

Aural Processing of Cognates in Learners of Spanish as a Second Language

by

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Abstract

The present study investigates the role of phonology in the aural processing of cognates in learners of Spanish as a second language. First, this thesis expands on the body of research on cognate processing to include the aural modality. In doing so, it proposes a definition and a classification of Spanish-English cognates based on their shared phonological features and the degree of phonological overlap. To address this topic, data was collected through experimental tasks performed by learners of Spanish as a second language. Second, the study contributes to clarify: a) whether cognates are perceived and comprehended aurally more accurately than non-cognates; b) whether the degree of phonological overlap has a facilitative effect on the perception and comprehension of cognates aurally; c) whether cognates are perceived and comprehended more accurately in the visual modality than in the aural modality. Overall results indicate that cognates are perceived and comprehended more accurately than non-cognates. Also, study suggests that the degree of phonological overlap may affect the perception and comprehension of cognates. Finally, results show that cognates presented in the visual modality are perceived and comprehended better than in the aural modality.

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Aural Processing of Cognates in Learners of Spanish as a Second Language

Researchers in the fields of Second Language Acquisition and Bilingualism have focused considerable attention on explaining how language is processed in the human brain and what factors facilitate and/or hinder this process. In terms of the comprehension process, recent studies have mostly focused on understanding how learners process the written text or reading comprehension, leaving questions about the processing of the aural input or the listening comprehension unanswered. Even though listening and reading share similar the processing steps (e.g., perception of the signal, decoding, construction of meaning, etc.) and might be affected by several factors (e.g., text type and learner characteristics, among many others) these two comprehension processes differ considerably in many aspects; for example, reliance on working memory to process an acoustic signal in listening versus decoding of the orthographic text in reading comprehension, on line text delivery in listening versus written text presented in reading. Notwithstanding, as pointed out by Bloomfield, Wayland, Rhoades, Blodgett, Linck, and Ross (2010), listening is often found more difficult for learners since they have to deal with a variety of factors which are not present in reading, such as phonological features, speech spontaneity, irregular pauses, disfluencies, intonation patterns, spelling-to-sound correspondence, accent, word boundaries, among others.

A vast body of literature has aimed at understanding cognates in the bilinguals' and second language learners' brains. Even though there is no unique definition of cognates, there is agreement that cognates are words in two languages that share etymology, spelling, and meaning. This inquiry has led to studies ranging from how cross-language similarity and task demands affect cognate recognition (Dijkstra, Miwa, Brummelhuis, Sappelli, and Baayen, 2010), the representation of cognates in the lexicon (Cristoffanini, Kirsner, and Milech, 1986), visual

recognition of cognates (Holmes and Guerra, 1993), how cognates are stored in the mind of bilinguals (Comesaña, Soares, Sánchez-Casas, and Lima, 2012), cognate effects in phonetic production (Amengual, 2016), phonology in cognate recognition (Dijkstra, Grainger, and Van Heuven, 1999), among others. Nonetheless, previous research although informative, has been mostly directed at cognate recognition in the written form (e.g., Holmes and Guerra, 1993; Tercedor, 2010; Hoshino and Kroll, 2008; among others) with a few exceptions directed toward auditory processing of cognates, (e.g., Amengual, 2016; Dijkstra et al., 1999; among others). The aim of the present study is to address some of the factors that might play a role in the auditory processing of cognates in learners of Spanish as a second language (L2). In particular, I examine whether phonological characteristics shared between English and Spanish languages may or may not facilitate the processing of cognates in terms of aural perception and comprehension.

The thesis is organized as follows. First in chapter 1, I present a brief review of the theoretical literature accounting for cognate representation and activation in the brain with a discussion of the pertinent empirical literature. In chapter 2, I present the driving research questions for the present study and hypotheses, while in chapter 3, I describe the methodology used for the present research. In chapter 4, I present the results of the study and in chapter 5, I discuss the significance of the findings. Finally, chapter 6 offers the overall conclusions and avenues for further research.

1. Theoretical Foundation.

1.1. Listening Comprehension

Implicit in the study of aural processing is the need to define the construct of listening comprehension, in other words, what processes are at work in a listener's cognitive system once a message in the form of an acoustic signal is perceived by the auditory system. Vandergrift and Goh (2012) provide a model of the listening competence, based on Anderson's (1995) model, which helps to illustrate the complexity involved in the listening comprehension process. The researchers divide the process into three interconnected phases: perceptual processing, parsing, and utilization, as shown in Figure 1. In the initial phase, learners use bottom-up processing to decode the input perceived via the acoustic signal by excluding sounds of the environment, noting similarities and pauses, and grouping all these features according to the categories of the target language. In other words, meaning is constructed from phonemes to words to sentences and larger parts of discourse. Bottom-Up Processing is seen as a mechanical process, which does not involve the listeners' prior knowledge of the world but instead their linguistic knowledge. We should point out, that in this phase access to L2 phonological knowledge is crucial to process the acoustic signal in a target like fashion, that is, the more knowledge they have about the sounds of the L2, the higher the likelihood of target like acoustic processing of cognates. As pointed out by Vandergrift and Goh (2012), linguistic knowledge plays a determining role in the success or failure of the listening comprehension process.

The phonetic representation derived during the perception phase is passed onto the next phase, the parsing phase. In this phase listeners activate potential word candidates from the long-term memory focusing on different phonetic features. In addition to bottom up processing, learners have access to top-down processing at this phase, that is, the use of their prior

knowledge (i.e., world and experiential knowledge of the context and the topic), pragmatic knowledge, cultural knowledge, and discourse knowledge along with their expectations about the speech stream to interpret the sound stream.

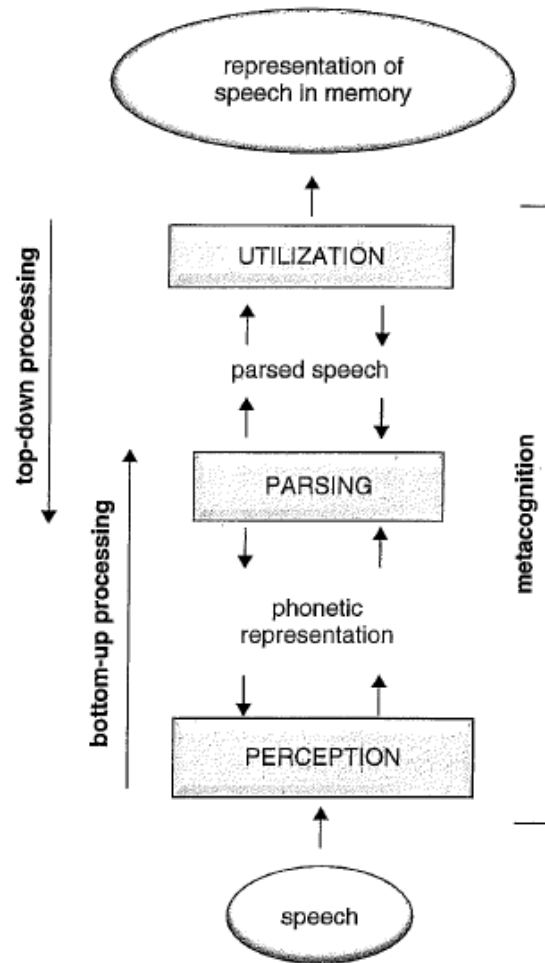


Figure 1. Cognitive Processes in L2 Listening (Vandergrift and Goh, 2012).

Finally, in the utilization phase, parsed speech derived during the parsing phase is processed in a top-down, fashion to assign it an intended or implied meaning if possible. Figure 1 displays the cognitive processes in L2 listening where phases influence each other and can even take place in a parallel fashion during fluent listening. This model suggests that bottom up and top down

processing are seen as recursive processes. During fluent listening, Vandergrift and Goh (2012) highlight that these phases rarely occur independently. Research findings support the idea that these processes, bottom up and top down, interact and occur in a parallel fashion (Davis and Johnsruide, 2007).

Another aspect closely related to the L2 listening model described is the way the attention resources are allocated to processing, that is, controlled versus automatic processing. In controlled processing listeners consciously switch between top down and bottom up processing, while in automatic processing listeners do not have control over this. In L1 listeners, both types of processing interact automatically (automatic processing). However, in L2 listeners they do not (Vandergrift and Goh, 2012). This is because L2 listeners need to learn to consciously focus on some aspects of the input they are receiving and selectively go back and forth between bottom up and top down processing (controlled processing). Controlled processing tends to be costly because it requires conscious attention and hence, uses up more of the limited cognitive resources. Comprehension breaks easily due to the difficulty of keeping up with the input. Therefore, listeners have to make use of other compensatory strategies. This points to the role working memory and long-term memory play in listening comprehension. Both types of memory can provide opportunities for listeners to process some aspects of the input faster by making use of different types of knowledge. By doing this, they can focus more on other aspects that require closer attention.

Furthermore, Vandergrift and Goh (2012) suggest that different knowledge sources are available at the three phases of the model (e.g., linguistic knowledge, pragmatic knowledge, prior knowledge, and discourse knowledge). They also mention that information outside the linguistic input is also available during these phases. This information assists the listener in order to create

relations with information stored in the long-term memory and to build a conceptual framework. Vandergrift and Goh (2012) explain that linguistic knowledge involves knowing how to use semantic knowledge, phonological knowledge, and syntactic knowledge of the target language as speech unfolds. For the purposes of the present study, it is important to highlight that cognates are thought to be mapped onto the long-term memory faster, hence facilitating word processing (Vandergrift and Goh, 2012). Pragmatic knowledge is used to interpret intended meaning going beyond the literal meaning, which usually happens during the utilization phase of the comprehension process. This knowledge is essential to interpret the speaker's intention and it is closely related to sociocultural knowledge and sociolinguistic knowledge. Moreover, prior knowledge plays an essential role during the utilization phase of the comprehension process since listeners match the linguistic input with their prior knowledge in order to establish connections. When a context is provided, prior knowledge is more easily activated helping listeners interpret the linguistic input more efficiently. Finally, discourse knowledge involves awareness of the text organization for facilitation of comprehension, thus, helping listeners to obtain an idea of the kind of information they can hear at certain parts of the speech. Clearly, some of the content of the knowledge sources can be extracted from the L1. Vandergrift and Goh's (2012) model illustrates the complexity involved in auditory processing to achieve a target like comprehension, with several interactive cognitive processes at work, informed by the knowledge sources available to the listener.

Having discussed the processes involved in the different stages of listening comprehension according to the model by Vandergrift and Goh (2012), we now turn to review the literature that focuses on how vocabulary is processed in the brain of bilinguals and L2 learners.

1.2. Word Recognition

The topic of how new vocabulary is processed, accessed and stored by second language learners and bilinguals has received considerable attention in research (e.g., Chen, 1990; De Groot et al., 1994; Kroll & Cureley, 1988; Potter, So, Von Eckardt, and Feldman, 1984). During the 1960s and 1970s, the researchers focused on how the two languages were represented and stored in the mind of a bilingual; that is, one or two memory stores. Research on this topic led to the *independence hypothesis*, which assumes separate memory stores for each language, and the *interdependence hypothesis*, which assumes one integrated memory store for both languages (see Macnamara and Kushnir, 1971; Gerard and Scarborough, 1989; Van Heuven, Dijkstra, and Grainger, 1998; Mitchell, 2005). Several studies have addressed this matter and results are contradictory at best. Evidence in favor of the independence hypothesis can be found in the studies by Durgunoglu and Roediger (1987) and Gerard and Scarborough (1989). On the contrary, most of the literature on conceptual representations supports the interdependence hypothesis with studies finding evidence for simultaneous availability of both languages. (Paradis, 1997; Altarriba, 1992).

Research on how languages are stored and represented also stirred up interest on how languages are connected to the concept and accessed or activated in bilinguals, turning research focus towards lexical access and activation. As a result, three memory and processing models emerged in the field to account for these processes: *The Word-Association model*, *the Concept-Mediation model*, and *the Intermediate model*, which was renamed later *the Revised Hierarchical model* (RHM). These models try to explain word production by bilinguals and how vocabulary is processed and activated in the minds of bilinguals and L2 learners. Although the three models

are founded primarily on the same ideas and assumptions, they all differ on how the concept representations of L1 and L2 words stored in the mind are connected.

The Word-Association model, introduced by Potter et al. (1984) based on Weinreich's (1953) models of bilingualism, proposes a direct connection between L1 and L2 lexicons, hence, it assumes that L1 words act as mediators between the concept and the L2 word, as can be seen in Figure 2. That is, L2 words reach their corresponding concepts through L1 words, which causes a strong direct link between the concept and the L1 lexicon, but no direct link or connection between the concept and the L2 is assumed.

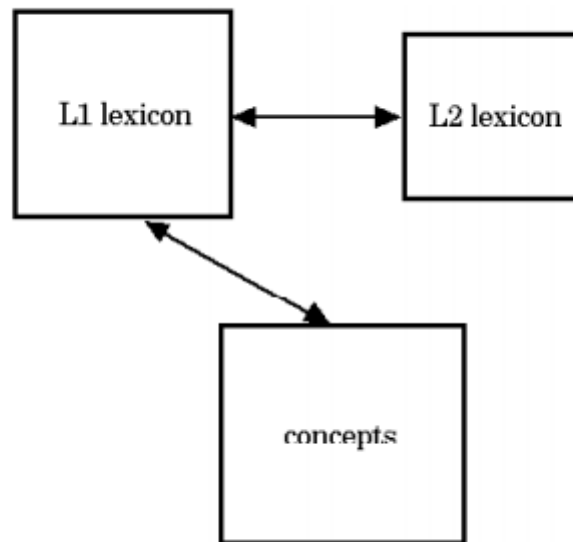


Figure 2. The word-association model (Potter et al.,1984).

