HERITAGE AND SECOND LANGUAGE LEARNERS OF SPANISH: THE ROLES OF TASK COMPLEXITY AND INHIBITORY CONTROL

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By

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ABSTRACT

Scholars in language education have called for a research agenda that examines how heritage language (HL) learners re-learn their family language since their experience learning the heritage language differs from that of second language (L2) learners. This dissertation study explores how increasing cognitive demands on tasks, as predicted by the Cognition Hypothesis, may have an impact on the development of the Spanish present subjunctive in adjectival relative clauses in both HL and L2 learner populations, and how individual differences in inhibitory control may mediate learning outcomes. The study also examines how prior language experience across different contexts shapes inhibitory control abilities.

Participants in simple and complex conditions were engaged in a one-way computerized language-learning (CALL) task manipulated differentially by intentional reasoning demands in the complex task. A subset of the participants also completed a stimulated recall session. Following a split-block design, participants completed three versions of an oral and written production task (pretest, immediate and delayed posttests) as measures of learning outcomes. Also, results from an ANT or Attentional Network Task were analyzed to gauge inhibitory control ability.

Overall, and contrary to expected, participants in both experimental conditions performed similarly on the oral production task. However, the learners in the simple condition demonstrated larger net gains and superior performance on the delayed posttest for the written production task, possibly due to how learners allocated their overt attention during task completion as stimulated recall episodes suggest. HL learners in the simple condition benefitted most from the treatment
task. In line with previous literature, HLs were significantly faster at suppressing distracting information during the first block event on the ANT; they also lacked explicit knowledge of the target form, whereas L2 learners verbalized being more aware of the target form as a result of task completion. These findings have implications for task-based approaches for HL development and how different bilingual experiences may lead to various learning and cognitive outcomes.
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CHAPTER 1: PROBLEM STATEMENT

A growing interest has ignited on researching heritage language (HL) speakers and populations from some different fields such as education, linguistics, sociology and cultural anthropology. Despite a trajectory of research that commenced in the 1930s, resurfaced in the 1970s and 80s with Spanish speakers (Valdés, 2005b), it was not until the tragic events of September 11th that the government articulated the existence of ‘a language crisis’ (MLA report, 2007), and the importance of peoples with language resources living in the United States. Therefore, encouraging the use and development of heritage languages has become highly valuable for political and security reasons (Montrul, 2010a), as evidenced by the creation and funding for the National Heritage Language Resource Center from the Department of Education housed at the University of California, Los Angeles (UCLA). Cross-linguistic research from both theoretical and sociolinguistic camps has contributed to the understanding and description of HL speakers’ grammars across linguistic domains (e.g., Au, Knightly, Jun, Oh (2002); Au, Oh, Knightly, Jun, Romo, 2008; Rothman, 2007; Polinsky, 2008, 2011; Kim, Yoon, Montrul, 2010; Montrul & Ionin, 2010; Montrul & Perpiñán, 2010; Montrul & Bowles, 2009; Montrul, 2002, 2004b, 2005, 2007, 2009, 2010b; Silva-Corvalán, 1994, 2001; 2003; Zentella, 1997; Merino, 1983). Researchers have characterized HL speakers’ bilingualism as a case of incomplete acquisition when compared to a native speaker baseline (Polinsky, 1997), issues pertaining to L1 attrition (e.g., Polinsky, 2011) as well as L1 transfer (e.g., Montrul, 2004b). Benmamoun, Montrul and Polinsky (2010) report that due to the differences in learning experiences between the HL and second language (L2) populations, they will develop different types of knowledge. That is, HL learners will have more implicit than explicit knowledge of their language whereas the opposite holds true for the L2 learners. Performance on tasks of both populations suggest that L2 learners tend to do better on more written explicit tasks that exploit metalinguistic knowledge,
and HL learners perform better in more oral implicit tasks. Bowles (2011) utilized an array of assessments that ranged from more to less explicit, and found that HL learners did indeed score lower on the tasks that required more metalinguistic knowledge. These results provide empirical support for the types of knowledge in both populations due to the differences in their proficiency development. Although empirical data have begun to shine light on the grammars of HL speakers, very little is still known as to how these speakers (re)-learn their HL, if they decide to do so.

Despite the rise of methodological prescriptions for teaching HL speakers, some researchers cast doubt on the effectiveness of these methods and have advised for robust research from a (Instructed) Second Language Acquisition perspective on the language development of these speakers as a point of departure (e.g., Valdés, 2005b; Montrul, 2009) --- with the ultimate goal of devising a theory of heritage language acquisition. Interestingly, Ortega (2010) recommends a shift from a monolingual to a more bilingual focus in SLA research since (multi-) bilingualism is the unmarked situation in societies around the world. Sanz (2012) also points out the need for quality instruction of Spanish in different contexts and for populations such as Latinos residing in the U.S. As a result, some studies have begun to look into the language development of HL learners, that is, the speakers who opt to (re)-learn their HL. Some studies include the role of feedback (Gass & Lewis, 2007; Kang, 2010), the possible benefits of different types of instruction (Montrul & Bowles, 2008; Potowski, Kergen & Morgan-Short, 2009) and task-supported interactions (Blake & Zyzik, 2003; Bowles, 2011). Out of the six studies just mentioned, only four studies included an L2 population to make comparisons. As a result, a dire need exists to conduct more research to understand how effective are different pedagogical interventions on the language development of HL learners considering their prior language learning experience and the types of linguistic knowledge they develop (e.g., Benmaoun,
Montrul, Polinsky, 2010) which differ from L2 learners. Also, if theoretical underpinnings and research methods from (Instructed) SLA are to be utilized as a point of departure, it is imperative that researchers conduct studies comparing HL to L2 learners in order to examine more carefully the potential interactions of pedagogical interventions with the HL learning experience. Finally, not only is it important to measure learning outcomes but the role cognitive processes that these learners undergo. So far, only one study, Gass and Lewis (2007), has employed an introspective method known as Stimulated Recall (Gass & Mackey, 2000) to gauge into learners’ perceptions of feedback. Montrul (2008) predicts, “If there is a re-exposure effect, heritage speakers should react faster and better to instruction than L2 learners.” (p. 221). This prediction is based on the assumption that since HL speakers acquired the language prior to a critical or sensitive period (Long, 2007), they still have access to their implicit system and may override explicit processes. However, even though Montrul (2008) mentions linguistic differences and similarities between both HL and L2 population, she does not mention the potential role for how cognitive variables (e.g., inhibitory control) may play in learning outcomes for HL learners since both population of learners (i.e., HL and L2) have developed sophisticated cognitive abilities as adults. SLA research has widely explored the role of individual differences, including those that are based on cognitive variables, and how these may interact with external conditions to account for rate of interlanguage development (see Sanz, 2005).

Task-based Language Teaching (TBLT), a pedagogical approach that promotes the use of tasks as units for the creation of syllabi (Long, 2009; Doughty & Long, 2003), has received much attention from SLA cognitive-interactionist researchers since its premise is based on cognitive and psycholinguistic constraints on L2 learners’ interlanguage development. However, no consensus has been reached on the best way to sequence tasks (Robinson, 2009; 2011). Long (1985) suggested that tasks should be arranged by their level of difficulty, to which the field
refers to as task complexity. Currently, two competing hypotheses, based on an information-processing perspective, differ on their reasoning for the best manner to sequence tasks based on their complexity. Although both hypotheses share many similarities and are preoccupied with the same goal --- to stretch interlanguage development by taking into account issues pertaining to learners’ attentional resources, they approach this endeavor differently. Both hypotheses also invoke Levelt’s Speech Production Model (Levelt, 1989) as a theoretical framework to how learners may allocate attentional resources during task completion --- the Conceptualizer, the component responsible for producing a pre-verbal message that goes into another component, named the Formulator, to get encoded with linguistic information. The Cognition Hypothesis (Robinson, 2001a, 2001b, 2003, 2005, 2010; 2011; Robinson & Gilabert, 2007), inspired by a multiple-resources perspective of attention (e.g., Wickens, 2007), predicts that increasing the cognitive demands of a task prompts learners to invest more attentional demands to conceptualizing a sophisticated pre-verbal response that in turn requires the learners to access the necessary linguistic resources to encode the pre-verbal message, and by directing learners’ attentional resources in this manner, the Cognition Hypothesis predicts that this will lead to more accuracy of output, more uptake, depth of processing and automaticity (Robinson, 2011). On the other hand, the Trade-Off Hypothesis (Skehan, 1996, 1998, 2009; Skehan & Foster, 2001) subscribes to a more limited view of attentional capacity and predicts that tasks that place too many attentional demands on conceptualizing a response, for instance, will have a cost effect on the learner’s formulation of their L2 production.

