una idea.
[Is obvious that thinks-SUB in an idea]
‘It is obvious that he thinks/is thinking of an idea.’

-Meaning, +Form
Es cierto que piense en una idea.
[Is true that *thinks-SUB in an idea]
‘It is true that he thinks/is thinking of an idea.’
Es probable que opere en el hospital.
[Is probable that operates_{SUB} in the hospital]
‘It is probable that s/he operates/is operating in the hospital.’

Es obvio que opere en el hospital.
[Is obvious that *operates_{SUB} in the hospital]
‘It is obvious that s/he operates/is operating in the hospital.’

Es posible que ande con los perros.
[Is possible that walks_{SUB} with the dogs]
‘It is possible that s/he walks/is walking with the dogs.’

Es cierto que anda con los perros.
[Is true that *walks_{SUB} with the dogs]
‘It is true that she walks/is walking with the dogs.’

Es cierto que opera en el hospital.
[Is true that operates_{IND} in the hospital]
‘It is true that she operates/is operating in the hospital.’

Es posible que opera en el hospital.
[Is possible that *operates_{IND} in the hospital]
‘It is possible that she operates/is operating in the hospital.’
+Meaning, +Form
Es cierto que salta en el parque.
[Is true that jumps-IND in the park]
‘It is true that she jumps/is jumping in the park.’

+Meaning, -Form
Es posible que salta en el parque.
[Is possible that *jumps-IND in the park]
‘It is possible that she jumps/is jumping in the park.’

+Meaning, +Form
Es cierto que come en la cafetería.
[Is true that *eats-IND in the cafeteria]
‘It is true that she eats/is eating in the cafeteria.’

+Meaning, -Form
Es probable que come en la cafetería.
[Is probable that *eats-IND in the cafeteria]
‘It is probable that he eats/is eating in the cafeteria.’

-Meaning, +Form
Es obvio que come en la cafetería.
[Is obvious that eats-IND in the cafeteria]
‘It is obvious that she eats/is eating in the cafeteria.’

-Meaning, +Form
Es cierto que coma en la cafetería.
[Is true that *eats-SUB in the cafeteria]
‘It is true that she eats/is eating in the cafeteria.’

-Meaning, -Form
Es probable que salte en el parque.
[Is probable that jumps-SUB in the park]
‘It is probable that he jumps/is jumping in the park.’

-Meaning, +Form
Es obvio que salte en el parque.
[Is obvious that *jumps-SUB in the park]
‘It is obvious that he jumps/is jumping in the park.’
+Meaning, +Form
Es probable que pregunte en la clase.
[Is probable that asks-_SUB in the class]
‘It is probable that he asks/is asking a question in class.’

+Meaning, -Form
Es obvio que pregunte en la clase.
[Is obvious that *asks-_SUB in the class]
‘It is obvious that he asks/is asking a question in class.’

-Meaning, +Form
Es posible que llueva en la ciudad.
[Is possible that rains-_SUB in the city]
‘It is possible that it rains/is raining in the city.’

-Meaning, +Form
Es probable que llueva en la ciudad.
[Is probable that *rains-_IND in the city]
‘It is probable that it rains/is raining in the city.’

+Meaning, +Form
Es obvio que llueve en la ciudad.
[Is obvious that rains-_IND in the city]
‘It is obvious that it rains/is raining in the city.’

+Meaning, -Form
Es cierto que llueva en la ciudad.
[Is true that *rains-_SUB in the city]
‘It is true that it rains/is raining in the city.’

-Meaning, +Form
Es cierto que pregunta en la clase.
[Is true that asks-_IND in the class]
‘It is true that s/he asks/is asking a question in class.’

-Meaning, +Form
Es posible que pregunta en la clase.
[Is possible that *asks-_IND in the class]
‘It is possible that s/he asks/is asking a question in class.’
Es cierto que juega en el partido.
[Is true that plays-IND in the game]
‘It is true that he plays/is playing in the game.’

+Meaning, +Form

Es posible que juegue en el partido.
[Is possible that plays-IND in the game]
‘It is possible that he plays/is playing in the game.’

+Meaning, -Form

Es obvio que fuma en el bar.
[Is obvious that smokes-IND in the bar]
‘It is obvious that he smokes/is smoking in the bar.’

-Meaning, +Form

Es cierto que fume en el bar.
[Is true that *smokes-SUB in the bar]
‘It is true that he smokes/is smoking in the bar.’

-Meaning, +Form

Es probable que juegue en el partido.
[Is probable that plays-SUB in the game]
‘It is probable that he plays/is playing in the game.’

+Meaning, -Form

Es posible que fume en el bar.
[Is possible that *smokes-SUB in the bar]
‘It is possible that he smokes/is smoking in the bar.’