The Concept-Mediation model—also introduced by Potter et al. (1984) based on Weinreich's (1953) models of bilingualism—proposes a direct connection between the concept and the L1 and L2 lexicons, as well as an indirect connection between them, as illustrated in Figure 3. In other words, L1 and L2 lexicons are connected through the concept only.

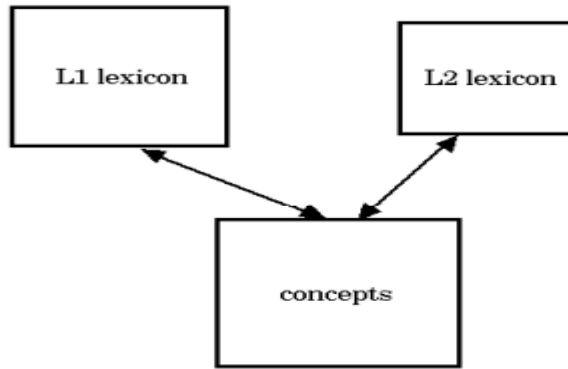


Figure 3. The concept-mediation model (Potter et al., 1984).

The Intermediate model, better known as *the Revised Hierarchical model (RHM)*, by Kroll and Sholl (1992; see also Kroll and Stewart, 1994), merges the word-association model and the concept-mediation model into one model. As shown in Figure 4, this model integrates both types of connections between L1 and L2 lexicons and the concept and assumes a link between the three, which is affected by the language proficiency level of the learner and task demands. The RHM was first proposed as a model of word production, not word recognition, which accounted for observed asymmetries in translation performance by Dutch-English bilinguals.

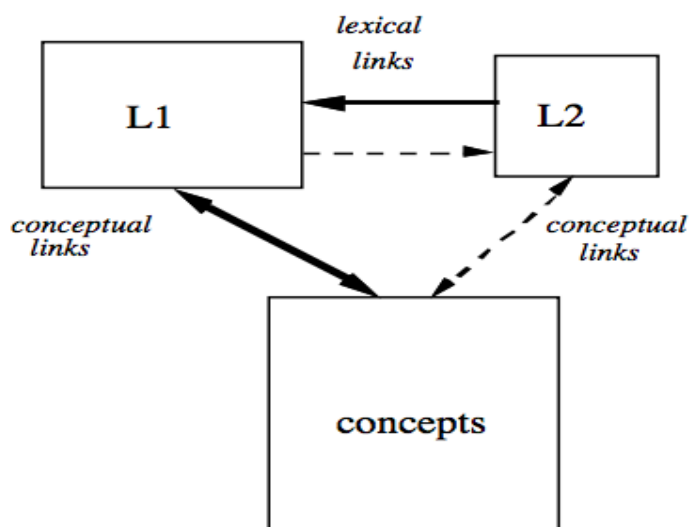


Figure 4. The revised hierarchical model (Kroll and Sholl, 1992).

Several studies have been conducted to assess the most adequate model to represent the bilingual lexicon (e.g., Potter et al, 1984; Kroll and Stewart, 1994; Sunderman and Kroll, 2006) and most found evidence supporting the RHM's assumption of asymmetries depending on the proficiency level of the learner. That is, those studies examining lower proficiency level learners presented evidence in favor of the word-association model whereas those studies with higher proficiency level learners presented evidence in support of the concept-mediation model. For the purposes of the present study, it is interesting to highlight that Sunderman and Kroll's (2006) found a cognate facilitation effect on word recognition and translation by English-Spanish bilinguals. In this study, cognates received faster responses than non-cognates in a lexical decision task with written cognates. It would be interesting to see if this effect is observed in the auditory mode as well.

Nonetheless, *the Revised Hierarchical model* has received a lot of criticism and some issues have been discussed. For example, one of them is that it supports asymmetries in translation, that is L1 to L2 translation is mediated by the concept while L2 to L1 translation is lexically mediated. However, some studies have found evidence for both types of translation being mediated through the concept (e.g., Bloem and La Heij, 2003; La Heij, Hooglander, Kerling, and Van der Velden, 1996), pointing to the fact that the RHM needed to be revised.

Research on bilingual access or activation of lexical mental representations brought forth two major hypotheses. On the one hand, several studies propose that lexical representations are accessed or activated selectively corresponding to the language being used at the moment – *selective lexical access* (e.g., Macnamara and Kushnir, 1971; Kirsner et al., 1980; Gerard and Scarborough, 1989; Durgunoglu and Roediger, 1987; Costa et al., 1999; among others). On the other hand, other studies suggest that bilinguals access or activate lexical representations non-

selectively, regardless of the language being used at the moment – *non-selective lexical access* (e.g., Altenberg and Cairns, 1983; Beauvillain and Grainger, 1987; Dijkstra, De Bruin, Schriefers, and Ten Brinke, 2000; Dijkstra and Van Heuven, 1998; Conklin and Maurer, 2005; among others).

Conklin and Maurer (2005) explain *selective* and *non-selective lexical access* taking, as an example, the word “*coin*.” *Coin* shares the same spelling in English and French but differs in meaning (i.e., ‘piece of money’ in English and ‘corner’ in French; see Figure 5). Conklin and Maurer (2005) mention that language *selective lexical access* would entail activating only the meaning associated with the target language upon encountering an interlingual homograph like *coin* (e.g., Gerard and Scarborough, 1989; Macnamara and Kushnir, 1971). That is, encountering the word *coin* in a French text should only activate the ‘corner’ meaning and not the ‘piece of money’ meaning. Conklin and Maurer (2005) add that in contrast, lexical access that is language *non-selective* would entail activating both the ‘corner’ meaning associated with the word *coin* in French, and the ‘money’ meaning associated with the English word *coin* (e.g., Altenberg and Cairns, 1983; Beauvillain and Grainger, 1987; Dijkstra and Van Heuven, 1998).

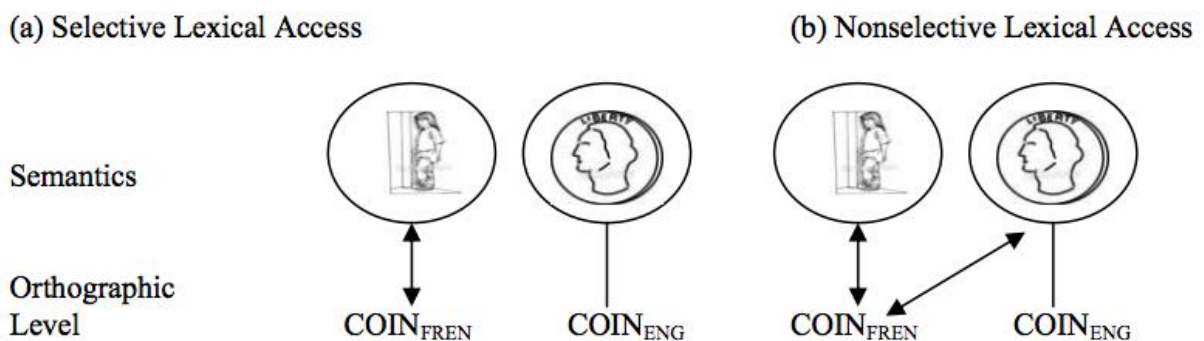


Figure 5. Selective and non-selective lexical access of the homograph ‘coin’ (Conklin and Maurer, 2005)

Researchers have also addressed lexical access or activation through the use of an adapted version of the Stroop task, which requires naming in one language the ink colors of words that spell color names in another language (Preston and Lambert, 1969; Chen and Ho, 1986; Dyer, 1971; Tzelgov et al., 1990). The Stroop task results favored parallel activation of a bilingual's two lexicons. However, as pointed out by Marian and Spivey (2003), task-demands could have led to interlingual interference in these studies, that is, task-demands could have caused both languages to interfere with each other during the task. In contrast, Costa et al. (1999) support a language selective view of lexical access assuming separate language-specific lexicons.

Most studies focusing on bilingual lexical access have used written interlingual homographs (e.g., the word "coin," shares the same spelling in English and French but differs in meaning: 'piece of money' in English and 'corner' in French) as a tool to clarify the controversy about selective and non-selective lexical access. Studies focused on determining whether lexical access is selective or non-selective have presented different results. Evidence supporting language selective lexical access has been found in several studies (e.g., Kirsner et al., 1980; Gerard and Scarborough, 1989; Watkins and Peynircioglu, 1983; Durgunoglu and Roediger, 1987; Ransdell and Fischler, 1987; Scarborough, Gerard and Cortese, 1984). Nonetheless, the majority of the reviewed research supports the assumption that bilingual lexical access is language non-selective, that is, both languages are activated in parallel during lexical access (e.g., Altenberg and Cairns, 1983; Beauvillain and Grainger, 1987; Dijkstra, De Bruin, Schriefers, and Ten Brinke, 2000; Dijkstra and Van Heuven, 1998, Conklin and Mauner, 2005). Conklin and Mauner (2005) highlight the study conducted by Gerard and Scarborough (1989), who used homographs with different frequency across languages for a Spanish-English lexical decision task. Their study obtained results that suggest selective lexical activation or access;

however, further analysis of these results shows that they are also completely compatible with non-selective lexical access. Thus, these results could be interpreted in different ways considering different factors.

Evidence supporting language non-selective lexical access is found in neighborhood effects studies (e.g., Dijkstra and Van Heuven, 2002; Van Heuven et al., 1998; Jared and Kroll, 2001), cross-linguistic priming and repetition effects studies (e.g., Woutersen, 1997), eye-tracking studies (e.g., Marian et al., 2002), language node studies (e.g., Grosjean, 2001; Marian and Spivey, 2003), masked priming studies (Bijeljac-Babic et al., 1997) and language production: picture/word interference studies (e.g., Hermans et al., 1998). Even though these studies concluded that parallel non-selective lexical activation or access takes place, input from both languages was present, which may have helped keep both languages active (Grosjean, 1997, 1998). This raises the question whether non-selective activation is possible when there is no input from the other language, as noted by Marian and Spivey (2003). Results from studies using cognates and/or interlingual homophones/homographs bring support to the parallel non-selective activation hypothesis even in a monolingual condition (Caramazza and Brones, 1979; de Groot and Nas, 1991; de Groot 1992, 1993, 1995; Van Hell and de Groot, 1998; Dijkstra et al., 1998, 1999, 2000; Van Hell and Dijkstra, 2002; Lemhofer and Dijkstra, 2004; Sunderman and Kroll, 2006; Duyck et al. 2007; Van Assche et al. 2009).

The hypotheses that the lexicon is integrated across languages and that lexical access occurs non-selectively through parallel activation are represented in the *Bilingual Interactive Activation model* (BIA), introduced by Dijkstra and Van Heuven (1998). The BIA model is an extension of McClelland and Rumelhart's (1981) Interactive Activation model, adapted to account for the case of bilinguals. According to the BIA, in early stages of the process of word

recognition, inhibition and activation happen regardless of language, i.e., non-selectively, as can be seen in Figure 6, both Dutch and English are active in parallel.

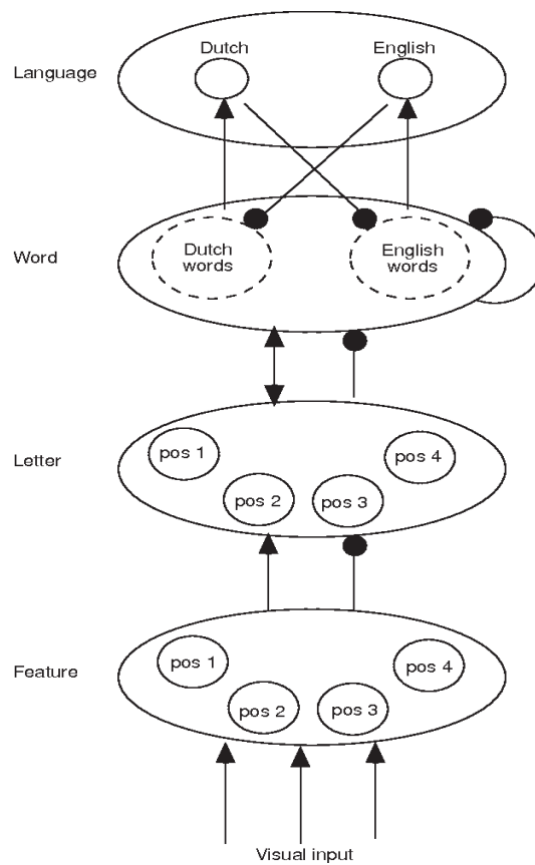


Figure 6. The Bilingual Interactive Activation model (Dijkstra and Van Heuven, 1998).

However, the language nodes, represented in Figure 6 as arrowheads and black filled circles, are the mechanisms that correctly select activated words to match the intended language and inhibits words in the non-target language in a top-down fashion. In Figure 6, arrowheads indicate excitatory connections and black filled circles indicate inhibitory connections. During bilingual visual word recognition, orthographic forms of both languages are activated in a bottom-up fashion where letters activate words from both languages in an integrated lexicon, for languages whose orthographies are similar (see Dijkstra et al., 1998; Dijkstra and Van Heuven, 2002). To test this property of the model, several studies have investigated the effect of form overlap

(similarities shared by two words) across languages making use of cognates, interlingual homographs (words that share orthographic form across languages but are not translation equivalents), and orthographic neighbors (words in each language whose form is slightly different from the target word). Results report a facilitation effect of form overlap on visual word recognition.