Most empirical studies have been devoted to testing the Cognition Hypothesis, and this is probably due to the feasibility for operationalizing different variables (e.g., +/- intentional reasoning, +/- here and now) that may contribute to making a task more complex. Robinson posits that increasing task demands by resource-directing and resource-dispersing dimensions
The recommendation is that designing tasks along resource-directing variables (e.g., +/- intentional reasoning) will promote interlanguage development by directing the learners’ attentional and memory resources to conceptualizing a response with the goal to enhance the involvement of working memory capacity to tap into the more complex linguistic encoding needed to produce the message (Robinson, 2011). However, increases in resource-dispersing factors (e.g., +/- planning time) are intended to help learners proceduralize and consolidate interlanguage information available in the developing system. Pedagogical implications as per predictions of the Cognition Hypothesis are available through Robinson’s (2010) SSARC model that provides steps for sequencing tasks in an analytic syllabus. The empirical support for the Cognition Hypothesis has been dubious since some studies find support for the Cognition Hypothesis (e.g., Sercu et al., 2006; Kim & Tracy-Ventura, 2011), partial support (e.g., Révész, 2009; Baralt, 2010) or no support (e.g., Nuevo, 2006; Révész, Sachs & Mackey, 2011) on L2 development. More studies are needed to widen the scope of empirical evidence on sequencing tasks by their complexity and acknowledging both theoretical accounts (Robinson, 2011; Skehan, 2009). Furthermore, most of the studies have examined task complexity alongside with interaction, and very few studies have employed a monologic or one-way flow task (e.g., Sercu et al., 2006). Not many studies have investigated the role of task conditions through a computerized task. Baralt (2010) was the first study to look at effects of task complexity on a dialogic computer-mediated communication (CMC) task. A study in preparation (Révész, Sachs & Hama, 2012) has used a monologic computerized task, although the participants had limited interaction with a proficient interlocutor who provided the participants with recasts. Despite the crucial role of computer assisted language learning (CALL) in language instruction (see Chapelle, 2009) and SLA studies employing computerized treatments to examine different pedagogical interventions (e.g., Rosa & O’Neill, 1999; Rosa &
Leow, 2004; Sanz & Morgan-Short, 2004; Stafford, Bowden & Sanz, 2011), only a couple of studies have adopted the use of a computerized treatment to examine the role of task complexity. Finally, no study-up-to-date has investigated whether or not HL learners can also benefit from task-based instruction to promote their language development, and consequently, if TBLT can be considered a pedagogical approach to address the linguistic needs of these learners. Two studies (Blake & Zyzik, 2003; Bowles, 2011) have begun to look at task-supported classroom interaction between dyads of HL and L2 learners, but no study, to best of my knowledge, has reported on language development.

The field of SLA has studied extensively the role of individual differences (IDs) and how they may mediate, for example, learning outcomes and noticing during interaction (e.g., Dörnyei, 2005) --- whether it is affective variables such as anxiety (e.g., Baralt & Gurzynski-Weiss, 2011) or cognitive variables as working memory capacity (e.g., Mackey et al., 2002). Both the Cognition Hypothesis and Trade-Off Hypothesis recognize the impact that individual differences may have as learners complete a task. Some studies testing the predictions of the Cognition Hypothesis have included IDs to determine if these moderate language performance. For example, for working memory capacity, Niwa (2000) in Robinson (2005) reports on how working memory capacity mediated results on L2 development on complex tasks, Kormos and Trebits (2011) found that the production of more complex clauses during narratives correlated with higher working memory; Baralt (2010), however, did not find a beneficial role for working memory on L2 development. Additionally, Robinson’s (2007) and Kim and Tracy-Ventura’s (2011) findings suggest that participants’ levels of anxiety affect performance on tasks and Albert (2011) discusses how learner creativity had an influence on participants completing the more complex task. Researching IDs and their role on task performance is a worthwhile endeavor since they can be pivotal for syllabus designers that must address individual learner
needs. Therefore, more research that includes IDs is needed for both affective and cognitive variables, but also for learners whose linguistic profile may differ as well --- i.e., HL learners.

The field of Cognitive Psychology spends research effort on exploring the role of different executive functions (e.g., working memory, executive control), most of which are subserved mainly by the prefrontal cortex of the brain (Abutalebi & Green, 2007). Executive control can be defined as cognitive mechanism that allows an individual to allocate her/his attentional resources to particular stimuli. The ability to suppress misleading stimuli that tends to be visually or acoustically salient is referred to also as inhibitory control (e.g., Bialystok, 2007). Individuals with severe dysfunctions in inhibitory control are diagnosed with Attentional (Hyperactivity) Deficit Disorder (e.g., Denckla, 2007) while others can demonstrate superior abilities (e.g., Borkowski & Peck, 1986). Ellen Bialystok and colleagues have conducted studies suggesting that early bilingual language experience grants a superior capacity to inhibit distracting stimuli (e.g., Bialystok, 1999, 2006, 2007, 2009; Bialystok, Craik, Klein and Viswanathan, 2004; Martin-Rhee & Bialystok, 2008; Bialystok, Craik and Luk, 2008; Costa, Hernández & Sebastián-Galles, 2008; for a meta-analysis, see Adesope, Lavin, Thompson & Ungerleider, 2010). This cognitive advantage in inhibitory control for early bilinguals is credited to their experience inhibiting the use of one of their languages while using the other (Green, 1989). However, not many studies have investigated if these advantages hold true for bilingual experiences across contexts, that is, examining levels of proficiency in both languages or whether advantages are for biliterates, for example. Researchers suggest that individual bilingualism can take different forms contingent on external conditions such as societal bilingualism and access to bilingual programs (e.g., Sanz, 2000a). Two studies have attempted to examine how different bilingual experiences may affect executive control --- Stafford (2011) and Finger, Billig and Scholl (2011). Stafford looked at early vs. late bilinguals while Finger and
colleagues examined low levels of literacy in one of the languages. No conclusions can be derived from these two studies since sample sizes were small and they only report on descriptive statistics, that is, trends in the data. As a result, more studies are needed to explore the interaction between different bilingual experiences and inhibitory control. Finally, although the field of SLA has studied the role of working memory capacity, only one study (Linck & Weiss, 2011) has looked into the role of inhibitory control and how it differentially affects L2 development. This longitudinal study found that inhibitory control seems to not play a role in beginning L2 learners’ development of explicit knowledge. However, it is obviously too preliminary to discard inhibitory control as a possible cognitive variable that contributes to learners’ language aptitude.

Therefore, this study, under a cognitive-interactionist theoretical framework (Long, to appear) proposes to address task-based approaches in both the linguistic development of HL and L2 learners by testing the predictions of the Cognition Hypothesis and Trade-Off Hypothesis on how increasing cognitive demands of a task may affect language performance. The study will operationalize task complexity via +/- intentional reasoning as proposed by Peter Robinson in the Cognition Hypothesis in promoting the development of the present Spanish subjunctive in adjectival relative clauses (e.g., Campos, 1993). The learners in this study will engage in a monologic computerized task that will require them to describe certain individuals’ behaviors, and the complex experimental condition will differ in that the participants need to choose among different options (i.e., intentional reasoning) to explain the behavior. Furthermore, the study investigates how participants’ individual differences in inhibitory control based on previous bilingual experience may also play a role in task-based learning outcomes. Hopefully, the results of this dissertation study will have implications for the effective creation of tasks by taking into account task-design features that are most appropriate for promoting HL and L2 development.
CHAPTER 2: REVIEW OF THE LITERATURE

This chapter will present a review of pertinent literature that describes the state of knowledge on the issues raised in the previous chapter. It summarizes theoretical and empirical studies on the experiences of heritage language learners, the role of task complexity on L2 learning opportunities and development and inhibitory control as a result of early bilingual experience and as an individual difference. The chapter ends with the proposed research questions and hypotheses for the current study based on the literature.

2.1 Heritage Language Learners

2.11 Defining Heritage Language Learners

According to Cummins (2005), the term *heritage language* (HL, henceforth) was coined in Canada during the 1970s, and it definitely came into use as a result of the organization of the Ontario Heritage Languages Programs in 1977; and then, it became a popular term in the United States during the late 1990s for language policy purposes. Cummins describes speakers of HLs as individuals who “learned their language as their home language (L1), or who have some form of family or ‘heritage’ connection to the language.” (p. 586). Researchers have approached defining HL experience from a socio-historical perspective (Fishman, 2001); acquisition of the HL in a naturalistic setting (Scalera, 2000); participants of a speech community (Erick & Schultz, 1982); use of a non-English language at home (Campbell & Peyton, 1998); highlighting cultural and sociopsychological identities (Hornberger & Wong, 2008); and learners who appear in a foreign language classroom in need of instruction in their heritage language (Valdés, 2001). In sum, characterizations of HLs are categorized into two domains as suggested in Polinsky and Kagan (2007): cultural and linguistic practices mainly through family interaction. Whether a researcher embraces a more cultural or linguistic approach, the reality is that individuals’ knowledge of the HL may range from none to native-like proficiency. Moreover, a distinction
exists between those individuals who are in the ‘wild’ (i.e., a non-school context) using their HL, that is, *heritage language speakers*, and those individuals who enter a classroom setting to (re)-learn the HL, also referred to as *heritage language learners*.