-Meaning, +Form

Es probable que fume en el bar.
[Is probable that *smokes-SUB in the bar]
‘It is probable that he smokes/is smoking in the bar.’
Es probable que sirva en el restaurante.

\[\text{[Is probable that serves-}\text{SUB in the restaurant]}\]

\[\text{‘It is probable that he serves/is serving in the restaurant.’}\]

Es obvio que sirva en el restaurante.

\[\text{[Is obvious that serves-}\text{IND in the restaurant]}\]

\[\text{‘It is obvious that he serves/is serving in the restaurant.’}\]

Es posible que borre en la pizarra.

\[\text{[Is possible that erases-}\text{IND on the board]}\]

\[\text{‘It is possible that he erases/is erasing the board.’}\]

Es cierto que sirve en el restaurante.

\[\text{[Is true that serves-}\text{IND in the restaurant]}\]

\[\text{‘It is true that she serves/is serving in the restaurant.’}\]

Es cierto que borra en la pizarra.

\[\text{[Is true that erases-}\text{IND on the board]}\]

\[\text{‘It is true that she erases/is erasing the board.’}\]

Es cierto que sirve en el restaurante.

\[\text{[Is true that serves-}\text{IND in the restaurant]}\]

\[\text{‘It is true that she serves/is serving in the restaurant.’}\]

Es cierto que sirve en el restaurante.

\[\text{[Is true that serves-}\text{IND in the restaurant]}\]

\[\text{‘It is true that she serves/is serving in the restaurant.’}\]

Es cierto que sirve en el restaurante.

\[\text{[Is true that serves-}\text{IND in the restaurant]}\]

\[\text{‘It is true that she serves/is serving in the restaurant.’}\]
+Meaning, +Form
Es cierto que escribe en el cuarto.
[Is true that writes-IND in the room]
‘It is true that he writes/is writing in the room.’

+Meaning, +Form
Es posible que escribe en el cuarto.
[Is possible that writes-IND in the room]
‘It is possible that he writes/is writing in the room.’

+Meaning, -Form
Es cierto que limpie en la sala.
[Is true that *cleans-SUB in the living room]
‘It is true that he cleans/is cleaning in the living room.’

+Meaning, +Form
Es probable que limpie en la sala.
[Is probable that *cleans-SUB in the living room]
‘It is probable that he cleans/is cleaning in the living room.’

+Meaning, -Form
Es obvio que limpia en la sala.
[Is obvious that cleans-IND in the living room]
‘It is obvious that he cleans/is cleaning in the living room.’

+Meaning, +Form
Es probable que escriba en el cuarto.
[Is probable that writes-SUB in the room]
‘It is probable that he writes/is writing in the room.’

+Meaning, +Form
Es obvio que escriba en el cuarto.
[Is obvious that *writes-SUB in the room]
‘It is obvious that he writes/is writing in the room.’

+Meaning, -Form
Es cierto que escriba en el cuarto.
[Is true that *writes-SUB in the room]
‘It is true that he writes/is writing in the room.’

+Meaning, +Form
Es posible que escriba en el cuarto.
[Is possible that *writes-SUB in the room]
‘It is possible that he writes/is writing in the room.’

+Meaning, -Form
Es obvio que escriba en el cuarto.
[Is obvious that *writes-SUB in the room]
‘It is obvious that he writes/is writing in the room.’
Es probable que pida en la calle.
[Is probable that asks\textsubscript{SUB} in the street]
‘It is probable that he begs/is begging in the street.’

Es obvio que pida en la calle.
[Is obvious that *asks\textsubscript{SUB} in the street]
‘It is obvious that he begs/is begging in the street.’

Es posible que vuela en el aire.
[Is possible that flies\textsubscript{IND} in the air]
‘It is possible that he flies/is flying in the air.’

Es cierto que vuela en el aire.
[Is true that *flies\textsubscript{SUB} in the air]
‘It is true that it flies/is flying in the air.’

Es probable que pida en la calle.
[Is probable that asks\textsubscript{IND} in the street]
‘It is probable that it begs/is begging in the street.’

Es obvio que pida en la calle.
[Is obvious that flies\textsubscript{IND} in the air]
‘It is obvious that it flies/is flying in the air.’

Es cierto que pide en la calle.
[Is true that asks\textsubscript{IND} in the street]
‘It is true that it begs/is begging in the street.’

Es posible que pida en la calle.
[Is possible that asks\textsubscript{IND} in the street]
‘It is possible that it begs/is begging in the street.’
Es cierto que corre en el maratón.
[Is true that runs-IND in the marathon]
'It is true that s/he runs/is running in the marathon.'

Es posible que corre en el maratón.
[Is possible that runs-IND in the marathon]
'It is possible that s/he runs/is running in the marathon.'