Most of the evidence supporting the BIA model focuses on its assumptions regarding orthographic interactions across languages in the written modality. Nevertheless, more recent evidence has brought up the role of phonology during word recognition suggesting that phonological codes of both languages are active during word recognition (e.g., Brysbaert et al., 1999; Dijkstra et al., 1999; Jared and Kroll, 2001; Jared and Szucs, 2002; Marian and Spivey, 1999; Schwartz et al., 2007). These findings suggest an interaction between orthography and phonology having a facilitative or inhibitory effect on word recognition. Also, it was noted that while orthographic and semantic overlap resulted in facilitation effects; phonological overlap, which refers to the phonological features shared by two words, resulted in inhibition effects making it more difficult to recognize the target words instead of facilitating recognition. Dijkstra and Van Heuven (1998, 2002) concluded that since phonological codes of both languages are active during word recognition, they compete causing a delay in the identification of the target item in Dutch-English bilinguals.

In order to account for cross-language phonological activity and other factors, such as the effects of task demands on word recognition, representation of homographs and cognates, and representational and functional aspects of the language nodes, the BIA model was extended and Dijkstra and Van Heuven (2002) introduced the BIA+ model (found in Figure 7). Both lexical and sub lexical phonology, phonological features of words and constituents of words, are taken

into consideration regarding orthographic and phonological interaction. Semantic representations are also included in the BIA+. This upgraded model assumes that word recognition in bilinguals is affected by cross-linguistic orthographic overlap, phonological overlap, and semantic overlap. It also considers other factors such as word frequency, use frequency, language proficiency, task demands, etc.

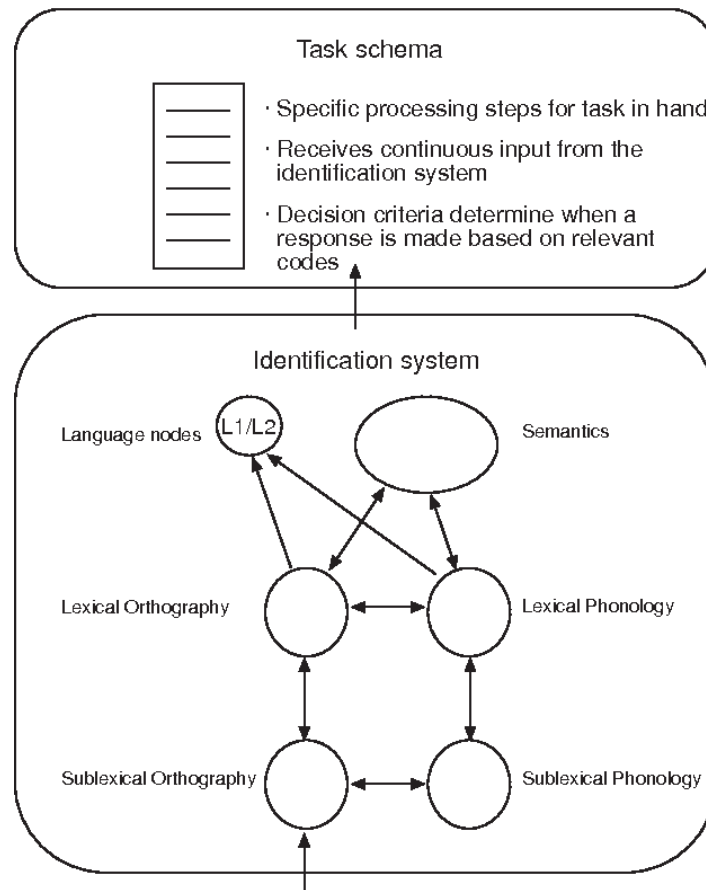


Figure 7. The Bilingual Interactive Activation Plus model (Dijkstra and Van Heuven, 2002). Arrows indicate activation flows between representational pools. Inhibitory connections within pools are omitted.

The BIA+ model also recognizes the influence of linguistic and non-linguistic context on word recognition. The sentence context and the context in which a word recognition task is performed might modulate lexical activation in both languages. Dijkstra and Van Heuven (2002) stated that

the BIA+ could also account for word recognition in the auditory modality. This serves as an aid to understand how auditory-word processing takes place in bilinguals, which is the primary objective of the present study.

Even though most of the research regarding bilingual lexical access focuses on visual recognition of words, it has also extended to spoken word recognition and it is assumed that the models of visual-word recognition are accountable for spoken-word recognition as well (e.g., Spivey and Marian, 1999; Marian, 2000; Marian and Spivey, 2003). Although there are not many studies focusing on bilingual spoken-word recognition, available literature in the field shows evidence that parallel activation also takes place.

Marian and Spivey (2003) conducted a study using objects with Russian-English bilinguals. The names of the objects were part of a cross-linguistic cohort (Russian-English) in such way that “the beginning portion of the name of the target object bore phonological similarity to the name of one of the other objects in the other language.” (Marian & Spivey, 2003:99) Language non-selective access during spoken word recognition was supported by the fact that “when instructed to pick up an object whose name in language A was initially phonologically similar to the name of another object in language B, bilingual subjects frequently looked at the cross-linguistic cohort, even when the other language was not being used overtly.” (Marian & Spivey, 2003:99) However, the magnitude of this effect may vary across different language backgrounds. The findings of Marian and Spivey’s study (2003) support activation and competition of multiple word candidates as well as non-selective lexical access.

Among the most relevant spoken-word recognition models to the present study are *The Cohort Model*, *The Cohort II*, *The Neighborhood Activation Model* (NAM), *PARSYN*, and *The Distributed Cohort Model* (DCM). Despite the differences among these models of spoken-word

recognition, they all agree that the activation of multiple word candidates takes place while hearing a word. Such activation depends on the degree of similarity between the stimuli and the stored representations. These models also recognize that there is a competition between all the activated candidates in the process of spoken-word recognition. Description of each of these models goes beyond the scope of this thesis (see Marslen-Wilson, 1987; Luce and Pisoni, 1998; and Weber and Scharenborg, 2012).

Andrea Weber and Odette Scharenborg (2012) provide a review of the available models of spoken-word recognition. They note that the process of recognition of spoken language tends to be more difficult for different reasons. One of the reasons is that a lot of words sound alike, considering the limited sets of phonemes in languages. That is, many words share phonological overlap and it is very common to find sounds of short words embedded in longer words. For example, words like ‘sum’, ‘sun’, ‘suck’, and ‘such’ only differ in the last consonant sound and the phonemes of words like ‘rye’ and ‘eye’ can be found in the word ‘rise’. Another reason lies in the individual differences of each speaker. Each person has a particular speaking style and rate, and the phonological context in which the word to be recognized is embedded also plays a role in this process (e.g., ‘sun’ is usually pronounced as ‘sum’ before a bilabial stop consonant). The third reason is that spoken language fades very fast from the perceptual field and there are no clear phonological boundaries for individual words.

Weber and Scharenborg (2012) highlight that the process of spoken-word recognition and comprehension is incremental; in other words, listeners interpret a word progressively as they hear it and a lot of times they can interpret it before reaching the end of the word or utterance. Just like in the study conducted by Marian and Spivey (2003), the authors of the review state that parallel activation of words has been demonstrated in different ways and that the strength of the

activation depends on the degree of similarity, a characteristic that is also observed in the neighborhood effect of visual-word recognition. This neighborhood effect, which refers to the effect of the different words that share characteristics with the target word, is apparently present during spoken-word recognition as well. This effect influences lexical decision times in different ways. It usually facilitates processing for languages with different phonemic repertoires and it usually hinders processing for languages with similar phonemic repertoires.

Monolingual models of spoken word recognition were developed before than bilingual models, hence they have served as a base for the development of bilingual models. Several studies have used the models described before, along with the models of visual word recognition, in order to investigate bilingual spoken-word recognition. Studies with monolinguals show that phonological overlap or similarity plays an important role not only during spoken-word recognition, but also during visual-word recognition and word production (e.g., Dijkstra et al. 1999; Garlock et al. 2001; Slowiaczek et al. 2003; Vitevitch, 1996, 2002). This finding led researchers to investigate the role of phonology in bilingual language processing. Several studies, mainly focused on visual word recognition, found that phonological and lexical access take place in parallel across languages (e.g., Doctor and Klein, 1992; Nas 1983), that is, lexical and phonological features of both languages are active in parallel during recognition.

Phonological overlap can either facilitate or inhibit bilingual language processing at different stages (inhibition during lexical level and facilitation during sub-lexical level) and task demands also influence the perceived results. In bilinguals, factors such as target language (L1 or L2) and language proficiency influence the asymmetries across stages of processing (Dijkstra and Van Heuven, 2002; Weber and Scharenborg, 2012).

Studies by Blumenfeld and Marian (2005), Marian and Spivey (2003), Weber and Cutler (2004), Marian et al. (2008), Boukrina and Marian (2006), and Jared and Kroll (2001) show parallel L1 activation during L2 phonological processing consistently and also varied inconsistent results of L2 activation during L1 phonological processing, meaning that there must be an asymmetry regarding L1-L2 activation during phonological language processing. Nonetheless, these studies point to a parallel activation of L1 and L2 during phonological language processing.

Marian et al. (2008) conducted a study aiming at the effects of phonological similarity within and across languages. They manipulated phonological overlap as well as neighborhood density (the number of words that share characteristics with the target word) and cross-linguistic overlap for picture naming and lexical decision tasks. Results indicate that phonological overlap does play an asymmetrical role within and across languages influencing bilingual language recognition, that is, the more sounds shared the stronger the activation of multiple candidates.

Boukrina and Marian (2006) also address the role of cross-linguistic phonological overlap during L1 and L2 processing, based on Jared and Kroll's (2001) study on bilingual activation of phonological representations in a reading task. In particular, Boukrina and Marian manipulated phonological overlap for a lexical decision task and examined the role of language context on parallel activation. Results indicate that cross-linguistic phonological overlap affects response times and accuracy. Moreover, facilitation effects of phonological overlap were perceived during the L2 experiment whereas inhibition effects were perceived during the L1 experiment. That is, L2 words that shared phonology with the L1 were identified faster when the L2 was the target language.

All of the models and studies mentioned before in this literature review establish the theoretical basis for evaluating research on L2 cognates. I have reviewed relevant research on visual-word recognition and spoken-word recognition to establish a base on which the present study will be set. It is clear that further research in this field is needed since most studies suggest that phonology plays an important role during visual-word recognition, spoken-word recognition, and word production.

1.3 Empirical Research on Cognates

Cognates, as well as homographs, have been the focus of several studies in order to account for selective and non-selective lexical access and cross-linguistic overlap. Although the use of cognates has become very popular in bilingual language processing studies, there is still no clear definition of cognates. Some researchers include orthographic and phonological similarity and shared roots in their definitions while others focus only on orthography and roots. The following sections will provide a review of consideration for defining and classifying cognates in the current project.

1.3.1 Cognates definition.

Lobo (1966) defines cognates as words with shared orthographic, semantic, or etymological traces, or a combination of these in two languages while De Groot and Nas (1991) say that cognates are translation equivalents with sound and spelling similarities. Holmes and Guerra (1993) state that cognates are items of vocabulary in two languages that share roots. De Groot (1995) refers to cognates as lexical items with considerable similarity in phonology, orthography, and semantic. Moreover, Dijkstra et al. (1999) equal cognates to interlingual homographs with shared orthography and meaning while Friel and Kennison (2001) mentions

similar roots, sound, and appearance in his definition of cognates. In contrast, Hall (2002) says that cognates share phonological and/or orthographic forms but not necessarily meaning. More recently, Dijkstra et al. (2010) say that cognates are translation equivalents with identical or similar orthography across languages; similarly, Van Assche et al. (2012) define them as translation equivalents too but with full or partial form overlap.

As can be seen, there is a variety of definitions of cognates. It is important to note that researchers use the word ‘similarity’ in their definitions, but they do not provide a clear definition of how ‘similar’ is defined. Also, they do not specify the degree of form (orthographic or phonological) similarity needed for a word to be considered a cognate. These asymmetries in the definitions of cognates across researchers make an interpretation among different research findings not feasible. In fact, while some words might be considered cognates in one study, they might not be regarded as such in others.

For the present study, cognates would be defined as words that share orthography, meaning, and phonology in two languages.

1.3.2 Types of cognates.

In addition to the variety of definitions of cognates, some studies assume different types of cognates depending on the degree of similarity. Most studies classify cognates based on orthography and morphology rather than meaning or phonology. Lobo (1966), for example, designed a corpus of cognates shared between Spanish and English. Lobo defines cognates as words with shared orthographic, semantic, or etymological traces, or a combination of these in two languages. As a result, Lobo considers three types of cognates between Spanish and English: *true cognates*, which share orthographic, semantic, and etymological similarities (e.g., ‘tomato’ - ‘tomate’); *accidental cognates*, which are similar in meaning and orthography only but not in

etymology (e.g., ‘shock’ - ‘chocar’); *false cognates*, which share orthography and etymology, but their meanings are different in both languages (e.g., ‘bigot’ - ‘bigote’).