This dissertation is concerned with *heritage language learners* (HLL), that is, those individuals who opt to relearn their HL, especially during the time of adolescence upon entering high school or college, for example, and who did not have any academic education background in their HL during elementary and most, if not all, middle school years. However, they utilized during childhood, and continue to use to some extent their HL in their household and/or communities. Based on this description, it seems most appropriate to adopt the definition set forth by Valdés (2001) that describes a HL learner (HLL) as “a student who is raised in a home where a non-English language is spoken, who speaks or at least understands the language, and who is to some degree bilingual in that language and in English.” (p. 38). Unlike second language learners (L2), Valdés also explains that a HLL enters the classroom with some functional knowledge of the language being taught that was acquired most often in a naturalistic environment in the home and/or community; and thus, representing a major trait that differentiates them from traditional L2 students. Due to some issues as the heterogeneity of the HLL population, the lack of heritage language teacher education programs and the need for curriculum and instructional guidance, many school systems and educators struggle to provide effective instruction to HLL to meet their linguistic needs. Although endeavors to create different types of curricula (see Kondo-Brown, 2010) and instructional materials for these types of language learners have emerged in recent years often modeling foreign language programs, some researchers have cast doubt on the effectiveness and lack of empirical support of adapting foreign language methods for promoting HL development in classrooms. Therefore, researchers have called for a research agenda utilizing (instructed) second language acquisition research
tools, as point of departure, to examine HLL development as well (e.g., Lynch 2003; Valdés, 2005a; Montrul, 2009). Some of the questions that researchers need to address include the following: what does it mean to have some functional knowledge of the HL? How does this knowledge, especially as adolescents/adults, play a role in the further development of the HL in a classroom context? How does the experience of growing up with the HL affect an individual’s social, psychological and cognitive processes? These are important questions to consider when addressing some of the following challenges posited by Valdés (2001): theoretical foundations for instruction, teacher education and educational policy to guide curriculum development.

2.12 Characteristics of Heritage Language Learners

Some researchers have studied the impact of the social context of these bilinguals and how their communities help shape their identities and language use. Ochs (1992) states, “… in any given actual situation, at any given actual moment, people in those situations [in bilingual/multilingual situations] are actively constructing their social identities rather than passively living out some cultural prescription for social identity.” (p. 11). Ochs’ quote can be applied to Zentella’s (1997) longitudinal anthropological linguistic approach to examine New York Puerto Ricans’ (NYPR) use of their multi-dialectal repertoire and how this plays a role in the construction of their identities, ideologies and attitudes. In the community, Zentella notes that these NYPR children used Spanish (their HL) for singing, praying and conversing with bodegueros (i.e., owners or workers in a grocery store) whereas English was used for physical activities, T.V. programs and U.S. American movies. Furthermore, hours of tapes of children’s conversations indicate a predominant use of English most of the time with the exception of Spanish loans, expressions and code switches. Zentella also describes how the “English-only” movement of the 1980s influenced heavily on the process of assimilation and language shift to English monolingualism in the community. This shaped some caregivers’ attitudes on home
language use, which is passed on to the children. According to Zentella’s data on five bilingual children she observed, these environmental factors in the community and at home played a role on the non-standard variation of certain Spanish morphemes for tense, mood and aspect. As a result, Zentella urges teachers to consider the social context that influence HL speakers’ dialect development which many times is not a standard variation. However, teachers also should look at the strengths that these learners already bring with them into the classroom, and build on them to help these learners achieve “bilingual excellence” (p. 279). To achieve this, teachers must avoid negative attitudes toward HL learners’ non-mainstream social contexts that have influenced their linguistic repertoire.

Silva-Corvalán’s (e.g., 1994, 2001, 2003) research on societal bilingualism and language contact has highlighted the importance of examining language transfer and extralinguistic factors such as attitudes, language as a mean of communication in different contexts, the ethnic value of languages and policies on bilingual and bicultural education on language maintenance. Most of her research has taken place in a Los Angeles with Mexican-American bilinguals. Silva-Corvalán (2003) discusses how children’s various interactions in their social environment with the HL language affects their proficiency since it tends to interrupt the process of normal acquisition. Some of these experiences include but are not limited to television, English-only daycare and split-language homes. Furthermore, in the context of subtractive bilingualism, many school children, due to the focus on learning the dominant school language, fail to develop a more complex linguistic system in their HL. This leads to repercussions of HL adults developing reduced or simplified linguistic systems, especially in the area of morphosyntax. Silva-Corvalán (1994) found how the length of residence of family stay in Los Angeles of different immigrant groups correlated with the loss of subjunctive use.
Lynch (2003) has called for research that looks at the HL speakers’ sociolinguistic discontinuities in social networks in which HL speakers may interact. These social networks may be comprised of a heterogeneity group of HL speakers with different proficiency levels but share common sociocultural backgrounds. He sums up that English is the language of everyday use of Spanish HL speakers, English is the “socially” preferred language and that most HL speakers do not view that speaking Spanish makes a person “Hispanic” or “Latino.” Therefore, he recommends educators to compare HL learners to advanced L2 learners of Spanish and not native speakers of Spanish since both populations are English-dominant. He views the comparison of HL to native speakers as socially unjust and linguistically inaccurate. Valdés, González, García and Márquez (2008) studied the social interactions of HL speakers in an academic Spanish department at a university and how this plays a role in shaping language ideology and maintenance. The interviews with faculty members, lecturers and graduate students demonstrated a belief on the notion of an “educated native speaker.” They also characterized academic Spanish as a special professional discourse, a register that has particular features and an error-free language. Therefore, daily interactions between U.S. Latinos and other members of the department are based on speaking the language like a monolingual educated native speaker. The researchers suggest taking into account societal bilingualism, language contact, second dialect learning in order to understand clearly how two languages play a role in a HL speaker’s life. These issues need to be considered for the teaching of HL programs to be successful.

Beckstead and Toribio (2003) studied the views of Latino adolescents’ perceptions of the status of Spanish and English in their communities as well as the language attitudes in a suburban junior high school of Santa Barbara, California. The researchers report that participants placed a high value status on the use of both Spanish and English in their communities. Beckstead and Toribio state that this high value may be due to the positive school environment
associated with Spanish. As far as language attitudes, the participants embrace English due to more instrumental reasons like succeeding educationally and obtaining good employment. Their attitudes toward the maintenance of Spanish is more linked with their cultural or Latino identity. According to the researchers, the administration of surveys and language questionnaires can be added to the curricula of middle/junior and high schools. It also can foster peer discussions among teachers and create an affective environment of engagement among students.

Parodi (2008) presents psychological and attitudinal characteristics of HL speakers that a model of HL teaching must take into account. Parodi discusses the roles of insecurity and stigma as two of the most salient psychological issues. HL learners need help in overcoming insecurity issues about their Spanish in academic environments. Therefore, teachers should explain the advantages of being bilingual, first language acquisition and how Spanish in Latin America is closely related to their vernacular variation. This is a technique that may help eradicate the stigma of their vernacular variation. HL learners need help in recognizing that code switching, lexical borrowing and semantic extensions are typical of bilingual speech, and that many speakers of the standard variation will consider these features as inappropriate. A model of HL teaching should educate speakers of the contexts of when to use these bilingual speech features and how to deal with the stigma attached to them.

Duff (2008) presents a summary of research associated with language-related identity issues in Canada. She reports a study (Kouritzin, 1999) that examined the psychological impact of HL loss on the life stories of people from different ethnic backgrounds. Kouritzin’s participants reported feelings of anger, frustration, shame and disappointment caused by HL loss. This also negatively affected relationship with family members and even creating new friendships with the HL community members. This has lead to a negative self-image and views of their ethnic culture and unable to feel integrated with the HL or English-dominant culture.
Guardado (2002) interviewed and observed four Hispanic immigrant families in British Columbia and reports that HL maintenance was promoted by strong and positive L1 identity. Chumak-Horbatsch (1999) reports a longitudinal study of Ukrainian-speaking children who successfully maintained their L1. The data reveal a strong relationship between the children’s perception of themselves as bilinguals and their bilingual status. This was also fostered in the church and community school as support for the HL. Duff sees the need for HL programs to promote intercultural understandings, positive ethnic identification and internationalism, and this can be accomplished through teacher education and engaging pedagogical materials.