Es obvio que llora en la escuela.
[Is obvious that cries-IND at the school]
'It is obvious that s/he cries/is crying at school.'

Es cierto que llora en la escuela.
[Is true that *cries-SUB at the school]
'It is true that s/he cries/is crying at school.'

Es probable que llora en la escuela.
[Is probable that *cries-IND at the school]
'It is probable that s/he cries/is crying at school.'

Es probable que corra en el maratón.
[Is probable that runs-SUB in the marathon]
'It is probable that s/he runs/is running in the marathon.'

Es obvio que corra en el maratón.
[Is obvious that *runs-SUB in the marathon]
'It is obvious that s/he runs/is running in the marathon.'
Es probable que espere en la parada.
[Is probable that waits\textsubscript{SUB} at the bus stop]
‘It is probable that he waits/is waiting at the bus stop.’

Es obvio que espere en la parada.
[Is obvious that *waits\textsubscript{SUB} at the bus stop]
‘It is obvious that he waits/is waiting at the bus stop.’

Es posible que cante con el micrófono.
[Is possible that sings\textsubscript{SUB} with the microphone]
‘It is possible that he sings/is singing with the microphone.’

Es cierto que cante con el micrófono.
[Is true that *sings\textsubscript{SUB} with the microphone]
‘It is true that he sings/is singing with the microphone.’

Es probable que canta con el micrófono.
[Is probable that *sings\textsubscript{IND} with the microphone]
‘It is probable that he sings/is singing with the microphone.’

Es cierto que espera en la parada.
[Is true that waits\textsuperscript{IND} at the bus stop]
‘It is true that he waits/is waiting at the bus stop.’

Es posible que espera en la parada.
[Is possible that *waits\textsuperscript{IND} at the bus stop]
‘It is possible that he waits/is waiting at the bus stop.’
Es cierto que nada en la piscina.
\[\text{Is true that swims-IND in the pool}\]
'It is true that she swims/is swimming in the pool.'

Es posible que nada en la piscina.
\[\text{Is possible that *swims-IND in the pool}\]
'It is possible that she swims/is swimming in the pool.'

Es obvio que pinta en el estudio.
\[\text{Is obvious that paints-IND in the studio}\]
'It is obvious that she paints/is panting in the studio.'

Es cierto que pinte en el estudio.
\[\text{Is true that *paints-SUB in the studio}\]
'It is true that she paints/is panting in the studio.'

Es probable que pinte en el estudio.
\[\text{Is probable that paints-IND in the studio}\]
'It is probable that he paints/is panting in the studio.'

Es probable que nade en la piscina.
\[\text{Is probable that swims-SUB in the pool}\]
'It is probable that he swims/is swimming in the pool.'

Es obvio que nada en la piscina.
\[\text{Is obvious that *swims-SUB in the pool}\]
'It is obvious that he swims/is swimming in the pool.'

Es cierto que pinte en el estudio.
\[\text{Is true that *paints-SUB in the studio}\]
'It is true that she paints/is panting in the studio.'
+Meaning, +Form
Es probable que hable en la ceremonia.
[Is probable that speaks-\textsubscript{SUB} at the ceremony]
‘It is probable that she speaks/is speaking at the ceremony.’

+Meaning, +Form
Es obvio que hable en la ceremonia.
[Is obvious that *speaks-\textsubscript{SUB} at the ceremony]
‘It is obvious that she speaks/is speaking at the ceremony.’

+Meaning, -Form
Es posible que corte con la tijera.
[Is possible that cuts-\textsubscript{SUB} with the scissors]
‘It is possible that she cuts/is cutting with the scissors.’

+Meaning, -Form
Es cierto que corte con la tijera.
[Is true that *cuts-\textsubscript{SUB} with the scissors]
‘It is true that he cuts/is cutting with the scissors.’

-Meaning, +Form
Es posible que corte con la tijera.
[Is possible that cuts-\textsubscript{IND} with the scissors]
‘It is possible that she cuts/is cutting with the scissors.’

-Meaning, +Form
Es cierto que habla en la ceremonia.
[Is true that speaks-\textsubscript{IND} at the ceremony]
‘It is true that he speaks/is speaking at the ceremony.’

-Meaning, +Form
Es posible que hable en la ceremonia.
[Is possible that speaks-\textsubscript{IND} at the ceremony]
‘It is possible that he speaks/is speaking at the ceremony.’

-Meaning, +Form
Es cierto que habla en la ceremonia.
[Is true that speaks-\textsubscript{IND} at the ceremony]
‘It is true that he speaks/is speaking at the ceremony.’
Es cierto que toma en la fiesta.
[Is true that drinks-IND at the party]
‘It is true that she drinks/is drinking at the party.’