Dijkstra et al. (1999) classified cognates differently: *homographic cognates* (i.e., words with shared orthography and meaning), *homophonic cognates* (i.e., words with shared phonology and meaning), *homographic and homophonic cognates* (i.e., words with shared orthography, phonology and meaning), *false friends* (i.e., words with similar orthography or phonology but not meaning). They also used a series of codes to determine the degree of form overlap (‘S’ for similar semantics, ‘O’ for identical orthography, and ‘P’ for similar phonology) and the different degrees of similarity are coded as: SOP, SO, SP, OP, O, and P.

Font (2001) considers only two types of cognates based on their orthography: *identical cognates* and *neighbor cognates* (i.e., non-identical cognates that differ in only one letter).

Dijkstra and Van Heuven (2002) used the same codes created in Dijkstra et al. (1999) to distinguish between *cognates* (SOP and SO), *interlingual homographs* (OP and O), and *interlingual homophones* (P). Finally, Van Assche et al. (2012) provides a binary classification of cognates as *identical* and *non-identical*.

As mentioned before, researchers have not reached an agreement regarding the definition and classification of cognates. Such disagreement affects the assessment of results across languages and, therefore, hampers the possibility of making predictions about the recognition of cognates in the visual and auditory modalities.

Friel and Kenninson (2001) conducted a study aiming at creating a list of English-German cognates. In their experiment, 250 English speakers performed two activities. In the first one, they were asked to rate the similarity of translation pairs on a seven-point scale (1= low similarity and 7= high similarity). This activity was based on the similarity-rating procedure of

De Groot and Nas (1991). In the second activity, based on the modified translation-elicitation task of Kroll and Stewart (1994), participants were asked to translate German nouns. While half of the participants were told to perform the rating focusing on phonological and orthographic overlap, the other half were told to focus on orthographic overlap only. From this study, 112 German-English cognates and 94 false cognates were obtained. After performing a correlational analysis of both activities, the authors concluded that both activities were correlated and provided significantly similar results. These two activities could be considered as techniques to identify cognates across languages. Nevertheless, these techniques need further assessment because task demands might provide ambiguous results. In fact, the similarity rating task seems a little imprecise because participants might consider completely different factors while rating. Further research is needed using the same words with different participants and if similar results are obtained then facts can be established accurately.

1.3.3 Studies on Cognates Recognition.

Cognates are believed to play a very important role which facilitates second language acquisition (SLA). However, if this occurs naturally during SLA, or relies on specific instruction has generated a controversial debate. Some researchers, based on their studies, suggest that language learners can recognize and process cognates more accurately without specific instruction (e.g., Holmes and Guerra, 1993; Tonzar et al, 2009; Hall, 2002, 2009; Tercedor, 2010; Hoshino and Kroll, 2008; Costa et al, 2008; Sherkina-Lieber, 2004). Others, in contrast, propose that cognates are not recognized and processed by language learners and, therefore, language instructors need to teach learners how to identify and process cognates (Lightbown and

Libben, 1984; Tréville, 1996; Harley et al, 1986). This shows that the role that cognates play in SLA remains still uncertain and more research is needed to clarify this matter.

One of the studies that support the assumption that learners are able to recognize cognates is that of Holmes and Guerra (1993). Due to form overlap, the authors predicted that cognates could be easily recognized by participants. Think Aloud protocols were used to collect data in a reading activity where participants had to summarize the information. The results show that cognate recognition happens as a natural strategy, that is, participants transferred cognates directly from the text to the summary. However, some variations are also observed, which leads to the conclusion that cognate recognition is a natural and personal process affected by each participant's individual characteristics. It is also noted that participants used their previous knowledge in order to identify and process cognates. One could point out that this makes compromises the results since previous knowledge also includes linguistic knowledge, which might have helped some participants in the recognition of cognates creating the variations perceived among participants. Maybe some participants were familiar with those cognates and that is why they used them in their summaries.

Additionally, Tonzar, Lotto, and Job (2009) address vocabulary acquisition with Italian native speakers of different ages. They compare two popular teaching/learning methods (L2 word-L1 word, picture- L2 word) in which the role of cognates is assessed. Their results indicate that the picture - L2 word method was more successful than the L2 word - L1 word method. It is observed as well that cognates were remembered more easily than non-cognates. However, it is still uncertain if this actually proves that cognates are recognized by learners. There is a facilitation effect in memory, but how much this relates to recognition remains to be determined.

In addition, Hall (2002, 2009), based on his parasitic model of vocabulary, investigates the role of cognates in SLA predicting that learners are predisposed to produce cross-linguistic overlap since they can use their L1 or L2 to obtain an initial representation of unfamiliar words. In other words, learners use existing information from their L1 and L2 to hypothesize the meaning of a new word. In this study, 95 Spanish-English bilinguals (Spanish = L1) performed a translation task in which cognates, non-cognates, and non-word cognates and non-cognates were used. The results of this study suggest that cross-linguistic overlap does take place and cognate facilitation effects are observed.

Tercedor (2010) investigates the role of cognates as lexical choices in translation. 77 translation and interpretation students and 66 advanced Spanish students performed translation tasks that differed in format. Both tasks contained the same cognates as part of compound structures or phonological units in an equibaised mode (with two or more translation equivalents not biased by frequency). Results show that the translation and interpretation students reduced their use or did not use cognates whereas the advanced Spanish students used cognates more often. However, some of these cognates were used inappropriately at times. This difference can be related to the fact that Translation and Interpretation students know that cognates can be problematic translation items due to differences in the sentence context, therefore, they reduce their use. This shows that participants' background knowledge can also influence the strategy used in a translation task having an effect on the results. Thus, one could state that because cognates were used inappropriately, it is uncertain whether or not recognition actually took place.

Hoshino and Kroll (2008) investigate the role of cognates in vocabulary processing considering also lexical access and representation in the bilingual lexicon. Participants in the

study were 35 Spanish-English and 20 Japanese-English bilinguals who performed a picture naming task in English. Cognate facilitation effects were observed since response times were shorter for cognates than for non-cognates even in the group of Japanese-English bilinguals. Although Spanish and Japanese do not share a common script, cross-linguistic activation happened due to the phonological overlap, highlighting once more the importance of phonology in word recognition.

In another study, Costa, Colomé, and Caramazza (2000) have Catalan speakers and Catalan-Spanish bilinguals perform picture naming tasks in both languages in order to compare naming latencies (the time it takes participants to name a picture) between monolinguals and bilinguals. Their results show very different patterns in cognates for monolinguals and bilinguals. Bilinguals named pictures representing a cognate faster than non-cognates whereas monolinguals showed no difference between naming cognates and non-cognates. These findings serve as evidence for the cognate effect in bilinguals and bring support to the hypothesis that cognates work in favor of bilinguals.

Finally, Sherkina-Lieber (2004) focused on cross-linguistic language representation as well through a rating task performed by Russian-English bilinguals and English monolinguals. Participants have to rate the frequency of use of words, cognates and non-cognates, using a ten-point scale. Frequency of cognates was rated significantly higher by bilinguals than monolinguals. One could point out that the cognate effect is also present in frequency rating, meaning that cognates' lexical representation might be shared partially between the two lexicons of a bilingual.

The studies reviewed are some of the most relevant studies supporting the assumption that learners can recognize cognates and process them easily without specific instruction. Most

of the research available on this subject supports the hypothesis on the effect of cognate facilitation in bilinguals. This is reflected on the assumption of language teachers and language book publishers that the use of cognates will automatically help students learning a second language. However, some of the results are not well-defined. Task-demands and previous knowledge might have interfered with the results in determining whether or not recognition takes place. On the other hand, there is also available research that supports the idea that learners need specific instruction on how to recognize and work with cognates since they cannot do this naturally by themselves.

One of the most relevant studies is the one conducted by Lightbown and Libben (1984). They investigated the role of cognates through three tasks: writing compositions, a cloze test, and a word acceptability judgement task performed by English learners with French as their L1 and native English speakers. Results of the study suggest that participants do not recognize cognates due to different aspects such as differences in context across languages among others. In addition, an analysis of the results served to create a classification of cognates based on context after examining participants's variations on cognate use: *appropriate in both languages, more appropriate in French, more appropriate in English, appropriate in neither language*. The researchers also proposed that learners do not usually trust words with similar spellings and that it is possible that they are not even aware of the relationship between the two languages. Therefore, they suggest specific instruction is needed in order to recognize and process cognates and to know about the relationships between both languages.

More evidence in support of the need for instruction on cognate recognition is found in Tréville's (1996) study, which focused on cognate recognition in French as the L2. One hundred and five university students learning French in the beginner level were divided in two groups.

One group received instruction on how to recognize cognates and the other did not. Towards the end of the semester, both groups took a test on cognates (Test of Aptitude in Recognizing Written Cognates). Results show that students who received instruction on cognates performed better in recognition and in most sections of the test. However, it could be pointed out that the fact that students who did not receive instruction on cognates did not do well on the test does not necessarily imply that recognition did not take place for them. Instruction on cognates could have made one group more aware of cognates than the other, but further analysis is needed to determine if recognition took place in both groups or not.

As previously mentioned, studies on the role of cognates in word recognition have observed cognate facilitation effects in some cases but not in others. It is also possible that different results respond to different task demands and different linguistic and non-linguistic contexts. In fact, the answer to this matter is still unclear and further research is needed.

2. Research Questions and Hypotheses

The primary objective of this study is to determine the role of phonology in L2 aural processing of cognates in learners of Spanish as a second language. As mentioned before, there is not much research available on the role of phonology in the perception and comprehension of cognates. Most of the research focused on visual-word recognition rather than spoken-word recognition, which is the principal aim of the present study.

Previously I have noted that most of the studies on visual-word recognition and spoken-word recognition lack well-defined conclusions and more precise definitions of the construct of cognates. In the present study, some of these issues are addressed. First, I suggest a possible classification of cognates regarding their orthography and phonology besides their meaning that can serve to understand perception and comprehension patterns. Second, I provide a clear description of the degrees of similarity or overlap along with a clear description of what is considered cognate recognition in the present study. In this fashion, the present study contributes to clarify the matter of cognate recognition and some conflicting findings previously discussed.

2.1 Research Questions

The present study focuses on the following research questions:

1. Do cognates have facilitative processing effects when presented in the aural mode to learners of Spanish as an L2?
 - a. If so, are cognates processed more accurately than non-cognates when presented in the aural mode to learners of Spanish as an L2?
2. What role does L1 phonology play in the aural processing of cognates in the L2?

- a. Does the degree of phonological overlap between cognates have an effect on the aural perception and comprehension of cognates?
 - b. If so, does the number of shared phonemes between cognates in Spanish and English affect aural perception and comprehension of cognates?
 - c. Does having a shared stressed syllable affect aural perception and comprehension of cognates?
3. Is there a difference between the processing of cognates in the aural mode versus in the written mode by learners of Spanish as an L2?
- a. If so, are cognates perceived more accurately in the written or aural mode?
 - b. Are cognates comprehended more accurately in the written or the aural mode?

2.2 Hypotheses

Based on the research questions guiding this study, I present the following predictions:

1. Cognates presented in the aural mode to learners of Spanish as an L2 will have facilitative effects. Overlap will cause strong activation of both languages facilitating the processing of the target word.
2. Phonological overlap between Spanish and English will facilitate perception and comprehension of cognates. The degree of overlap will facilitate word connections considering the differences in the phonemic repertoires of both languages.
 - a. The number of shared phonemes between cognates in Spanish and English will facilitate perception and comprehension of cognates because the more shared sounds will cause stronger word connections and activation.

b. Sharing the stressed syllable in the L1 and the L2 will facilitate the perception and comprehension of cognates because it increases the similarity between words across languages creating a stronger link.

3. Cognates will be perceived and comprehended more accurately in the written mode because of the complexity of the processes of listening comprehension and recognition of spoken word.

3. Methodology

3.1. Participants

Sixty-two learners of Spanish as an L2 registered in a Spanish undergraduate class at Auburn University participated in the study. Participants were recruited from three different levels of Spanish courses offered. The mean age at the time of testing was 20.5 years ($SD= 4.3$) for the participants; see Appendix B. The participant pool is split in terms of gender as follows: 15 male and 47 female participants; see Appendix B. All subjects participated in the study voluntarily and this was approved by Auburn University Institutional Review Board. Each participant was assigned a code number in order to protect their identity. The participant pool was divided into two groups including a Control Group and an Experimental Group. Although we made an effort to have the same number of participants in each group, the final groups resulted in unequal sizes: Control Group had 32 participants and Experimental Group had 30; see Appendix B. We also made an effort to control for proficiency level in both groups. We based this division on the level of the Spanish class they were enrolled in (1000, 2000, 3000, – elementary, intermediate, upper level). However, since participation was voluntary, we could not have equal numbers for all levels of proficiency. The final groups are as follows: the Control Group consisted of six participants enrolled in Upper Level classes, five participants enrolled in Intermediate Level classes, and 21 participants enrolled in Elementary Level classes. The Experimental Group consisted of seven participants enrolled in Upper Level classes, one participant enrolled in Intermediate Level classes, and 21 participants enrolled in Elementary Level classes; see Appendix B

3.2. Experiment design and materials

Cognates and non-cognates were presented in a random order using a Qualtrics online survey; see Appendix A. In the Qualtrics online survey, words were presented individually, and participants encountered a distractor activity after they had worked with four words. Distractor activities served to reduce participant bias and they were multiple choice questions in which participants had to select the correct word for a picture or the correct picture for a word. The Control Group had 16 distractor activities and the Experimental Group, 32 distractor activities. The images used in the distractor activities were obtained from the website of the vision and memory lab of the Department of Psychology at University of California – San Diego.