2.13 Linguistic Development of Heritage Language Speakers

To study the language development of HLL, it is logical and imperative to understand the characteristics of these learners’ language repertoire. A number of crucial theoretical and psycholinguistic studies examining the grammars of HLL have helped to shed light on describing the linguistic abilities of these learners. In general, researchers suggest that some subcomponents of HLL linguistic domains (e.g., lexis, morphosyntax and pragmatics) may have not been completely acquired, undergone attrition or change due to contact with another language or variety of the HL. This may be attributed to a decline in input and use of the L1, lack of literacy skills and formal education in the HL or even the age of onset of bilingualism; as a result, the L2 becomes the dominant language of these bilinguals (Montrul, 2008; Rothman, 2007; Valdés, 2006) which would be English in the case of the United States. Therefore, especially in the domain of morphosyntax, the grammars of HLL tend to demonstrate evidence of either absence, simplification or overregularization of morphosyntactic structures that do not mirror the more complex systems of their caregivers or peers living in a country where the heritage language enjoys a majority status (Montrul, 2010). In comparing HL to L2 speakers, Montrul (2008) notes that based on some available empirical evidence, both speakers’ linguistic grammars undergo
developmental and transfer errors, may become fossilized, outcome is variable proficiency and typically incomplete, and personality and affective factors also play a role. Despite some similarities on proficiency development between HL and L2 speakers (e.g., developmental errors, transfer, variability), HL proficiency development has its distinct characteristics that set it apart from L2 proficiency. Basically, some of these traits are shared with L1 acquisition (e.g., Montrul, 2008). Children acquire their L1 mostly through implicit learning, that is, acquiring knowledge without awareness or intention (Rebuschat, forthcoming). In fact, some researchers (e.g., Pinker, 1989) cast doubt on whether a child will benefit from negative evidence from caregivers by figuring out when to modify a syntactic rule based on explicit corrective feedback. Furthermore, Bley-Vroman’s (1988) Fundamental Difference Hypothesis posits that children rely on implicit learning mechanisms whereas adults need to rely on more problem-solving strategies.

Researchers in HL acquisition concur that most of a HL speakers’ proficiency development, if not all, is based on implicit learning given their childhood experience with the language. Another characteristic that differentiates HL and L2 proficiency development is related to issues of modality. HL speakers predominantly learn their HL through an aural mode. Since most HL learners enter a school system that does not support the literacy development of the HL (for those HL that have a written system); and thus, hindering the possibilities of these learners becoming biliterate bilinguals (e.g., Hornberger, 1990), many only become literate in the school dominant language. This results in limiting HL speakers’ usage of the language to oral and informal communication. Meanwhile, L2 learners’ experience with the language begins and is mostly taught through written input. These types of input lead to different processes and representations of the language in both populations.

Benmamoun, Montrul and Polinsky (2010) report that due to the differences in learning experiences between the HL and L2 populations, they will develop different types of knowledge.
That is, HL learners will have more implicit than explicit knowledge of their language whereas the opposite holds true for the L2 learners. The performance on tasks of both populations suggest that L2 learners tend to do better on more written explicit tasks that exploit metalinguistic knowledge, and HL learners perform better in more oral implicit tasks. Bowles’ (2011) study on the utilization of an array of assessments that ranged from more to less explicit found that HL learners did indeed score lower on the tasks that required more metalinguistic knowledge. These results provide empirical support for the types of knowledge in both populations due to the differences in their proficiency development.

2.14 Empirical Studies on Heritage Language Grammars

Many researchers have examined the linguistic repertoires of heritage language speakers/learners. Au and colleagues (e.g., Au, Knightly, Jun and Oh, 2002; Au, Oh, Knightly, Jun, Romo, 2008) have conducted research on phonological and phonetic characteristics of HL speakers, and if “overhearing” a language during childhood is sufficient to develop native-like proficiency in this linguistic domain. Au et al. (2002) measured the voice onset time (VOT) of Spanish HL speakers’ for the stop consonants /p, t, k/. The VOT for English consonant stops usually last 30 to 50 seconds longer than the Spanish ones. Additionally, they conducted acoustic analyses on Spanish HL speakers’ production of lenited consonants /b, d, g/ in intervocalic position since these rules do not exist in English. The results suggest that HL learners’ VOT and lenited consonants mirrored those of the Spanish native speaker group and not the L2 learners’ results. Au (2008) reports results of Korean HL speakers’ perception of the following three minimal triplets: plain (/t/) , aspirated (/tʰ/) and tense (t’). The HL speakers outperformed the L2 learners in the phoneme perception task. Au and colleagues’ research suggest that even low-proficiency HL speakers can develop a nativelike accent with minimal input unlike their L2 counterparts.
Rothman (2007) compared heritage speakers to the educated native speakers and advanced proficient L2 speakers of Brazilian Portuguese of Rothman and Iverson (2007) who demonstrated the acquisition of inflected infinitives (INFL-parameter) in their grammars. However, when utilizing the same interpretive and grammaticality judgment tasks as Rothman and Iverson (2007), the results suggest an absence of inflected infinitives in the grammar of the heritage speakers to which Rothman attributes to a lack of literacy skills/formal education in Brazilian Portuguese when this structure is fully acquired. Polinsky (2008) studied heritage speakers’ production and interpretation of gender assignment in Russian. The results of two experiments revealed some discrepancies in gender assignment between the heritage and native speaker participants. While the native speakers had no trouble interpreting or producing gender agreement in Russian (i.e., masculine, feminine and neuter forms) for all nouns; on the other hand, for the production task, heritage speakers had problems with neuter nouns and feminine nouns ending in a palatalized consonant, and problems interpreting feminine and neuter word pairs of nouns and adjectives. Although the performance within the heritage speaker participants seemed to vary according to proficiency level, the heritage speaker data suggest that they have a more simplified Russian gender system. Kim, Montrul and Yoon (2010) examined two groups of heritage language participants (simultaneous Korean-English bilinguals and late L1 Korean-English bilinguals) to late L2 Korean-English bilinguals and Korean monolinguals’ interpretation of anaphoric binding of the Korean reflexive caki. The researchers utilized a truth value judgment task in which participants first read a short story in English, and then had to provide the interpretation of a Korean sentence following the story. The target items contained either an anaphoric binding violation in both English and Korean or just in Korean. Results of participants’ judgments on the target sentences, that is, true for accepting binding relations or false for rejecting them, showed similar performances between simultaneous and L2 Korean bilinguals,
and between late L1 Korean bilinguals and Korean monolinguals. The data reveal that both simultaneous and L2 Korean bilinguals did not reject sentences with anaphoric binding violations for just Korean suggesting possible transfer from English, and that age of onset of bilingualism may contribute to incomplete acquisition in bilinguals since the late L1 Korean bilinguals (or attriters as also referred to in this study) performed similarly to the Korean monolingual group.

Montrul and Perpiñán (2008) compared instructed HL and L2 learners on assessment tasks that measured linguistic knowledge of tense, mood and aspect (TAM) morphology in Spanish. The study also included participants from low to advanced proficiency levels. Both HL and L2 groups seem to acquire functional morphology for aspect and mood; however, they still differed from native speakers’ full command of TAM. For aspect, the trend in the data suggests that HL learners’ semantic interpretation of aspect outperformed that of L2 learners, but the L2 learners showed better command of inflectional morphology of aspect. Both HL and L2 learners demonstrated more accuracy with the use of the indicative than the subjunctive. Even though both groups had problems with the entailments of indicative and subjunctive forms when compared to the native speakers, the HL learners were less accurate than the L2 learners with the subjunctive. Overall, it seems that the HL learners had an advantage over the L2 learners in the interpretation of aspect but not mood. The researchers explain that this may be attributed to the fact that aspect is acquired earlier than mood in L1 acquisition. L2 learners’ performance on morphology may be due to their experience learning verbal paradigms, and this may have been advantageous when completing the morphology recognition tasks. Montrul (2010b) compared both HL and L2 learners’ knowledge of clitics in Spanish and found that both groups performed well on assessment tasks. The results suggest that HL speakers did appear to show more native-like knowledge of clitics, especially during an oral task than L2 learners.
2.15 Pedagogical Interventions for HL Learners

Blake and Zyzik (2003) explored the interactions of HL with L2 learners through computerized-mediated communication (CMC) with the main goal of investigating how both groups of learners negotiated meaning during the completion of a two-way jigsaw task. Eleven HL-L2 dyads interacted to search for an apartment in which both participants have a portion of information and had to communicate with each other in order to complete the task. And, of course, this interaction occurred by chatting on the computer. The researchers analyzed the transcripts of the interactions and found that learning opportunities emerged as a result of negotiation, and these included, for example, clarification requests, recasts and self-correction. Another observation was that these meaning negotiations appeared to be more favorable for lexical items and both groups benefitted from the interaction.