Es posible que toma en la fiesta.
[Is possible that *drinks-IND at the party]
‘It is possible that she drinks/is drinking at the party.’

Es obvio que lee en la biblioteca.
[Is obvious that reads-IND in the library]
‘It is obvious that she reads/is reading in the library.’

Es cierto que lea en la biblioteca.
[Is true that *reads-SUB in the library]
‘It is true that she reads/is reading in the library.’

Es probable que lee en la biblioteca.
[Is probable that *reads-IND in the library]
‘It is probable that s/he reads/is reading in the library.’

Es probable que tome en la fiesta.
[Is probable that *drinks-SUB at the party]
‘It is probable that s/he drinks/is drinking at the party.’

Es obvio que tome en la fiesta.
[Is obvious that *drinks-SUB at the party]
‘It is obvious that s/he drinks/is drinking at the party.’
+Meaning, +Form
Es probable que cocine en el patio.
[Is probable that cooks-\textsubscript{SUB} on the patio]
‘It is probable that he cooks/is cooking on the patio.’

+Meaning, -Form
Es obvio que cocine en el patio.
[Is obvious that *cooks-\textsubscript{SUB} on the patio]
‘It is obvious that he cooks/is cooking on the patio.’

-Meaning, +Form
Es posible que maneje en la calle.
[Is possible that drives-\textsubscript{SUB} in the street]
‘It is possible that he drives/is driving in the street.’

-Meaning, +Form
Es probable que maneje en la calle.
[Is probable that *drives-\textsubscript{IND} in the street]
‘It is probable that he drives/is driving in the street.’

+Meaning, +Form
Es cierto que maneje en la calle.
[Is true that *drives-\textsubscript{SUB} in the street]
‘It is true that he drives/is driving in the street.’

-Meaning, +Form
Es cierto que cocina en el patio.
[Is true that cooks-\textsubscript{IND} on the patio]
‘It is true that he cooks/is cooking on the patio.’

-Meaning, +Form
Es posible que cocine en el patio.
[Is possible that *cooks-\textsubscript{IND} on the patio]
‘It is possible that he cooks/is cooking on the patio.’

+Meaning, +Form
Es obvio que maneje en la calle.
[Is obvious that drives-\textsubscript{IND} in the street]
‘It is obvious that he drives/is driving in the street.’
Es cierto que estudia en el cuarto.
[Is true that studies-IND in the room]
'It is true that he studies/is studying in the room.'

Es posible que estudia en el cuarto.
[Is possible that studies-IND in the room]
'It is possible that he studies/is studying in the room.'

Es obvio que estudia en el cuarto.
[Is obvious that studies-SUB in the room]
'It is obvious that he studies/is studying in the room.'

Es cierto que aplaude en el concierto.
[Is true that applauds-SUB at the concert]
'It is true that he applauds/is applauding at the concert.'

Es posible que aplaude en el concierto.
[Is possible that applauds-SUB at the concert]
'It is possible that he applauds/is applauding at the concert.'

Es obvio que aplaude en el concierto.
[Is obvious that applauds-SUB at the concert]
'It is obvious that he applauds/is applauding at the concert.'

Es cierto que estudie en el cuarto.
[Is true that studies-SUB in the room]
'It is true that he studies/is studying in the room.'

Es posible que estudie en el cuarto.
[Is possible that studies-SUB in the room]
'It is possible that he studies/is studying in the room.'

Es obvio que estudie en el cuarto.
[Is obvious that studies-SUB in the room]
'It is obvious that he studies/is studying in the room.'
Es probable que trabaje en el jardín.
[Is probable that works-\textsubscript{SUB} in the garden]
'It is probable that he works/is working in the garden.'

Es obvio que trabaje en el jardín.
[Is obvious that *works-\textsubscript{SUB} in the garden]
'It is obvious that he works/is working in the garden.'

Es posible que bucee en el mar.
[Is possible that scuba dives-\textsubscript{SUB} in the sea]
'It is possible that he scuba dives/is scuba diving in the sea.'

Es probable que buceen en el mar.
[Is probable that scuba *dives-\textsubscript{IND} in the sea]
'It is probable that he scuba dives/is scuba diving in the sea.'

Es cierto que trabaja en el jardín.
[Is true that works-\textsubscript{IND} in the garden]
'It is true that she works/is working in the garden.'

Es cierto que bucean en el mar.
[Is true that scuba *dives-\textsubscript{IND} in the sea]
'It is true that she scuba dives/is scuba diving in the sea.'
+Meaning, +Form
Es cierto que responde a la maestra.
[Is true that responds-IND to the teacher]
‘It is true that he answers/is answering the teacher.’