3.2.1 Stimuli

In the study, I used 12 cognates of each of the four categories mentioned above (48 cognates total) and 15 non-cognates; see Appendix A. The total number of test words was 63. Recall that for the present study, cognates are defined as words that share orthography, meaning, and phonology in two languages. Regarding the degree of similarity or phonological overlap, cognates are divided into four categories:

1. Cognates that share 1 or 2 phonemes and the stressed syllable. For example, “control” [kən'trɒl] and “control” [kon'trol].

2. Cognates that share 1 or 2 phonemes but not the stressed syllable. For example, “activity” [æk'thɪvəti] and “actividad” [aktiβi'ðað].

3. Cognates that share 3 or more phonemes and the stressed syllable. For example, “center” ['sentə] and “centro” ['sentro].

4. Cognates that share 3 or more phonemes but not the stressed syllable. For example, “information” [ˌɪnfə'meɪʃən] and “información” [imforma'sjon].

As previously mentioned, I paid close attention to any possible asymmetries caused by factors such as the frequency of use. For this reason, the cognates selected for the experiment were additionally distributed according to their frequency of use. In particular, most of the words used were relatively frequent in both languages. An online frequency counter, designed by Timur Baytukalov, was used to control the frequency of the words used. Frequency was counted in a scale of 1000-5000, most frequent – least frequent, respectively; see Appendix A.

At the beginning of each of the sections, participants performed practice tasks similar to the experimental tasks in order to become familiarized with the instructions and the software; see Appendix A. In the experimental tasks, all participants were presented with an input, either visual or aurally, and were asked to translate (from Spanish into English) and/or type the word they heard in Spanish. Both the Control Group and the Experimental Group were instructed to perform different tasks. This is discussed in more detail in subsection 4.3.1.

3.3. Procedure

Prior to the experiment, interested students attended an orientation session in which they were acquainted with the experiment briefly and they were required to fill out and sign an informed consent form, a background questionnaire, and a form that explained all the requirements, conditions, benefits, and risks of the study following the regulations of the Institutional Review Board at Auburn University; see Appendix C. All the participants carried out the study during different sessions. Each participant was assigned a code number in order to protect their identity; see Appendix B. No participants reported hearing difficulties; however, 40/62 randomly selected participants passed hearing screenings, to evaluate the self-reported hearing status. The hearing screenings were conducted by professionals in the Department of Audiology and Speech Pathology at Auburn University. Prior to data collection, participants also

took the Versant proficiency test; however, the results were not available at the time of the completion of this project.

During the experimental session, participants in both the Control and Experimental groups performed different tasks on a computer; see Appendix A. Information about the tasks is discussed in detail in subsection 3.3.1. As previously mentioned, an effort was made to keep a balance of the number of students in both groups according to different factors such as proficiency level.

3.3.1 Groups

The Control Group (CG) and the Experimental Group (EG) were instructed to perform the following tasks:

Control Group (CG): Participants were presented with a list of 63 words in Spanish (visual input only), 48 cognates and 15 non-cognates, and they were asked to read the word and translate it from Spanish to English and type their translation. The objective of this task was to test the comprehension of cognates and non-cognates in the visual modality; see Appendix A.

Experimental Group (EG): Participants were presented with a list of 63 words in Spanish (auditory input only), 48 cognates and 15 non-cognates, and they were asked to listen to the word and type the word they heard. The objective of this task was to test the perception of cognates and non-cognates in the auditory modality. Then, participants were presented with the same list of words (auditory input only) and they were asked to listen to the word and translate the word from Spanish to English and type their translation. The objective of this task was to test the comprehension of cognates and non-cognates in the auditory modality; see Appendix A.

All participants encountered the same cognates and non-cognates as well as distractor activities, and data collection was complete in individual sections. Participants of both groups could read or listen to the input as many times as needed.

3.3.2. Scoring Procedure

The data was analyzed quantitatively. Participants were scored 1 point for each correct answer and 0 points for each incorrect answer using Excel spreadsheets. Certain spelling inaccuracies in English and Spanish were considered correct answers because they were attributed to the difficulty of spelling in both languages. For the translation tasks, spelling inaccuracies in English, such as “profesor” instead of “professor” or “catastrphy” instead of “catastrophe”, were counted as correct answers. For the perception task, different possible correct answers were accepted as long as the sounds of words in Spanish were not affected. That is to say, changes between ‘b’ and ‘v’; ‘s’, ‘c’, and ‘z’; ‘c’ and ‘k’; ‘x’ and ‘cc’; ‘y’ and ‘ll’ were taken as correct answers as long as the change in the spelling would not affect the sounds of the words in Spanish. The number of correct answers for each group and/or phase was compared in order to determine any significant differences. A non-parametric test was conducted for this purpose.

4. Results

The purpose of the present study is to determine how L2 learners of Spanish process cognates aurally, through perception and comprehension tasks. In particular, the role of phonology in the aural processing of cognates was addressed through the degree of phonological overlap or the number of phonemes shared between cognates in Spanish and English, as well as whether or not they shared the stressed syllable. In order to analyze the results obtained, a quantitative analysis was carried out using an Excel spreadsheet. A non-parametric test was conducted as well.

As previously mentioned, the answers of all the participants were entered into an Excel spreadsheet. Correct answers were scored 1 and incorrect answers were scored 0. In table 1, we can find the total numbers of correct and incorrect answers and their corresponding percentages.

Group	Correct Answers	Percentage	Incorrect Answers	Percentage	Total Answers
Control Group Comprehension	1565	77.6%	451	22.37%	2016
Exp. Group Comprehension	1199	63.4%	691	36.56%	1890
Exp. Group Perception	1278	67.6%	612	32.38%	1890

Table 1. Total correct and incorrect answers.

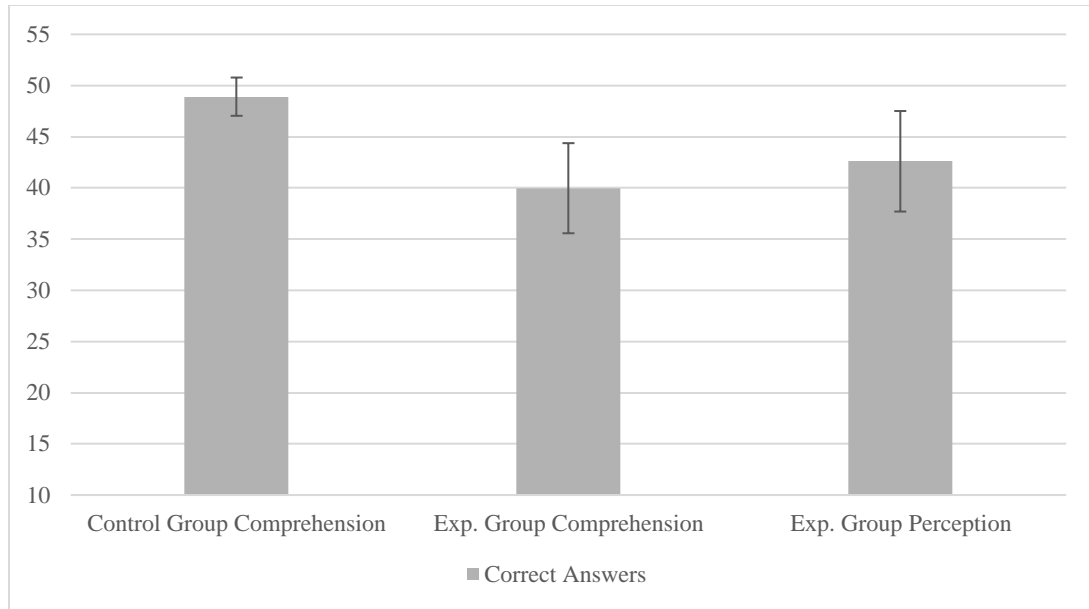


Figure 8. Total correct answers.

In terms of comprehension, the total correct and incorrect responses of the Control Group and the Experimental Group were compared. As previously mentioned, participants in Control Group were presented with a list of isolated words only in the visual modality whereas participants in the Experimental Group were presented with isolated words in the aural modality. Results show that participants in the Control Group were more successful at accurately responding to the comprehension task (obtaining 77.6% correct answers) than the Experimental Group (obtaining 63.4% correct answers) in the visual and auditory modality respectively, as can be seen in Table 1. Non-parametric tests suggest that the differences between the Control Group and the Experimental Group might be significant with 95% CIs [47, 50.7] and [35, 44.8] respectively. This shows that participants had more difficulty processing words in the auditory modality than in the visual modality.

In the comprehension task, participants were presented with cognates and non-cognates in Spanish either in the auditory or the visual modality and were asked to translate them to English. In the perception task (e.g., pertaining only to the experimental group), participants

were presented with cognates and non-cognates in the auditory modality only and were asked to type the word they heard in Spanish. In terms of comprehension, the total correct and incorrect answers of the Control Group and the Experimental Group for cognates and non-cognates were compared. Results show that participants in the Control Group were more successful at accurately comprehending (e.g., translating) cognates (obtaining 89.77 % correct answers) than non-cognates (obtaining 38.75% correct answers) in the visual modality; see Figure 9. In addition, results show that participants in the Experimental Group performed more accurately with cognates (obtaining 74.7% correct answers) than with non-cognates (obtaining 27.33% correct answers) in the auditory modality. Comparing the responses of the comprehension task of the Control Group and the Experimental Group for cognates and non-cognates, we observe that participants performed more accurately with both, cognates and non-cognates, in the visual modality than in the aural modality. Pertaining to cognates only, participants in the Control Group performed better (in the visual modality), obtaining 89.77% correct answers, than participants in the Experimental Group (in the aural modality), obtaining 74.72%. Non-parametric tests suggest a possible significant difference with 95% CIs [42, 44] and [31.7, 39.9] respectively.

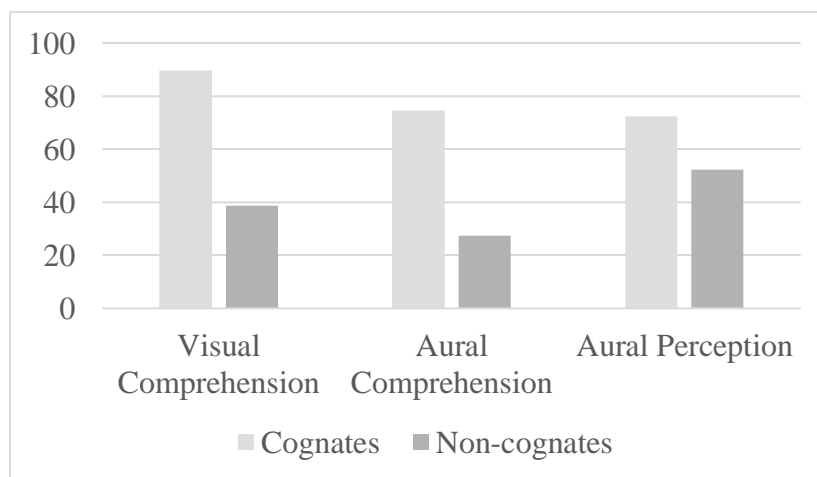


Figure 9. Total correct answers for cognates and non-cognates.

In terms of perception (i.e., orthographic transcription) of cognates and non-cognates, results show that participants in the Experimental Group performed more accurately with cognates (obtaining 72.4% correct answers) than with non-cognates (obtaining 52.2% correct answers) in the auditory modality; see Figure 9. An interesting highlight is that participants in the Experimental Group performed considerably better with non-cognates in the perception task (obtaining 52.2% correct answers) than in the comprehension task (obtaining 27.33% correct answers). However, the results of the performance of these same participants with cognates in the perception task and the comprehension task were very similar (obtaining 72.4% and 74.7% correct answers respectively).

Regarding the perception and comprehension of cognates only, for the present study, as I have mentioned before, cognates are classified into four categories considering the number of phonemes that they share in English and Spanish and whether they share the stressed syllable. In order to know whether or not the different phonological characteristics considered in the study had a significant effect in the processing of cognates, a non-parametric test was conducted to determine any possible significant differences. In terms of perception, results show that participants in the Experimental Group performed very similarly with cognates that share 1 or 2 phonemes (obtaining 72.6% correct answers) as with cognates that share 3 or 4 phonemes (obtaining 72% correct answers). Non-parametric tests suggest that these results might be inconclusive with 95% CIs [15.7, 19] and [15.6, 19] for their performance with cognates that share 1 or 2 phonemes and 3 or 4 phonemes respectively; see Figure 10.

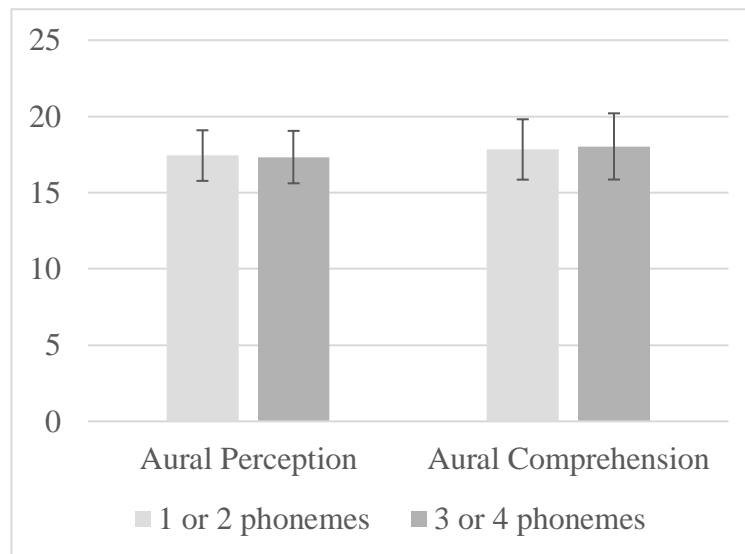


Figure 10. Correct answers for cognates that share 1 or 2 and 3 or 4 phonemes.