Gass and Lewis (2007) studied and compared how HL and L2 learners perceive feedback during interaction. The study was a follow-up to Mackey, Gass and McDonough (2000) who found that L2 learners seem to perceive more accurately lexical and phonological corrections than morphosyntactic ones. They examined 13 L2 learners and 6 HL learners enrolled in a beginning or intermediate IFL (Italian as a Foreign Language) course. All participants in the study interacted with a native speaker on a “spot the difference task,” in which both interlocutors received a similar picture and needed to find the differences between the pictures. The native speaker interlocutor provided feedback to non-targetlike utterances when appropriate related to lexis, phonology, morphosyntax and semantics. An immediate stimulated recall session followed to elicit recall comments to feedback episodes during the interaction. The stimulated recalls reveal that both L2 and HL learners perceived more accurately feedback related to lexis and phonology than morphosyntax corroborating results with Mackey et al. (2000). However, the
recall sessions also suggest that the HL participants better perceived semantic feedback episodes (70%) than the L2 learners (10%) during the dyad interaction.

Montrul and Bowles (2008) tested whether exposing 45 HL speakers of Spanish to metalinguistic information and practice exercises that involved delivery of explicit feedback when appropriate on the dative object marker “a” and gustar type verbs led to learning gains. The study employed a pretest-immediate posttest design. As measures of learning outcomes, the participants completed an elicited written production task and a written grammaticality judgment task. The findings suggest that HL learners did better on the immediate posttest overall; however, the gains were greater for the written production task as some of the participants did not improve rejecting ungrammatical sentences that contained omission of the dative object marking with animate and specific objects.

Potowski, Jegerski and Morgan-Short (2009) examined the effectiveness of traditional and processing instruction along with feedback on the development of the Spanish imperfect subjunctive as demonstrated on interpretation (aural mode) and production (written mode) tasks as well as a grammaticality judgment test (written mode) on a pre to posttest design. They only compared HL learners to a HL control group that received no treatment and only attended regular class sessions. The results show that both HL and L2 learners significantly improved from pre to posttest under both types of instruction for both interpretation and production tasks; however, only the L2 learners demonstrated improvement on the grammaticality judgment test. Another significant finding was the effect size of treatment for the interpretation and production tasks. The researchers report that effect size differed between both populations showing significant stronger net gains for the L2 learners on both tasks.

Kang (2010) studied the role of negative evidence in HL learners of Korean. Kang only looked at HL learners who were assigned to four experimental conditions that manipulated the
explicitness (explicit vs. implicit) as well as positioning (proactive vs. reactive) of negative evidence to incorrect use of past tense morphology in Korean. It is worthwhile mentioning that the explicit group condition varied from providing the learner with metalinguistic terminology (e.g., Don’t use the present tense hay yo when talking about what happened yesterday. Say hay-ss-eyo) to simply giving instructions (e.g., When talking about the what happened yesterday, don’t use –ess after apa-. Use –ass instead.) to use the correct past tense morpheme over the incorrect one. The implicit group may have received anything from reformulation (e.g., Yesterday, this person slept?) to full repetition (e.g., Did you say, “This person sleeps yesterday?”) of the incorrect utterance. The participants engaged in two dyad communicative tasks with the researcher --- story sequencing and a spot the difference task. The results of a grammaticality judgment task suggest that the explicit/reactive and implicit/reactive participants outperformed the control group, but no differences were found between both groups. For the picture description test, all three groups (i.e., explicit/proactive, explicit/reactive and implicit/reactive) outperformed the control group but no significant differences among the three groups. Overall, the results suggest that negative evidence seem to help HL learners’ development of morphosyntax.

Bowles (2011) investigated the role of modality in the interaction between pairings of HL and L2 learners while engaging in a spot the difference task, written crossword puzzle task and a collaborative writing task. The participants were 18 college-aged learners in a communicative Spanish classroom; half of the participants were monolingual while the other half heritage learners and were match on proficiency based on sections of the DELE test. For the spot the difference task, the learners had drawings of a kitchen with different objects and had to match the pictures without looking at each other’s version of the drawings. The crossword puzzle task consisted of learners having a crossword puzzle to complete and relied on their partner who had
half of the clues. The learners collaborated together during the third task to complete two love stories using verbs in the past tense and then had to write an original ending for the love stories. Bowles analyzed the language related episodes (LRE) of participants during completion of the tasks. Even though the study reports that both HL and L2 learners initiated about an equal number of LREs for all tasks, the nature of the LREs was qualitatively different. The HL learners seemed to rely on their L2 partner for issues of orthography and accent placement for the written tasks whereas the L2 learners benefitted from HL learners’ lexical knowledge.
2.2 Task Complexity in Second Language Acquisition

2.21 Tasks and Second Language Acquisition

Tasks have been a topic of inquiry in the field of SLA for over more than a decade since its inception (Long, 1985). Researchers in the field encourage the use of tasks as a unit of analysis to promote interlanguage development (e.g., Long, 2009; Doughty & Long, 2003). This research area has lead to Task-Based Language Teaching (TBLT), a form of language pedagogy that aims at helping L2 learners with their second language development by engaging them in meaningful tasks that imitate the real world. Researchers have posited an array of definitions for the construct of task (e.g., Long, 1985; Prabhu, 1987; Wright, 1987; Nunan, 1989; Skehan, 1998; Swales, 1990; Bygate et al., 2001; Ellis, 2003; Samuda & Bygate, 2008; Norris, 2009). For example, tasks need to be “problem-posing activities” (e.g., Candlin, 1987); tasks need to be “goal-oriented” in order to receive the status of a task as well as co-constructed by both teacher and student (Swales, 2009); a task is primarily based on meaning (Ellis, 2000); a task serves to raise learners’ awareness of the functional use of a linguistic item (Norris, 2009). This study adopts Ellis’ (2003) definition for tasks since it is probably the most comprehensive of all definitions. Ellis (2003) states, “A task is intended to result in a language use that bears a resemblance, direct or indirect, to the way language is used in the real world. Like other language activities, a task can engage productive or receptive, and oral or written skills, and also various cognitive processes.” (p.16).

A few research strands in SLA have utilized tasks in order to examine its effects on L2 learning. For example, research inspired by The Interaction Hypothesis (Long, 1996; Gass & Mackey, 2007) has employed tasks to observe if the interaction among different types of interlocutors (i.e., a native speaker with a non native speaker or a teacher and a student) while completing a task facilitates L2 development. The completion of the task will provide learners
with opportunities to negotiate meaning and produce comprehensible input in order to stretch interlanguage development (Long, 1989; Pica, 1994). Second, based on The Output Hypothesis (Swain, 1998), Swain proposes that tasks should allow learners to reflect and test their hypotheses of the language through production. Finally, information-processing models such as the Limited Attentional Capacity Model (Skehan, 1996, 1998; Skehan and Foster, 2001) and The Cognition Hypothesis (Robinson, 2001a, 2001b, 2003, 2005, 2007, 2011) have utilized tasks within a cognitive and psycholinguistic framework to determine how learners allocate their attentional and memory resources during the completion of a task, and how this affects global measures of complexity, accuracy and fluency in the L2.

2.22 The Construct of Task Complexity

One of the unresolved issues in TBLT or using a task as a unit of analysis is its selection and sequencing (Robinson, 2009). The organization of tasks that would respect the internal syllabus of the L2 learner as propagated by supporters of an analytic syllabus design has received much attention; and therefore, some researchers have suggested the examination of the complexity of a task, that is ranging tasks from easy to more difficult, as a manner of sequencing tasks on a syllabus (e.g., Long & Crookes, 1992). Some early accounts of task complexity in SLA (Fleishman, 1978 cited in Crookes, 1986; Long, 1985; Crookes, 1986; Candlin, 1987; Brindley, 1987; Nunan, 1989) described that tasks can have different levels of difficulty. The level of difficulty depends on various factors including but not limited to: procedures, steps needed, number of parties, cognitive load, number of elements and grammatical accuracy to name a few. The earlier literature on task complexity also highlighted the difference between the complexity of the task and the performance of the individual (Crookes, 1986).

However, currently, Robinson (2001b) defines task complexity as “…the result of the attentional, memory, reasoning, and other information processing demands imposed by the
structure of the task on the language learner.” (p. 29). Skehan (1996) and Skehan and Foster (2001) state that language, cognition and performance factors comprise task difficulty and complexity. Language relies on the level of the target structure; cognition refers to cognitive complexity of the task; and, performance relates to communicative stress such as time pressure, modality, stakes and opportunity for control (Skehan & Foster, 2001). Furthermore, Robinson (2001b) describes task complexity “as a series of options which can be manipulated to progressively increase the cognitive demands of pedagogic tasks, so they approach the full complexity of the target task.” (p. 292).