+Meaning, -Form
Es posible que responde a la maestra.
[Is possible that *responds-IND to the teacher]
‘It is possible that he answers/is answering the teacher.’

-Meaning, +Form
Es obvio que baila en la fiesta.
[Is obvious that dances-IND at the party]
‘It is obvious that he dances/is dancing at the party.’

-Meaning, +Form
Es cierto que baile en la fiesta.
[Is true that *dances-SUB at the party]
‘It is true that he dances/is dancing at the party.’

+Meaning, +Form
Es probable que responda a la maestra.
[Is probable that responds-SUB to the teacher]
‘It is probable that she answers/is answering the teacher.’

+Meaning, -Form
Es probable que baila en la fiesta.
[Is probable that *dances-IND at the party]
‘It is probable that she dances/is dancing at the party.’

-Meaning, +Form
Es obvio que responda a la maestra.
[Is obvious that *responds-SUB to the teacher]
‘It is obvious that she answers/is answering the teacher.’

-Meaning, +Form
Es cierto que responda a la maestra.
[Is true that *responds-SUB to the teacher]
‘It is true that she answers/is answering the teacher.’
Es probable que enseñe a los estudiantes.
[Is probable that teaches-\textsc{sub} to the students]
'It is probable that he teaches/is teaching the students.'

Es obvio que enseñe a los estudiantes.
[Is obvious that *teaches-\textsc{sub} to the students]
'It is obvious that he teaches/is teaching the students.'

Es posible que dibuje en el papel.
[Is possible that draws-\textsc{sub} on the paper]
'It is possible that he draws/is drawing on the paper.'

Es cierto que dibuje en el papel.
[Is true that *draws-\textsc{sub} on the paper]
'It is true that she draws/is drawing on the paper.'

Es cierto que enseña a los estudiantes.
[Is true that teaches-\textsc{ind} to the students]
'It is true that she teaches/is teaching the students.'

Es posible que ensen\~{n}a a los estudiantes.
[Is possible that *teaches-\textsc{ind} to the students]
'It is possible that she teaches/is teaching the students.'
1. **+Meaning, +Form**
   - Es cierto que descansa en el patio.
     - [Is true that relaxes-IND on the patio]
     - 'It is true that she relaxes/is relaxing on the patio.'

2. **+Meaning, -Form**
   - Es posible que descansa en el patio.
     - [Is possible that *relaxes-IND on the patio]
     - 'It is possible that she relaxes/is relaxing on the patio.'

3. **-Meaning, +Form**
   - Es obvio que camina hacia el trabajo.
     - [Is obvious that walks-IND towards the job]
     - 'It is obvious that she walks/is walking to work.'

4. **-Meaning, +Form**
   - Es cierto que camina hacia el trabajo.
     - [Is true that *walks-SUB towards the job]
     - 'It is true that she walks/is walking to work.'

5. **+Meaning, -Form**
   - Es posible que camine hacia el trabajo.
     - [Is possible that *walks-IND towards the job]
     - 'It is possible that he walks/is walking to work.'

6. **+Meaning, +Form**
   - Es probable que camine hacia el trabajo.
     - [Is probable that *walks-IND towards the job]
     - 'It is probable that he walks/is walking to work.'

7. **+Meaning, -Form**
   - Es probable que descanse en el patio.
     - [Is probable that *relaxes-IND on the patio]
     - 'It is probable that he relaxes/is relaxing on the patio.'

8. **-Meaning, +Form**
   - Es obvio que descanse en el patio.
     - [Is obvious that relaxes-IND on the patio]
     - 'It is obvious that he relaxes/is relaxing on the patio.'
+Meaning, +Form
Es probable que patine en la calle.
[Is probable that skates-\textit{SUB} in the street]
“It is probable that he skates/is skating in the street.’

+Meaning, -Form
Es obvio que patine en la calle.
[Is obvious that *skates-\textit{SUB} in the street]
“It is obvious that he skates/is skating in the street.’

-Meaning, +Form
Es posible que duerma en el bosque.
[Is possible that sleeps-\textit{SUB} in the forest]
“It is possible that he sleeps/is sleeping in the forest.’

-Meaning, +Form
Es probable que duerme en el bosque.
[Is probable that *sleeps-\textit{IND} in the forest]
“It is probable that s/he sleeps/is sleeping in the forest.’

+Meaning, +Form
Es cierto que duerma en el bosque.
[Is true that *sleeps-\textit{SUB} in the forest]
“It is true that s/he sleeps/is sleeping in the forest.’

+Meaning, -Form
Es cierto que patina en la calle.
[Is true that skates-\textit{IND} in the street]
“It is true that s/he skates/is skating in the street.’