Also, the results show that participants in the Experimental Group perceived cognates that do not share a stressed syllable slightly more accurately (obtaining 74.7% correct answers) than cognates that share a stressed syllable (obtaining 70% correct answers). However, this difference seems inconclusive with 95% CIs [16, 19.5] and [15, 18.5] respectively; see Figure 11. However, a parametric test would be needed to confirm these results.

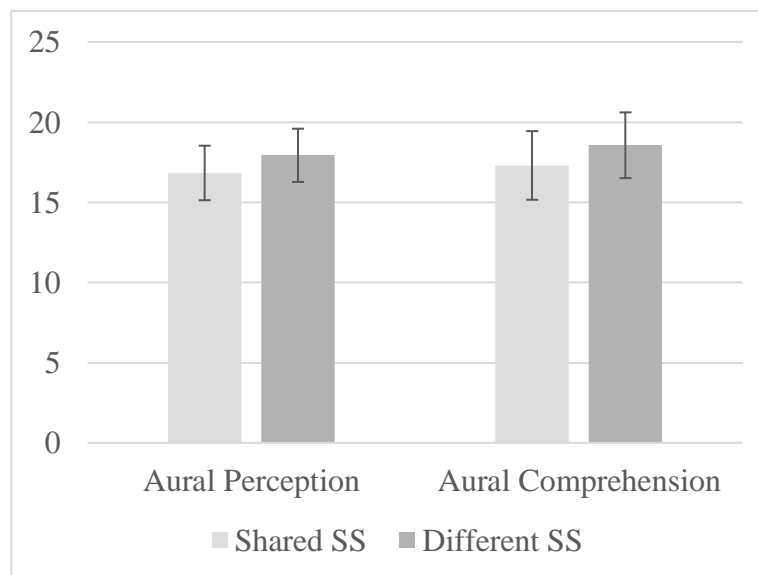


Figure 11. Correct answers for cognates that share the stressed syllable and cognates that have different stressed syllables.

In terms of comprehension, results showed that participants in the Experimental Group comprehended cognates that share 1 or 2 phonemes as accurately as cognates that share 3 or 4 phonemes (obtaining 74% and 75% correct answers respectively). There seems to be no significant difference with 95% CIs [15.8, 19.8] and [15.8, 20] in order; see Figure 10. Results show that participants in the Experimental Group comprehended cognates that do not share a stressed syllable slightly more accurately than cognates that share a stressed syllable (obtaining 77% and 72% respectively). However, non-parametric tests suggest that this difference might not be significant according to the 95% CIs [16.5, 20.6] and [15, 19]; see Figure 11.

Regarding the Control Group, results showed that participants performed better with cognates that share 1 or 2 phonemes (obtaining 92% correct answers) than with cognates that share 3 or 4 phonemes (obtaining 87.6% correct answers). This difference shows a trend towards significance with respect to the 95% CIs [21.5, 22.6] and [20, 21.7] respectively; see Figure 12.

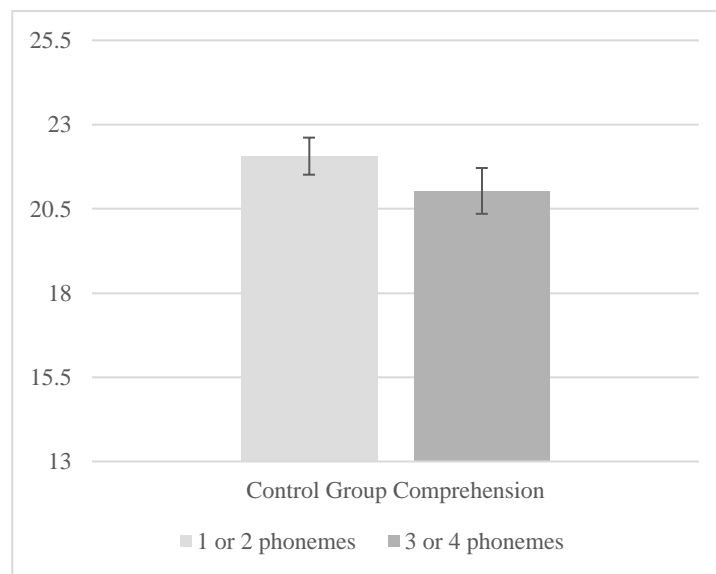


Figure 12. Correct answers of the Control Group for cognates that share 1 or 2 and 3 or 4 phonemes.

It was also found in the results of the Control Group that participants comprehended cognates that do not share a stressed syllable more accurately (obtaining 92.4% correct answers) than cognates that share a stressed syllable (obtaining 87% correct answers). This difference suggests significance according to the 95% CIs [21.64, 22.7] and [20, 21.63] respectively; see Figure 13.

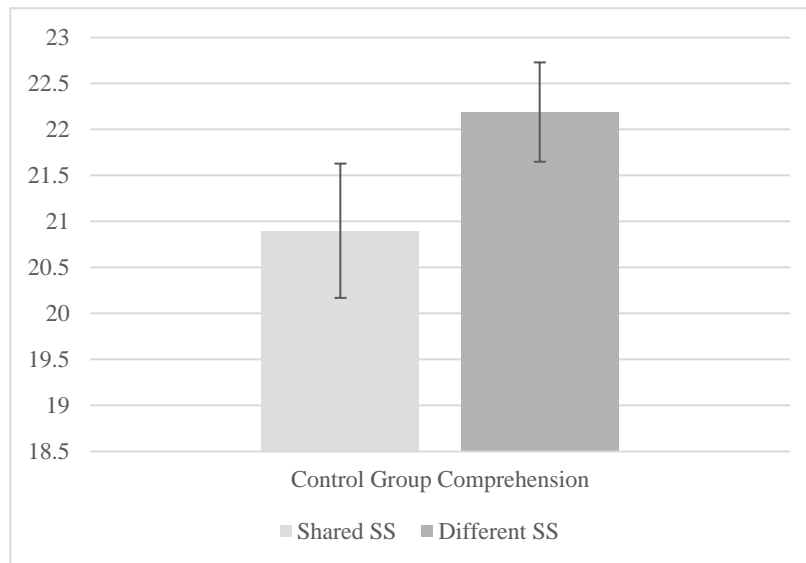


Figure 13. Correct answers of the Control Group for cognates that share the stressed syllable and cognates that have different stressed syllables.

It is important to highlight that, according to the results of the study, participants in both the Control Group and the Experimental Group performed better with cognates that do not share a stressed syllable than with cognates that share a stressed syllable in terms of comprehension and perception in both modalities.

5. Discussion

The present study has explored aural perception and recognition of cognates in learners of Spanish as a second language. In general, the results of this study show that participants obtained a higher number of correct answers in the comprehension task in the visual modality than in the auditory modality, bringing support to previous findings (Vandergrift and Goh, 2012; Weber and Scharenborg, 2012; among others). In particular, participants performed considerably better when they received visual input than when they received auditory input. As presented in the literature review, Vandergrift and Goh (2012) explain the different factors involved in the stages of the cognitive processes of listening comprehension. Weber and Scharenborg (2012) also mention the factors involved in spoken word recognition. They highlight the complexity of listening comprehension and spoken word recognition and debate that for different reasons they tend to be more challenging than reading comprehension, an assumption which the results of the present study support (Vandergrift and Goh, 2012; Weber and Scharenborg, 2012).

With regards to the facilitative effects on aural perception and comprehension, research question 1 asked whether cognates have facilitative processing effects when presented in the aural mode to learners of Spanish as an L2? If so, are cognates processed more accurately than non-cognates when presented in the aural mode to learners of Spanish as an L2? Regarding research question 1, I predicted that cognates would be perceived and comprehended more accurately than non-cognates. Several studies suggest that cognates are processed more accurately than non-cognates (e.g., Holmes and Guerra, 1993; Tonzar et al, 2009; Hall, 2002, 2009; Tercedor, 2010; Hoshino and Kroll, 2008; Costa et al, 2008; Sherkina-Lieber, 2004; among others). The results of the Control Group, which encountered cognates in the visual modality,

supported cognate facilitation effects as well. Participants performed better with cognates than non-cognates.

As previously mentioned, the present study has adopted the BIA+, introduced by Dijkstra and Van Heuven, 2002, as presented in chapter 1. The BIA+ integrates different factors involved in visual word recognition such as phonological features, frequency of use, proficiency level, degree of overlap, among others. The results of this study show that participants in the Experimental Group performed considerably better with cognates than with non-cognates in terms of comprehension and perception in the auditory modality. This supports the presence of cognate facilitation effects in the auditory modality as well, as predicted by the BIA+ model. Based on this, results suggest that cognate facilitation effects take place in visual and auditory processing of cognates.

Exploring deeper into aural perception and comprehension of cognates and the factors involved, research question 2 asked: What role does L1 phonology play in the aural processing of cognates in the L2? In particular, this question explores the effect on aural perception and comprehension of cognates in terms of the degree of phonological overlap between cognates; the number of shared phonemes between cognates in Spanish and English; and cognates sharing the stressed syllable in English and Spanish. Initially, I predicted that phonological overlap between Spanish and English would facilitate perception and comprehension of cognates. In addition, I anticipated that the degree of phonological overlap would facilitate perception and comprehension of cognates and that factors such as the number of shared phonemes and sharing the stressed syllable would facilitate perception and comprehension as well. As discussed in the literature review, in the BIA+, Dijkstra and Van Heuven (2002) assume that form overlap has facilitation effects on word recognition and that the degree of overlap affects recognition in

different ways as well. Studies such as those of Dijkstra, et al. (1999) and Lamhofer and Dijkstra (2002) show contradictory results related to this assumption of the BIA+. This suggests an overlap between inhibition effects and facilitation effects. The results of the present study show that phonological overlap might facilitate the perception and recognition of cognates since participants performed better with cognates than non-cognates in the auditory modality. Since Spanish and English have very different phonemic repertoires, phonological overlap might have contributed to stronger connections and activation of the target words. However, the results did not suggest a great effect of the degree of phonological overlap on the aural perception and recognition of cognates. Participants perceived and comprehended cognates that share 1 or 2 phonemes as accurately as the ones that share 3 or 4 phonemes in the auditory modality. Although there was a trend suggesting that participants were slightly more successful at perceiving and comprehending cognates that do not share a stressed syllable than cognates that share a stressed syllable in the auditory modality, non-parametric tests suggest that this difference might not be significant. These results do not support the assumption of the BIA+ regarding the degree of overlap since trends toward significant differences were not found between groups of cognates. Models of spoken-word recognition such as *The Cohort Model*, *The Cohort II*, *The Neighborhood Activation Model (NAM)*, *PARSYN*, and *The Distributed Cohort Model (DCM)* suggest that activation and competition of multiple candidates takes place while hearing a word and that such activation depends on the degree of similarity or overlap between the stimuli and the stored representations. The activation and competition of multiple candidates might result in inhibition or facilitation. However, the results of this study did not show any differences that could indicate that the degree of overlap caused facilitation or inhibition. It is necessary to mention the differences between the phonetic repertoires of English and Spanish as

one of the possible reasons why the degree of phonological overlap did not seem to affect aural perception and recognition in this study. The activation of possible candidates might not have been as strong due to the lack of similarity of the phonetic repertoires of both languages. Interestingly, significant differences for the degree of overlap were observed in the performance of the Control Group, which encountered visual input only. Participants performed slightly better with cognates that share 1 or 2 phonemes and cognates that do not share a stressed syllable. This seems to indicate that in the visual modality, participants were more successful at perceiving and comprehending the cognates that had less phonological overlap. In fact, Dijsktra and Van Heuven (2002) propose that phonology is a factor that affects visual word recognition. Phonological features are present and active during visual word recognition. Notwithstanding, in order to obtain more precise results on this issue, we would need to record how each participant pronounced each word and analyze the degree of phonological overlap. Since participants only read the words, there is no guarantee that they perceived the stressed syllable correctly. However, it is important to mention that the results do show that participants in both groups performed better with cognates that do not share a stressed syllable in both the comprehension and the perception tasks in the auditory and visual modality as well. Based on this, one could argue that sharing a stressed syllable might have inhibitory effects on cognate recognition.

6. Conclusions

This chapter provides a summary of the overall conclusions of the present study, as well as its limitations. The chapter concludes with avenues for further research on the aural processing of cognates by L2 learners.

6.1 Conclusions

In conclusion, the results obtained from this study provide empirical evidence in favor of Hypothesis 1, which claims that cognates have facilitative effects on aural processing by learners of Spanish as an L2. The findings from this study show that cognates are perceived and comprehended more accurately than non-cognates in both the visual and the auditory modality. Moreover, this study also provided evidence in favor of Hypothesis 2, which claims that phonological overlap facilitates perception and comprehension of cognates. It was observed that phonological overlap seemed to have facilitation effects on cognates in general. However, the results of the Experimental Group do not provide evidence in favor of Hypotheses 2.A and 2.B, which claimed that the degree of phonological overlap and phonological features such as the number of shared phonemes and sharing a stressed syllable facilitates comprehension and perception of cognates. Although participants were slightly more successful at perceiving and comprehending cognates that do not share a stressed syllable in the auditory modality, the difference was not great enough to support Hypotheses 2.A and 2.B. However, results of the Control Group, which encountered cognates in the visual modality, do provide evidence against the facilitative effect of the L1 phonology in the processing of cognates, as stated in Hypotheses 2.A and 2.B. Participants in the Control Group performed better with the cognates that had less phonological overlap.