Currently, two competing approaches in SLA, Skehan’s Trade-Off Hypothesis (Skehan, 1996, 1998; Skehan and Foster, 2001; Skehan, 2009) and Robinson’s Cognition Hypothesis (Robinson, 2001a, 2001b, 2003, 2005, 2007, 2010), offer two different views on predicting the impact of task complexity within an attentional framework. In other words, the approaches seek to explain how L2 learners allocate their attentional resources while being engaged in a complex task, and this is crucial since Schmidt (1993, 1995, 2001) claim that the role of attention in SLA plays an important role in order to explain interlanguage development. Schmidt’s noticing hypothesis claims that noticing, that is, both attention and some level of awareness of the input is what gets processed as intake for learning to occur (Schmidt, 1995). Therefore, “…SLA is largely driven by what learners pay attention to and notice in target language input and what they understand the significance of noticed input to be.” (Schmidt, 2001: p. 3 & 4). Recently, both Skehan (2009) and Kormos (2011) also point out the importance of relating findings of task complexity to a psycholinguistic speech production framework such as Levelt’s (1989)’s speech production model and how it relates to L2 speech (see Kormos, 2006). In their proposals, Kormos (2011) and Skehan (2009) attempt to link the role of attentional resources to the processes involved in L1 and L2 speech production.
2.23 Skehan’s Trade-Off Hypothesis

Skehan (1996) proposes a framework for task sequencing based on three general categories that include code complexity, cognitive complexity and communicative stress. Code complexity refers to the difficulty of the linguistic structure (i.e., complex tenses or subordination are examples of more complex items). Cognitive complexity is concerned with the content of the task and learners’ manipulation of this information, and is based on factors such as cognitive familiarity (i.e., a learner’s prior knowledge of the topic, discourse genre and task) and cognitive processing (i.e., organization, clarity and sufficiency of information and amount of computation of the task). Communicative stress or performance conditions refer to the role of time pressure, modality, stakes and opportunity for control on the outcome of tasks. Skehan draws from a limited-information capacity view of attention, that is, L2 learners are unable to allocate resources to both form and meaning during the completion of a task. If the learner’s attentional resources are used up by the cognitive demands of a task, this distracts the learner from paying attention to the linguistic structure. According to Skehan, unlike native speakers who have more automatized knowledge of their language, L2 learners’ linguistic knowledge tends to be more declarative and they access it through controlled processing. As a result, more complex tasks will require more attentional resources to the content of the task and limit attention to linguistic items (Skehan & Foster, 2001).

Skehan and Foster point to VanPatten’s (1990) empirical study that measured Spanish L2 learners’ ability to process both content and form. Participants from three proficiency levels were assigned to four task groups that involved listening to a Spanish passage, and who were instructed to listen for the content of the passage while simultaneously paying attention to different linguistic items. The participants in task group 1 (control group) only had to listen to the passage for content; task group 2 needed to listen for content and note every time they heard
the Spanish word *inflación*; task group 3 listened for content and noted the definite article *la*; and task group 4 also listened for content as well as for the verb morpheme –*n*. The participants in the experimental groups had to write a check on a blank piece of paper every time they heard their respective linguistic item. VanPatten coded free written recalls (an off-line comprehension measure) using an idea unit analysis to assess participants’ attention to content. VanPatten reported, especially for beginning learners of Spanish, that learners are unable to pay simultaneous attention to both form and content. Skehan’s Limited Attentional Capacity Model also claims, due to L2 learners’ limited attention capacity, that learners’ performance is contingent on whether they are completing a task with a focus on fluency and meaning, or a focus on form for accuracy and complexity development. If a learner is completing a task with an emphasis on focus on form, his or her attentional resources will be competing for accuracy or complexity (Skehan & Foster, 2001). Finally, Skehan and Foster highlight the relevance of exploring how individual differences may play role during task performance.

In Skehan (2009), he proposes the Trade-Off Hypothesis, an update to his theoretical position on the effects of increasing task demands, still maintains that attention and working memory are limited and demanding L2 performance in one of the subcomponent areas of performance (i.e., CAF: complexity, accuracy or fluency) will enter in competition and lead to compromising of another area(s). A major difference between the Cognition Hypothesis and the Trade-Off hypothesis is that the Cognition Hypothesis predicts increases in both complexity and accuracy contra to what Skehan trade-off account proposes. So, unlike Robinson’s proposal that increasing cognitive demands is what leads to greater accuracy and complexity, Skehan proposes that it is the combination of task characteristics and task conditions that may promote the relationship between accuracy and complexity as evidenced by studies that have investigated the
effects of planning conditions and task structure that integrated background information, for instance (e.g., Tavakoli & Skehan, 2005).

Skehan invokes Levelt’s (1989) Speech Production Framework, specifically the components that include the Conceptualizer and Formulator, in an attempt to account for the data that suggest that task features and conditions promote greater L2 performance as measured by CAF. Kormos (2011) characterizes the Conceptualizer as the component responsible for speech planning resulting in the production of a conceptual pre-verbal message that is ready to be encoded with language. Then, the Formulator component of the model takes care of the language encoding for the pre-verbal message providing morphosyntax, lexis and phonology to the message. The difference between L1 and L2 speech production lies within the Formulator component of the model since presumably both L1 and L2 concepts are stored together in semantic memory in the Conceptualizer (Kormos, 2006; Francis, 2005). According to Skehan, a preverbal message will encounter a more coarsed and unorganized process of encoding since the Formulator in an L2 learner has a smaller lexicon that is unsophisticated in comparison to a native speaker counterpart. Therefore, if a pre-verbal message requires difficult lexical encoding, this will present a challenge to the functioning of the Formulator and attention to accuracy may be compromised. To remediate this situation, the goal would be to provide learners with support in organizing information in a pre-planning task, for example, in order to ease the pre-verbal message produced by the Conceptualizer; and consequently, the learner would not need to use up attentional resources and overwork working memory to retrieve more difficult lexical items. As a result, the learner may employ more of her attentional resources to subsequent areas of the Formulator that take care of L2 speech production as represented by CAF.
2.24 Robinson’s Cognition Hypothesis

The Cognition Hypothesis (CH) (Robinson, 2001a, 2001b, 2003, 2005, 2010; 2011; Robinson & Gilabert, 2007) is based on a multiple-resources perspective of attention. This approach posits separate attentional resource pools (e.g., spatial vs. verbal) that may direct learners’ attention to different dimensions of the task (Wickens, 1992). The model suggests that the completion of tasks may promote competition among the attentional resource pools. Within this framework, Wickens (2007) characterizes effort invested as the amount of mental workload a person puts forth when performing a task. The amount of mental effort in a task should lead to deep processing of the material resulting in more proficient learning. The CH “claims that increasing cognitive demands of tasks contributing to their relative complexity along certain dimensions will (a) push learners to greater accuracy and complexity of L2 production in order to meet the consequently greater functional/communicative demands they place on the learner and (b) promote heightened attention to and memory for input, so increasing learning from the input, and incorporation of forms made salient in the input, as well as (c) longer retention of input; and that (d) performing simple to complex sequences will also lead to automaticity and efficient scheduling of the component of complex L2 task performance.” (Robinson, 2003: p. 47 & 48).

Robinson (2010) proposes a task sequencing principle that differentiates resource-dispersing dimensions (i.e., traits of a task that promote more ‘automatic access’ to learners’ internal linguistic system) from resource directing dimensions (i.e., traits that guide learners’ attention to L2 form-meaning connections that stretch interlanguage development). Resource dispersing dimensions include elements like planning time, prior knowledge, task structure whereas resource directing dimensions include perspective-taking, causal reasoning and here and now to name a few. Robinson’s model has made claims that resource-dispersing factors place
more cognitive demands on both performative and procedural features of a task since learners have to allocate too many attentional resources to both linguistic and non-linguistic items --- a view that is also shared by Skehan’s proposal (e.g., Skehan & Foster, 2001). This may be accomplished when giving learners a second simultaneous task to complete while engaged in another one such as ordering food on the phone while listening to a podcast on the benefits of water.