-Meaning, +Form
Es posible que patina en la calle.
[Is possible that skates-\textit{IND} in the street]
“It is possible that s/he skates/is skating in the street.’

-Meaning, +Form
Es probable que patina en la calle.
[Is probable that *skates-\textit{IND} in the street]
“It is probable that s/he skates/is skating in the street.’
+Meaning, +Form
Es cierto que roba en la noche.
[Is true that robs-IND in the night]
'It is true that s/he robs/is robbing at night.'

+Meaning, -Form
Es posible que roba en la noche.
[Is possible that *robs-IND in the night]
'It is possible that s/he robs/is robbing at night.'

-Meaning, +Form
Es obvio que aprende en la clase.
[Is obvious that learns-IND in the class]
'It is obvious that s/he learns/is learning in class.'

-Meaning, +Form
Es cierto que aprenda en la clase.
[Is true that *learns-SUB in the class]
'It is true that s/he learns/is learning in class.'

+Meaning, +Form
Es posible que aprenda en la clase.
[Is possible that learns-SUB in the class]
'It is possible that he learns/is learning in class.'

+Meaning, -Form
Es probable que aprenda en la clase.
[Is probable that *learns-IND in the class]
'It is probable that he learns/is learning in class.'

-Meaning, +Form
Es obvio que robe en la noche.
[Is obvious that robs-SUB in the night]
'It is probable that he robs/is robbing at night.'

-Meaning, +Form
Es cierto que robe en la noche.
[Is true that *robs-SUB in the night]
'It is obvious that robs/is robbing at night.'
Es probable que venda en la calle.
[Is probable that sells\textsubscript{SUB} in the street]
'It is probable that he sells/is selling (food) in the street.'

Es obvio que venda en la calle.
[Is obvious that *sells\textsubscript{SUB} in the street]
'It is obvious that he sells/is selling (food) in the street.'

Es posible que acampe en el bosque.
[Is possible that camps\textsubscript{SUB} in the forest]
'It is possible that he camps/is camping in the forest.'

Es probable que acampa en el bosque.
[Is probable that *camps\textsubscript{IND} in the forest]
'It is probable that he camps/is camping in the forest.'

Es cierto que acampe en el bosque.
[Is true that *camps\textsubscript{SUB} in the forest]
'It is true that he camps/is camping in the forest.'

Es cierto que vende en la calle.
[Is true that sells\textsubscript{IND} in the street]
'It is true that he sells/is selling in the street.'

Es posible que venda en la calle.
[Is possible that sells\textsubscript{IND} in the street]
'It is possible that he sells/is selling in the street.'
Es cierto que boxea en el gimnasio.
[Is true that boxes-IND in the gym]
‘It is true that he boxes/is boxing in the gym.’

Es posible que boxea en el gimnasio.
[Is possible that boxes-IND in the gym]
‘It is possible that he boxes/is boxing in the gym.’

Es obvio que bebe en la cafetería.
[Is obvious that drinks-IND in the cafeteria]
‘It is obvious that he drinks/is drinking in the cafeteria.’

Es cierto que beba en la cafetería.
[Is true that *drinks-SUB in the cafeteria]
‘It is true that he drinks/is drinking in the cafeteria.’

Es probable que beba en la cafetería.
[Is probable that *drinks-SUB in the cafeteria]
‘It is probable that he drinks/is drinking in the cafeteria.’
APPENDIX E
SUBJUNCTIVE TASK: FILLER SENTENCES WITH IMAGES

+Ella se broncea en la playa.
She suntans on the beach.

+Ella está en el mar.
She is in the sea.

+Tiene mucho calor.
It is very hot.

+Hace mucho frío.
It is very cold.

+Se siente muy enfermo.
He feels very sick.

+Le agradece al público.
He thanks the public.
+Meaning, +Form
Se esconde el niño.
*The child hides.*

+Meaning, +Form
Está alzando un balde.
*He is lifting a bucket.*

+Meaning, +Form
Está de rodillas.
*She is on her knees.*

+Meaning, +Form
Va a tirar la bola.
*She is going to throw the ball.*

+Meaning, +Form
Patea duro el balón.
*He kicks the ball hard.*

+Meaning, +Form
Se seca el cabello.
*She dries her hair.*
+ Meaning, + Form
Se está bañando.
*He is taking a shower.*

+ Meaning, + Form
Bota la basura.
*He throws out the garbage.*

+ Meaning, + Form
Plancha la ropa.
*She irons the clothes.*

+ Meaning, + Form
Está en la calle.
*He is in the street.*

+ Meaning, + Form
Es un soldado este hombre.
*This man is a soldier.*

+ Meaning, + Form
La mujer enciende la candela.
*The woman lights a candle.*
+Meaning, +Form
Su carro no funciona.
*His car does not work.*