6.2 Limitations of the Study.

This study encountered some limitations. Even though the focus of the present study was not a comparison between the processing of cognates versus non-cognates, the inclusion of a more balanced distribution between cognates and non-cognates would have provided more information on this distinction. Participants were tested using the Versant proficiency test. However, the results will be analyzed in the future to study any possible differences. The proficiency level of participants considered for this study was based on the level of the class they were enrolled in, which might not be the best indicator of their actual proficiency level. It would be interesting to take these factors into account in the future. Response times were measured, but they remain to be analyzed in a future project. Finally, this study did not include a pronunciation component in order to observe whether or not participants were perceiving the stressed syllable in Spanish accurately.

6.3 Future Research

This study supports findings that suggest that cognates are perceived and comprehended more accurately than non-cognates in both the visual and the auditory modality. Future research, should further explore the effects of the degree of phonological overlap on the perception and recognition of cognates. Other phonological features, such as the location of the shared phonemes, could be taken into consideration in order to classify cognates differently. This will allow for an analysis aimed at determining whether the degree of phonological overlap affects processing of cognates. Also, future research should also classify non-cognates according to their phonological features to predict any effects of overlap. In addition, factors such as the frequency

of use of the words and participants' familiarity with the target words should be considered as well.

Finally, it would be interesting to test participants that have never taken Spanish classes. This would allow us to see whether cognates actually have an effect on monolinguals as well or if it affects word recognition in bilinguals and L2 learners only with a certain level of exposure to Spanish instruction. Moreover, it would be valuable to test cognates in the auditory modality within a context to investigate any possible context effects since the present study tested words in isolation.

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Appendix A

Stimuli

Table 1. Cognates that share 1 or 2 phonemes.

English	Spanish
<i>Shared stressed syllable</i>	
control [kən'trəʊl] (1-1000) camera ['kʰæmrə] (1-1000) firm ['fɜ:m] (1-1000) circle ['sɜ:kəl] (1001-2000) fruit ['fru:t] (1001-2000) traffic ['træfɪk] (1001-2000) coast ['kʰəʊst] (2001-3000) cable ['kʰeɪbəl] (2001-3000) disaster [dɪ'zæstə] (2001-3000) alarm [ə'lɑ:m] (3001-4000) exotic [ɪg'zɒtɪk] (4001-5000) panic ['pʰænɪk] (4001-5000)	control [kon'trol] (1-1000) cámara ['kamara] (1-1000) firme ['firme] (1001-2000) círculo ['sirkulo] (3001-4000) fruta ['fruta] (4001-5000) tráfico ['trafiko] (3001-4000) costa ['kosta] (1001-2000) cable ['kaβle] (3001-4000) desastre [de'sastre] (1001-2000) alarma [a'larma] (3001-4000) exótico [ek'sotiko] (5001-6000) pánico ['paniko] (3001-4000)
<i>Different stressed syllable</i>	
activity [æk'tɪvətɪ] (1-1000) metal ['mɛtəl] (1001-2000) artist ['ɑ:tɪst] (1-1000) hospital ['hɒspɪtəl] (1-1000) concert ['kɒnsə:t] (2001-3000) history ['hɪstəri] (1-1000) memory ['meməri] (1-1000) office ['ɒfɪs] (1-1000) active ['æktɪv] (1001-2000) ordinary ['ɔ:rə,nerɪ] (2001-3000) sofa ['soʊfə] (3001-4000) furious ['fjʊri:əs] (5001-6000)	actividad [aktiβi'ðað] (4001-5000) metal [me'tal] (3001-4000) artista [ar'tista] (2001-3000) hospital [ospi'tal] (1-1000) concierto [kon'sjerto] (2001-3000) historia [is'torja] (1-1000) memoria [me'morja] (1001-2000) oficina [ofi'sina] (1-1000) activo [ak'tiβo] (5001-6000) ordinario [orði'narjo] (5001-6000) sofá [so'fa] (3001-4000) furioso [fu'rjosɔ] (4001-5000)

Table 2. Cognates that share 3 or 4 phonemes.

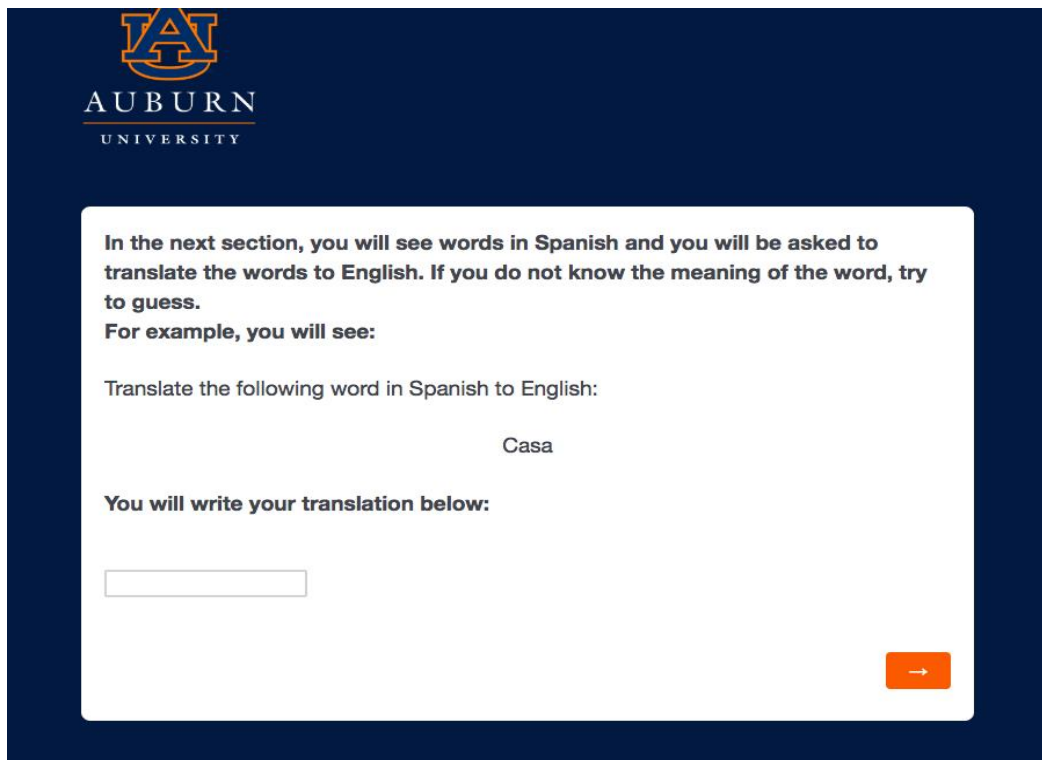
English	Spanish
<i>Shared stressed syllable</i>	
center ['sɛntə] (1-1000) class ['klæs] (1-1000) complete [kəm'pli:t] (1001-2000) debate [di'beɪt] (1001-2000) plastic ['plæstɪk] (1001-2000) electric [ɪ'lektrɪk] (2001-3000) astronomer [ə'strɒnəmər] (3001-4000) organic [ɔr'gænɪk] (3001-4000) elephant ['ɛləfənt] (4001-5000) catastrophe [kə'tʰæstrəfi] (5001-6000) cement [sɪ'mɛnt] (5001-6000) ceramic [sə'ræmɪk] (5001-6000)	centro ['sɛntro] (1-1000) clase ['klase] (1-1000) completo [kom'pleto] (1001-2000) debate [de'βate] (5001-6000) plástico ['plastiko] (4001-5000) eléctrico [e'lektriko] (5001-6000) astrónomo [as'tronomo] (5001-6000) orgánico [or'ɣaniko] (5001-6000) elefante [ele'fante] (5001-6000) catástrofe [ka'tastrofe] (5001-6000) cemento [se'mento] (5001-6000) cerámica [se'ramika] (5001-6000)
<i>Different stressed syllable</i>	
professor [prə'fɛsə] (1-1000) information [ˌɪnfə'meɪʃən] (1-1000) accident ['æksɪdənt] (1001-2000) moment ['moʊmənt] (1001-2000) planet ['plænət] (1001-2000) telephone ['tʰɛlə'foʊn] (1001-2000) ceremony ['sɛrə'moʊni] (2001-3000) confusion [kən'fju:ʒən] (3001-4000) explosion [ɪk'splɒʒən] (3001-4000) galaxy ['gæləksɪ] (3001-4000) continent ['kɒntɪnənt] (4001-5000) accidental [ˌæksə'dɛntl] (5001-6000)	profesor [profe'sor] (1-1000) información [informa'sjɔn] (1-1000) accidente [aksi'dɛnte] (1-1000) momento [mo'mento] (1-1000) planeta [pla'neta] (1001-2000) teléfono [te'lefono] (1-1000) ceremonia [sere'monja] (3001-4000) confusión [konfu'sjɔn] (5001-6000) explosión [eksplɔ'sjɔn] (3001-4000) galaxia [ga'laksja] (5001-6000) continente [konti'nente] (5001-6000) accidental [aksiðen'tal] (5001-6000)

Table 3. Non-cognates used for the stimuli of the experiment.

Non-cognates
Abogado / imperio / árbitro / ayuda / biblioteca / alfombra / dinero / cena / anuncio / horno / dibujo / éxito / fecha / impuesto / jabón

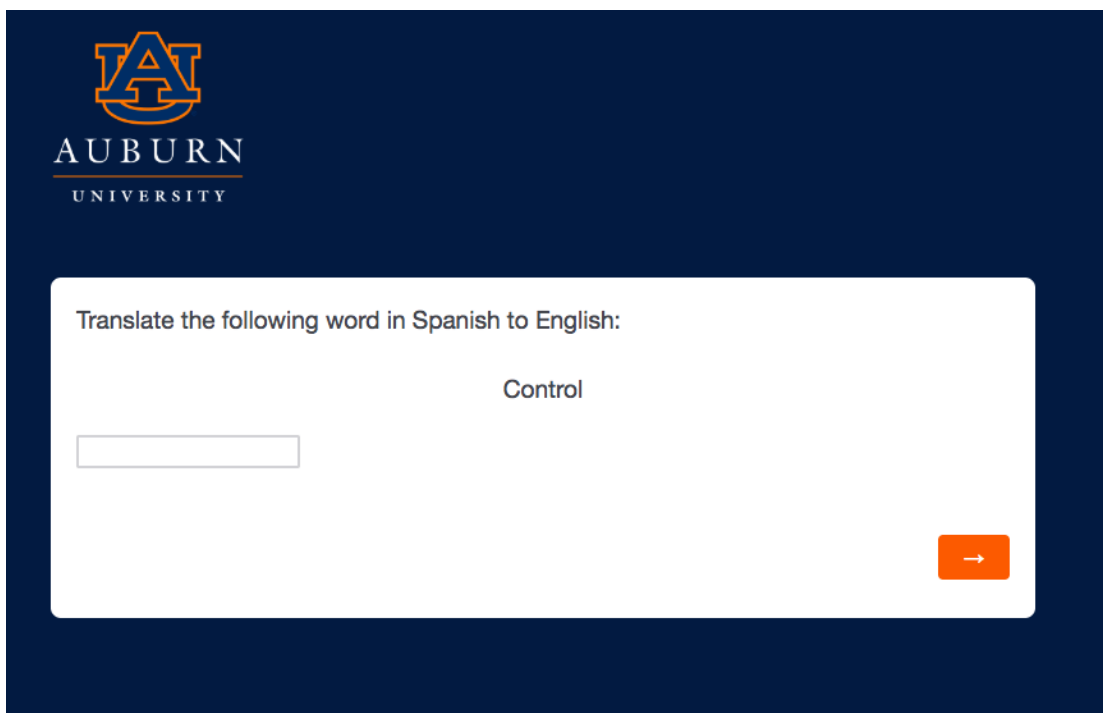
Sample tasks of the experiment

Figure 1. Control Group – Training task



The screenshot shows the Auburn University logo at the top left. Below it, the text "AUBURN UNIVERSITY" is displayed. The main content area is a white box with a dark blue border. It contains the following text: "In the next section, you will see words in Spanish and you will be asked to translate the words to English. If you do not know the meaning of the word, try to guess." followed by "For example, you will see:". Below this, it says "Translate the following word in Spanish to English:" and then "Casa". Underneath, it says "You will write your translation below:" followed by a text input field. In the bottom right corner of the white box, there is an orange button with a white right-pointing arrow.

Figure 2. Control Group – Comprehension task



The screenshot shows the Auburn University logo at the top left. Below it, the text "AUBURN UNIVERSITY" is displayed. The main content area is a white box with a dark blue border. It contains the following text: "Translate the following word in Spanish to English:" followed by "Control". Below this, there is a text input field. In the bottom right corner of the white box, there is an orange button with a white right-pointing arrow.

Figure 3. Experimental Group – Perception training task

The screenshot shows the Auburn University logo at the top left. Below it, the text reads: "In the next section, you will be asked to press 'play' and listen to a word in Spanish. After you listen, you will be asked to type the word you heard. For example, you will see:" followed by "Press 'play' and listen to the word in Spanish. Then, type the word you heard:". Below this is a SoundCloud player for a track titled "Juanjo Training 1". The player includes a play button, a progress bar, and a "Share" button. Underneath the player is a "Cookie policy" link and the instruction "You will write the word you heard below:" followed by a text input field. An orange arrow button is located at the bottom right of the interface.