<table>
<thead>
<tr>
<th>Task Complexity (Cognitive factors)</th>
<th>Task Condition (Interactive factors)</th>
<th>Task Difficulty (Learner factors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+/- here and now</td>
<td>+/- open solution</td>
<td>h/l working memory</td>
</tr>
<tr>
<td>+/- few elements</td>
<td>+/- one-way flow</td>
<td>h/l reasoning</td>
</tr>
<tr>
<td>+/- spatial reasoning</td>
<td>+/- convergent solution</td>
<td>h/l task-switching</td>
</tr>
<tr>
<td>+/- causal reasoning</td>
<td>+/- few participants</td>
<td>h/ aptitude</td>
</tr>
<tr>
<td>+/- intentional reasoning</td>
<td>+/- few contributions needed</td>
<td>h/ field independence</td>
</tr>
<tr>
<td>+/- perspective-taking</td>
<td>+/- negotiation not needed</td>
<td>h/ mind/intention-reading</td>
</tr>
<tr>
<td>+/- planning time</td>
<td>+/- same proficiency</td>
<td>+/- openness to experience</td>
</tr>
<tr>
<td>+/- single task</td>
<td>+/- same gender</td>
<td>+/- control of emotion</td>
</tr>
<tr>
<td>+/- task structure</td>
<td>+/- familiar</td>
<td>+/- task motivation</td>
</tr>
<tr>
<td>+/- few steps</td>
<td>+/- shared content knowledge</td>
<td>+/- processing anxiety</td>
</tr>
<tr>
<td>+/- independency of steps</td>
<td>+/- equal status and role</td>
<td>+/- willingness to communicate</td>
</tr>
<tr>
<td>+/- prior knowledge</td>
<td>+/- shared cultural knowledge</td>
<td>+/- self-efficacy</td>
</tr>
</tbody>
</table>

Figure 1. Peter Robinson’s Triadic Componential Framework --- adapted from Robinson (2011)

This type of complex task leads to more automatization and memory consolidation of a learner’s interlanguage repertoire instead of its development. In Kormos’ (2011) terms, this would put too much strain on a speaker’s ability to attend to linguistic encoding as well as monitoring in her L2 speech model. According to the CH, the design of a task should be based on increasing its complexity via resource-directing demands, that is, by placing higher cognitive demands on L2 learners during performance on a task in order to promote interlanguage development. Basically, from a psycholinguistic L2 speech framework, these task features allegedly prompt learners to spend more effort at the conceptualization stage of speech production that will set a pre-verbal
message or condition that would require new L2 linguistic encoding of concepts in the Formulator stage by drawing on the learner’s attentional and memory resources; and thus, promoting L2 performance and development (Robinson, 2011). This leads the CH to propose the following “five ancillary theoretical claims” (Robinson, 2011, p. 18) that potentially result from increasing task demands via resource-directing dimensions on L2 learning opportunities and development: (1) **Output**: increase in task demands will push learners to produce more accurate and complex L2 production while compromising fluency; (2) **Uptake and Interaction**: increase in task demands will lead to more interaction as evidenced by more negotiation of meaning, noticing of input and uptake of recasts; (3) **Memory and Retention**: more complex tasks will promote greater depth of processing and longer retention of input; (4) **Automaticity**: a simple to complex task sequence will lead to greater automaticity; and (5) **Individual differences**: complex tasks will lead to variation in learners’ L2 performance and development. Finally, the CH also predicts that L2 learning outcomes and performance will vary across task conditions or interactional demands (e.g., one-way flow, open solution, same proficiency) of the task; and also, across task difficulty or learners’ individual differences (e.g., working memory, aptitude, task motivation) as predicted by the fifth ancillary. Robinson finds that the sequencing of tasks in a syllabus implementing tasks, as its unit, should follow a simple to complex sequence (Robinson, 2001b).

Consequently, Robinson (2010) proposes a pedagogical design model, based on the findings and predictions of the Cognition Hypothesis, called the SSARC model to help syllabus designers organize the tasks of a given analytical syllabus. The model essentially consists of three stages: SS (simple/stabilize interlanguage), A (automaticity) and RC (restructuring and complexity) and for each stage the syllabus designer would need to take into consideration both resource-directing and resource-dispersing variables. The SS stage is the first step and the
simplest stage of all and the simplicity of the tasks should be grounded on both dimensions of resource-directing and resource-dispersing. So, for example, learners should be allowed sufficient planning time and they would not engage in narrating in the there and then. The second phase promotes interlanguage automaticity so that learners have quickier access to their L2 linguistic resources, and so they would not have any planning time but would still narrate in the here and now increasing the task demands only via the resource-dispersing dimension. The final phase of the SSARC would require the increase of cognitive demands on both dimensions in order to stretch interlanguage development so that learners may succeed at completing the task --- the learners would have no planning time and they would perform a narrative task in the there and then.

2.25 Evaluation of Skehan and Robinson’s Hypotheses

In sum, both proposals, Skehan’s Trade-Off Hypothesis and Robinson’s Cognition Hypothesis, attempt to tackle the issue of task sequencing and analysis in syllabus design within the TBLT pedagogical framework. The tenets of each model are based on an information-processing perspective of SLA, particularly within an attentional framework, that is, both endorse Schmidt’s noticing hypothesis (Schmidt, 2001) for promoting interlanguage development. They also view the role of individual differences during task completion as pivotal to explain possible variation in task outcomes. Both approaches also concur on the importance of factors such as planning time and task familiarity that help L2 learners solve tasks successfully – cognitive familiarity for Skehan and resource-dispersing dimensions for Robinson. For example, Révész and Han (2006) note that task content familiarity benefits both models since for the Limited Attentional Capacity Model, learners are able to invest less mental effort on the content of the task due to their prior knowledge of the task; and thus, may free up attentional resources to linguistic form. For the CH or the multiple resources perspective, prior knowledge facilitates task
completion because it diminishes competition between the attentional resource pools. The difference between both perspectives lies on the effects of how learners invest their attentional resources to manipulate the information or content of the task. Robinson refers to it as resource-directing dimensions while Skehan calls it, cognitive processing. For Skehan, cognitive processing involves “the amount of online computation that is required while doing a task.” (Skehan, 1996, p. 97). So, basically, if learners have to impose mental effort when engaged with the content of the task, they will have little attention devoted to linguistic forms and this affects negatively learners’ accuracy, fluency and complexity of the target form (Skehan and Foster, 2001). Robinson (2010) argues that placing communicative demands on the learners will heighten their attention resources to target forms during task performance and this should lead to form-meaning connections of novel linguistic items as well as restructuring of the interlanguage system. The underlying theoretical premise that differentiates both approaches is a single-resource vs. multiple-resources perspective of attention. Recently, both proposals have adopted an L2 speech production framework (Kormos, 2006) inspired by Levelt’s (1989) Speech Production Model to explicate how the manipulation of task features or conditions affect components of L2 production and how learners may invest their attentional and memory resources in the process. Both approaches focus on two components of the speech model as described above, the Conceputalizer (i.e., component responsible for the activation of concepts and producing a conceptual pre-verbal message) and the Formulator (i.e., component responsible for encoding the pre-verbal message with linguistic data). Within this framework, the main distinction between both approaches is on the demands that should be placed on the Conceptualizer. Robinson believes that L2 learners should spend more effort on the macroplanning phase that requires the speaker to develop her intended message, and according to his model, this would be achieved by increasing the cognitive demands of the task via
resource-directing variables. This will in turn prepare the message to go through a microplanning stage that prepares the pre-verbal message with initial linguistic content for further semantic and syntactic encoding (Kormos, 2011). The proposal is that ramifications of a more elaborated pre-verbal message will also lead to more accurate and complex linguistic performance in order to encode such pre-verbal message. However, Skehan (2009) posits that due to burdens on working memory and attentional resources as well as a poor L2 lexicon, the pre-verbal message should not be elaborated so that attentional resources may be invested in the Formulator phase when linguistic encoding occurs. To date, one empirical study, Kormos and Trebits (2012) has sought to examine this issue employing a cartoon description task with storylines and a picture narration task that prompted the learners to produce their own story. The premise is that the cartoon task would ease the burden on the Conceptualizer since the storyline as part of the task aided in conceptualizing what was going on in the story. The opposite can be said for the Picture Narration Task in which the learners had to create their own story and invest more effort on conceptualizing its content. The results were mixed by task type and mode. The researchers found that the picture narration task (i.e, the task that led to more effort in the Conceptualizer phase) led to more syntactically complex language use in writing; however, in the speech mode, the cartoon description task elicited more lexical diversity and verbal accuracy.