+Meaning, +Form
Recoge hojas en el jardín.
*He cleans up the leaves.*

+Meaning, +Form
La señora quiere matarla.
*The woman wants to kill it.*

+Meaning, +Form
Le pega a la pelota.
*He hits the ball.*

+Meaning, +Form
Se va a caer.
*He is going to fall.*

+Meaning, +Form
Le acaricia al gato.
*She pets the cat.*
-Meaning, +Form
Lo llaman por teléfono.
*They call him on the phone.*

-Meaning, +Form
Este hombre tiene hambre.
*This man is hungry.*

-Meaning, +Form
Pesca en el lago.
*She fishes in the lake.*

-Meaning, +Form
Se sienta en la silla.
*He sits in the chair.*

-Meaning, +Form
La niña tiene un gato.
*The girl has a cat.*
-Meaning, +Form
Está tocando la trompeta.
*He is playing the trumpet.*

-Meaning, +Form
Investiga en el laboratorio.
*He investigates in the laboratory.*

-Meaning, +Form
Sale con unos amigos.
*He goes out with his friends.*

-Meaning, +Form
Sabe hacer arroz con pollo.
*He knows how to make chicken and rice.*

-Meaning, +Form
Lo está bañando al perro.
*She is bathing the dog.*

-Meaning, +Form
Brinca la niña en el patio.
*The girl jumps on the patio.*
-Meaning, +Form
Es un mal jugador.
*She is a bad player.*

-Meaning, +Form
A su amigo le dice algo.
*He says something to his friend.*

-Meaning, +Form
Hace café por la mañana.
*She makes coffee in the morning.*

-Meaning, +Form
Ve una película romántica.
*He watches a romantic movie.*

-Meaning, +Form
Va a escuchar la música.
*She is going to listen to music.*

-Meaning, +Form
Conduce a velocidad máxima.
*He drives full speed.*
-Meaning, +Form
Va a dar un regalo.
*He is going to give a present.*

-Meaning, +Form
Navega el internet.
*She surfs the internet.*

-Meaning, +Form
Manda una carta a un amigo.
*She sends a letter to a friend.*

-Meaning, +Form
El sol calienta mucho.
*The sun is very hot.*

-Meaning, +Form
Necesita ir al supermercado.
*He needs to go to the supermarket.*

-Meaning, +Form
Va a ir al correo.
*He is going to go to the post office.*
Ahora Pedro toma el refresco en el salón.
[Now Pedro drinks the refreshment in the event hall]

Ahora yo tomo el refresco en el salón.
[Now I drink the refreshment in the event hall]

Ahora Alejandro saca el libro de la mesa.
[Now Alejandro takes out the book from the table]

Ahora yo saco el libro de la mesa.
[Now I take out the book from the table]

Ahora Isabel mira el programa con varios amigos.
[Now Isabel watches the program with various friends]

Ahora yo miro el programa con varios amigos.
[Now I watch the program with various friends]

Ahora Pedro toma el refresco en el salón.
[Now Pedro *drinks the refreshment in the event hall]

Ahora yo tomo el refresco en el salón.
[Now I *drinks the refreshment in the event hall]

Ahora Alejandro saca el libro de la mesa.
[Now Alejandro *takes out the book from the table]

Ahora yo saco el libro de la mesa.
[Now I *takes out the book from the table]

Ahora Isabel mira el programa con varios amigos.
[Now Isabel *watches the program with various friends]

Ahora yo miro el programa con varios amigos.
[Now I *watches the program with various friends]
Ahora Sancho busca el lápiz en el otro escritorio.
[Now Sancho searches for the pencil in the other desk]

Ahora yo busco el lápiz en el otro escritorio.
[Now I search for the pencil in the other desk]

Ahora tú pagas el alquiler de este mes.
[Now you pay the rent of this month]

Ahora ellos pagan el alquiler de este mes.
[Now they pay the rent of this month]

Ahora tú lavas el auto con los hermanos.
[Now you wash the car with the bothers]

Ahora ellos lavan el auto con los hermanos.
[Now they wash the car with the bothers]
Ahora tú tocas el piano para muchas personas.
[Now you play-2 Sg the piano for many people]

Ahora ellos tocan el piano para muchas personas.
[Now they play-3 Pl the piano for many people]

Ahora tú pasas el fútbol con los pies.
[Now you pass-2 Sg the soccer ball with the feet]

Ahora ellos pasan el fútbol con los pies.
[Now they pass-3 Pl the soccer ball with the feet]

Ahora Adriana enseña el cálculo en otro edificio.
[Now Adriana teaches the calculus in another building]

Ahora yo enseño el cálculo en otro edificio.
[Now I teach-1 Sg the calculus in another building]
The study “Processing Spanish sentences for form and meaning” is part of research intended to provide information about the way people learn and process language.