Figure 4. Experimental Group – Perception task

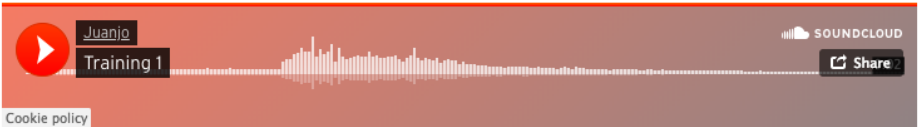
The screenshot shows the Auburn University logo at the top left. Below it, the text reads: "Press 'play' and listen to the following word in Spanish. Then, type the word you heard:". Below this is a SoundCloud player for a track titled "Juanjo 1". The player includes a play button, a progress bar, and a "Share" button. Underneath the player is a "Cookie policy" link and the instruction "Type the word you heard:" followed by a text input field. An orange arrow button is located at the bottom right of the interface.

Figure 5. Experimental Group – Comprehension training task

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UNIVERSITY

In the next section, you will be asked to press 'play' and listen to a word in Spanish. After you listen, you will be asked to translate the word in Spanish to English. If you do not know the meaning of the word, try to guess. For example, you will see:

Press 'play' and listen to the word in Spanish. Then, TRANSLATE the word to English:



Cookie policy

You will write your translation in English below:




Figure 6. Experimental Group – Comprehension task

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Press 'play' and listen to the word in Spanish. Then, TRANSLATE the word to English:



Cookie policy

Now, TRANSLATE the word you heard to English:



Figure 7. Distractor activity – Type 1

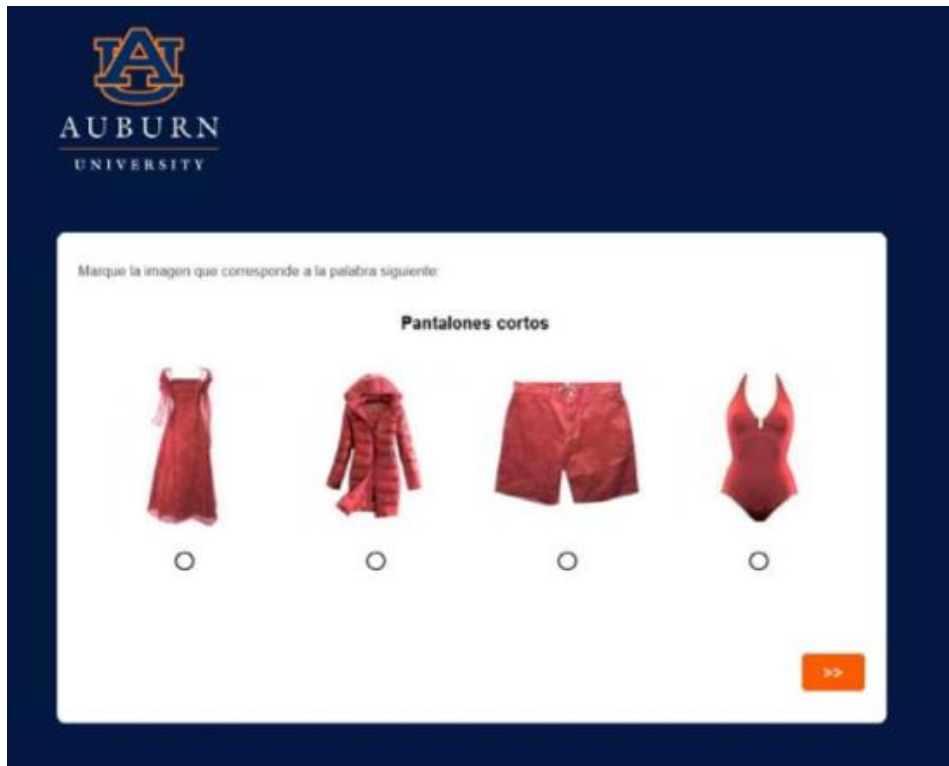


Figure 8. Distractor activity – Type 2

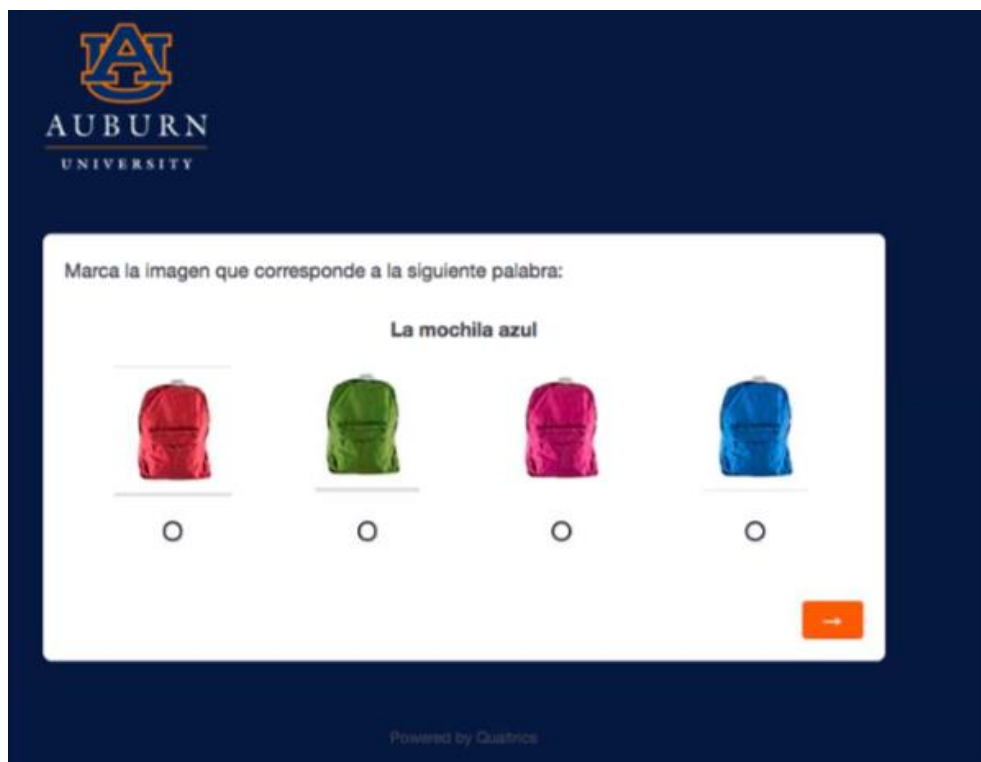


Figure 9. Distractor activity – Type 3


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Marca la palabra que corresponde al siguiente objeto:



la mesa
 las tijeras
 la silla
 los tenedores



Appendix B

Background of Participants

Code Number	Age	Gender	Class level
<i>Control Group</i>			
1	20	M	Intermediate
3	19	F	Elementary
4	19	F	Elementary
7	19	M	Intermediate
8	20	F	Upper
24	20	F	Upper
25	19	F	Elementary
28	19	F	Elementary
36	19	F	Elementary
39	19	F	Elementary
44	22	F	Elementary
54	19	F	Elementary
61	19	F	Intermediate
63	21	F	Elementary
66	19	F	Elementary
71	19	F	Elementary
74	21	F	Upper
80	21	F	Intermediate
81	20	M	Elementary
83	21	M	Elementary
85	20	M	Upper
87	19	F	Elementary
93	21	M	Elementary
94	19	M	Elementary
101	20	F	Elementary
111	20	F	Upper
133	20	F	Elementary
134	21	M	elementary
138	20	M	Upper

151	21	M	Elementary
167	20	M	Elementary
152	21	F	Intermediate
<i>Experimental Group</i>			
5	19	F	Elementary
6	19	F	Elementary
9	21	F	Intermediate
11	19	F	Elementary
12	21	F	Upper
13	21	M	Elementary
19	20	F	Elementary
37	19	F	Elementary
42	19	F	Elementary
45	20	F	Upper
46	19	F	Elementary
56	20	F	Upper
64	21	F	Upper
67	20	F	Upper
78	19	F	Elementary
82	20	M	Elementary
88	53	F	Elementary
89	19	F	Elementary
95	20	F	Elementary
96	20	F	Elementary
98	20	F	Upper
104	20	F	Elementary
106	20	F	Elementary
107	20	M	Elementary
109	20	F	Elementary
115	20	F	Upper
117	21	F	Elementary
128	21	M	Elementary
131	22	F	Elementary
132	20	F	Elementary

Appendix C

Documents of the study

Spanish Language Acquisition Research Study

The purpose of this study is to investigate how learners of Spanish as a Second Language process language, in terms of vocabulary, phonetics, syntax and reading.

Benefits:

- Extra credit (your professor will be informed of your participation once the study is complete).
- A hearing screening free of charge
- Opportunities to practice your Spanish Language skills

Adults 19 years of age or older registered for a Spanish class are eligible.

Responsibilities:

- Read and sign the Informed Consent Letter.
- Complete a background questionnaire.
- Take a complimentary hearing screening with the Department of Audiology.
- Take a Spanish proficiency test.
- Attend the experimental session.

Minor risks involved in the study:

- The risk associated with participating in this study is the disclosure of your name. To minimize this risk, all identifiable data will be stored on an encrypted flash drive which will be kept in a locked box in Dr. Socarras's locked office.
- People may see you completing the steps of the project, as it is being held in a public space.
- To minimize the risks, participants will be assigned a random code number, which will be an anonymizer. Participants will write their code number on all documents required in the study.

Remember: Your participation in this study is voluntary and you are free to leave the study at any stage with no negative consequences.

This study is being conducted by *Juan Berrías*, *Juan José Garrido*, and *Marina Cuartero*, Spanish graduate students from the Department of Foreign Languages and Literatures, under the supervision of **Dr. Gilda Socarrás**.

Please contact us at jig0020@auburn.edu, jzb0122@auburn.edu, or socargm@auburn.edu for more information.

Please write your name and sign below if you agree to the terms and conditions mentioned above:

Name

Signature

Date

Please answer all questions truthfully to the best of your ability and knowledge.

Information provided will be used only for the purposes of the study. Your answers will not affect the evaluation of your performance or your candidacy for bonus points.

Personal information

Name _____ Date _____

Code number _____

Gender M F Prefer not to answer

Age _____ Spanish Instructor _____

Auburn University e-mail address for any notifications _____

Language information

Is English your native language? Yes No

If no, what is your native language? _____

If yes, please list any other languages you speak with native proficiency _____

Have you ever studied a foreign language (not Spanish)? Yes No

If yes, which one(s) and for how long? _____

Please indicate your amount of previous Spanish experience in the table below:

None	1 year of high school or 1 semester of college	2 years of high school or 1 year of college	3+ years of high school, 3+ semesters of college
------	--	--	--

Academic information

What is your academic level and year (freshman, sophomore, first year graduate student, non-degree seeking, etc.)? _____

What is your major at Auburn University? _____

Why are you enrolled in a Spanish class? _____

Why have you agreed to participate in this research? _____



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(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS AN IRB APPROVAL STAMP WITH CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)

INFORMED CONSENT LETTER
for a Research Study entitled
"Processing in Second language Learning"

You are invited to participate in a research study to better understand how learners of Spanish as a Second Language process and understand syntactic structures, vocabulary, and sound in Spanish. The study is being conducted by Juan Berrios and Juan Garrido, Spanish Graduate Teaching Assistants, under the direction of Gilda Socarrás, Associate Professor of Spanish, in the Auburn University Department of Foreign Languages and Literatures. You are invited to participate because you are enrolled in a Spanish language class at Auburn University and are age 19 or older.

What will be involved if you participate? If you decide to participate in this research study, you will be asked to attend an orientation session, take a hearing screening and a language proficiency tests, and complete a Qualtrics survey in the experimental session. Your total time commitment will be approximately 3 hours.

Are there any risks or discomforts? The risk associated with participating in this study is the disclosure of your name. To minimize this risk, we will provide you with an anonymizer at the orientation session which will be associated with your results. All data will be stored on an encrypted flash drive which will be kept in a locked box Dr. Socarras' office.

Are there any benefits to yourself or others? If you participate in this study, you can expect to receive extra credit in your Spanish class. Also, you will receive a hearing screening free of charge. Participants on this research study, give permission to the researchers to conduct a hearing screening test and use the information collected for research purposes. In addition, you will have an opportunity to practice your Spanish language skills. We cannot promise you that you will receive all of the benefits described.

Will you receive compensation for participating? To thank you for your time you will be offered extra credit in the Spanish class from which you were recruited.

If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Department of Foreign Languages and Literatures or the researchers.

6030 HALEY CENTER
AUBURN, AL 36849-5204

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334-844-6378

www.auburn.edu

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02/25/2018 to ---
Protocol # 18-056 EX 1802



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DEPARTMENT OF FOREIGN LANGUAGES AND LITERATURES

Any data obtained in connection with this study will remain confidential. We will protect your privacy and the data you provide by providing you with an anonymizer. Only the researchers will have access to your name. Information collected through your participation may be used to be published in a professional journal and/or presented at a professional meeting.

If you have questions about this study, please ask them now or contact Juan Berrios at jzb0122@auburn.edu, Juan Garrido at jjg0020@auburn.edu, or Dr. Socarrás at socargm@auburn.edu

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334)-844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.

Participant's signature

Date

Investigator obtaining consent

Date

Printed Name

Printed Name

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