If you agree to participate in this study, you will be asked to perform two tasks in one session (approximately 45 minutes). In one task, you will see a series of images accompanied by sentences that either accurately or inaccurately describe what is represented by each image. The images and their corresponding sentences will appear on the screen for a pre-determined number of seconds, and you will be asked to decide as quickly as possible whether the sentences are representative of what is represented by each image by pushing buttons that say “yes” and “no”. In the second task, you will read sentences and answer comprehension questions by pushing buttons that say “yes” and “no”.

These tasks will be conducted on a computer, with the presentation of the sentences and pictures appearing on the screen. The computer will record the data, and your confidentiality will be protected. In addition, you will also complete a questionnaire asking about your past experience learning language. You may decline to answer specific questions.

Your participation is totally voluntary and you may stop participation at anytime. There is no expected risk during the session. However, you have the right to terminate the session at any time without any penalty.

Your performance and any information obtained during the course of the study will remain confidential, to the extent allowed by law. Your name will be replaced with a number for the purposed of coding and analysis of data. Only the primary researchers will have access to the codes and this will be destroyed after data analysis is complete.

You are encouraged to ask any questions that you might have about this study before, during and after your participation in the study. However, answers that could influence the results of the experiment will be deferred to the end of the experiment. You will also receive a debriefing form upon completion of the study, fully explaining the goals of the research.

There are benefits for participating in the research project. You will be providing second language acquisition researchers with valuable information about how individuals process a foreign language. This knowledge will assist researchers to improve second language learning methods.

You will be assigned a code, and at no time will your name or any other personal information be recorded. This de-identified data will be kept for a period of at least 10
years, as suggested by the American Psychological Association. Results will be kept in an SPSS file on the principle investigator’s work and personal computers.

The principle investigator, Robert Cameron, is a doctoral student in the Department of Modern Languages working under the supervision of his advisor, Dr. Michael Leeser. If you have any questions about this research or your rights as a participant in this study, or if you feel you have been placed at risk, please contact the Chair of the Human Subjects Committee, Institutional Review Board, through the Vice President for the Office of Research.

I understand that I am free to discontinue participation at any time without explanation. I understand that this form will not be used in conjunction with the results of the study so that my identity will be protected. I understand that I will receive a signed copy of this consent form.

______________________________  ________________________
Signature       Date

Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2742
(850) 644-8673 · FAX (850) 644-4392

APPROVAL MEMORANDUM

Date: 4/16/2009

Dept.: MODERN LANGUAGES AND LINGUISTICS

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research
Processing Spanish sentences for form and meaning

The application that you submitted to this office in regard to the use of human subjects in
the proposal referenced above have been reviewed by the Secretary, the Chair, and two
members of the Human Subjects Committee. Your project is determined to be Expedited
per 45 CFR Â§ 46.110(7) and has been approved by an expedited review process.

The Human Subjects Committee has not evaluated your proposal for scientific merit,
except to weigh the risk to the human participants and the aspects of the proposal related
to potential risk and benefit. This approval does not replace any departmental or other
approvals, which may be required.

If you submitted a proposed consent form with your application, the approved stamped
consent form is attached to this approval notice. Only the stamped version of the consent
form may be used in recruiting research subjects.

If the project has not been completed by 4/15/2010 you must request a renewal of approval for continuation of the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the Committee.

You are advised that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chair of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is IRB00000446.

HSC No. 2009.2485
REFERENCES


Doughty, C. J. (2004). Commentary: When PI is focus on form it is very, very good, but when it is focus on forms…. In B. VanPatten (Ed.), *Processing instruction: Theory, research, and commentary* (pp. 181-201). Mahwah, NJ: Erlbaum.


BIOGRAPHICAL SKETCH

Robert Cameron was raised in Montvale, New Jersey. After briefly attending the School of Visual Arts in New York City and Goddard College in Vermont, Robert earned a bachelor’s in Studio Art from Florida State University in 1996. After graduating, he taught English for three years at the Escuela Ineteramericana in Turrialba, Costa Rica. It was during this time that he met his wife, Yesennia. In 2000, Robert and Yesennia moved to Tallahassee, Florida where he earned a master’s in Multilingual/Multicultural Education from Florida State in 2002. In 2004, Robert was hired as Assistant Director of the Spanish Basic Language Program at Florida State, and he was admitted to the doctoral program in Spanish/Second Language Acquisition in 2006. In 2011, Robert will begin a new position as Assistant Professor of Hispanic Studies and Director of the Spanish Basic Language Program at the College of Charleston. He and Yesennia look forward to this new chapter of their lives with their son, Gabriel.