To evaluate both models, one must first assess the explanation adequacy (as recommended in Long, 2007) that they propose. In the most updated proposal, Skehan and Foster (2001) base the theoretical underpinnings only on one SLA study -- VanPatten (1990). They do not offer any other theoretical or empirical motivations from other fields like cognitive psychology to support the limited attentional capacity position. Furthermore, recently, some researchers have challenged VanPatten’s (1990) findings by improving methodological considerations (Leow, Hsieh & Moreno, 2006) and the results are not so clear for VanPatten’s
results and his Primacy of Meaning Principle. This presents a challenge for the explanandum of the model. To operationalize the cognitive processing component of the model is another challenge since the traits described leave too much room for interpretation for researchers. Skehan and Foster (2001) characterize cognitive processing as information organization, amount of “computation,” clarity of information given and sufficiency of information given – although these traits make sense at a conceptual level of what cognitive processing is, they are too broad for operationalizing in an empirical study. The words utilized, “amount,” “clarity,” and “sufficiency” are subjected to a variety of interpretations and may present problems for a cohesiveness of empirical studies. Additionally, Skehan has not conducted studies examining cognitive processing to account for empirical adequacy of the model. Skehan and Foster (2001) report on a series of studies (Foster & Skehan, 1996, 1999; Skehan and Foster, 1997) and provide evidence to the interaction among what they call dimensions of performance – fluency, accuracy and complexity. The studies suggest evidence for the tension among these dimensions and that a goal of a task that focuses on fluency, for example, compromises the level of accuracy and complexity of language production. The experiments focused on task planning, task type and post-task performance to examine the dimensions of performance. Skehan and Foster suggest that the tension between dimensions of performance present a challenge for a multiple resources perspective of attention. However, this conclusion is too preliminary without strong empirical support since none of the studies isolate or operationalize complex processing adequately.

Robinson imports Wickens’ three-dimensional structure of human processing (Wickens, 1984) that posits human’s multiple resource processing mechanisms, and as long as two tasks are not similar or engaging the same attentional resource, no interference should exist. This model seems to receive the most attention and empirical support in the field of cognitive psychology (Eysenck & Keane, 2005). Even though this is a strong model in cognitive psychology and grants a relative
strong foundation for the CH, as with any import from other fields, SLA task complexity researchers need to be sure that it does work with language development. A major strength of the CH is that resource-directing dimensions (cognitive processing for Skehan) are more operationalizable than Skehan’s model. Robinson lists a number of specific variables that comprise his resource-directing dimensions (e.g., +/- here and now, +/- few elements, +/- spatial reasoning, +/- causal reasoning, +/- intentional reasoning and +/- perspective-taking) that may serve to test the predictions of the CH. However, the empirical adequacy of the model is yet to be determined since some studies have found support for the CH (e.g., Sercu et al., 2006), partial support (e.g., Révész, 2007) and no support (e.g., Nuevo, 2006). Based on the brief comparative evaluation of both models above, their operationalization of task complexity, explanation and empirical adequacy, the findings remain inconclusive as to the predictions and recommendations on task analysis and sequencing for TBLT. However, the Cognition Hypothesis seems more suited to test empirically as a model than the Limited Attentional Capacity Model, and more experimental studies are needed to support or refute the premise of the CH as well as simultaneously suggesting implications for the Limited Attentional Capacity Model. For the reasons aforementioned, the proposed dissertation study will adapt the Cognition Hypothesis framework, due to its operationalizablity, to test task complexity while considering both single-resource and multiple-resource perspectives of attention.

2.2.6 Empirical Studies along Resource-Directing Variables

Robinson (1995) is a first attempt to operationalize task complexity as suggested by Long (1985) by examining L2 learners’ oral production during narratives that manipulated the contextual reference of the tasks --- here-and-now and there-and-then. Robinson measured 12 L2 English participants’ fluency, syntactic complexity, lexical production and accuracy of article use during the completion of two possible narrative cartoon tasks that varied along the lines of
their complexity. In this study, the treatment task under the complex condition required participants to narrate in the *there-and-then*. The results suggest significant greater accuracy gains for the use of articles and production of lexical words in *there-and-then* condition while better fluency findings for the *here-and-now* condition, and no significant differences for syntactic complexity.

Robinson (2001b) administered a dialogic simple or a complex version of a map task to dyads of 22 L1 Japanese learners of English. Each participant received the assignment of either information-giver or information-receiver. The information-giver had to give directions to the information-receiver on how to get from point A to point B on a map while the information-receiver was allowed to ask questions (i.e., clarification requests and confirmation checks) when s/he was not sure of the directions. The complex map was manipulated cognitively by having additional items; and thus, operationalizing +/- few elements. Robinson measured the L2 production of the information-givers and examined their accuracy, fluency and syntactic complexity whereas he analyzed the number of clarification requests and confirmation checks of the information-receivers. For the complex condition, the data demonstrate significantly more lexical variety for the information-givers while more negotiation moves as evidenced by the number of clarification requests for the information-receiving group.

Lee (2002) operationalized task complexity along reasoning demands by giving participants, 82 learners of Korean as a foreign language, two picture-description tasks of a car accident and the function of the human body. He divided his participants into three groups along task complexity: simple, complex and very complex. The complexity of the car accident task depended on the number of different cars and their direction, pedestrians and road conditions. The participants had to explain as clearly as possible the accident as if they had been eyewitnesses. For the human body task, the participants had to explain to an interlocutor in
Korean how the human body system worked. The three versions of this task differed on the stages of the body system (blood circulation, water intake and loss, movement in the intestine), arrows of movement and the number of translated key words and phrases from Korean to English. The study measured complexity and accuracy of Korean case particles and inflectional suffixes. The results suggest no statistical significance among groups for complexity or accuracy; however, this may be due to the task design of the study itself. First, Lee (2002) did not assess participants for prior knowledge of the target structures. Second, the task instructions encouraged the participants to reason in all of the tasks. In addition, the study had a complex and very complex group; as a result, the results need to clarify that the findings might contribute to a continuum of task complexity, and not the presence or absence of reasoning demands. In the human body task, the three versions were also different on the availability of Korean lexical items in English. This might have conflated the results of the human body task with reasoning demands due to lack of vocabulary knowledge, and since vocabulary was not a dependent variable in the study. Finally, the study does not say anything about L2 development.

The first major study to examine the effects of task complexity on L2 development is Nuevo’s (2006) dissertation. Nuevo examined reasoning demands during narrative and decision-making tasks in a learner-learner dyad. The participants, 113 intermediate and advanced ESL learners from a public charter school, were randomly assigned to control, low complexity and high complexity groups. The study reported findings on L2 learning opportunities and L2 development during completion of low and high complexity tasks. L2 learning opportunities were assessed via interactional modifications between learners, and L2 development through receptive and procedural knowledge of locative prepositions and past tense in English. For the narrative tasks, participants had to tell a story in the simple English past tense based on a series of eight pictures and write a sentence of each picture on a separate worksheet. The non-complex
set had the pictures arranged and numbered in chronological order that the events occurred whereas the complex set did not. In the decision-making tasks, participants had to make decisions on seating people for a particular event with certain information. Using locative prepositions, participants had to write where a person sat in relation to other people. Task complexity differed in that the low complexity group had only one possible solution whereas the high complexity group had different imperfect solutions based on the information they received. The results of a grammaticality judgment test to examine receptive knowledge for the simple past tense and locative prepositions showed no significant differences for L2 development. In an oral production test to measure L2 development, no statistical significance for the simple past tense, but the high complexity group outperformed the control group from pretest to posttest for locative prepositions. For L2 learning opportunities, in both tasks, the low complexity group provided more learning opportunities than the high complexity group in dyad interaction during treatment. Overall, Nuevo (2006) does not support predictions of The Cognition Hypothesis, and it suggests that increasing task complexity along reasoning demands does not lead to L2 development.

Sercu, Wachter, Peters, Kuiken and Vedder (2006) published three empirical studies on foreign language development under the effects of task complexity and task conditions. One of the studies, Kuiken & Vedder’s Cognitive task complexity and linguistic performance in L2 writing, reported on task complexity and its impact on lexical and accuracy variation and syntactic complexity. Task complexity was manipulated through +/- few elements and reasoning demands. The participants were Dutch native speakers, 91 of whom were learning Italian and 76 learning French, and whose proficiency levels also differed --- low language proficiency as well as advanced learners. The participants had to complete a writing task in which they recommended a traveling destination to a friend contingent on a number of requirements. The
complex and non-complex conditions had a different number of requirements, six in the complex and three in the non-complex. The study found that the participants in the complex group demonstrated significant results for accuracy and lexical variation as predicted by The Cognition Hypothesis. However, no results were significant for syntactic complexity. In addition, level of proficiency was not related to task complexity.

Robinson (2007) studied the effects of task complexity along the dimension of intentional reasoning. Intentional reasoning is “…successfully understanding (intention-reading) the motives, beliefs and thoughts which cause people to perform actions…” (Robinson, 2007: p. 194). The study operationalized task complexity to examine its effects on three areas: general measures through accuracy, syntactic complexity and fluency; specific measures of the production of conjoined clauses, infinitival phrases and Wh-clauses; and interaction measures through number of turns, clarification requests and confirmation checks. Additionally, the study employed measures of learners’ perception of tasks, individual differences in input, processing and output anxiety. The study used 42 native Japanese speakers learning English in a university setting in learner-to-learner dyads. All dyads participated in three narrative tasks: simple, medium and complex levels according to intentional reasoning demands. In each dyad, one of the participants was assigned the role of storyteller who needed to determine the sequence of a story and then narrate it to the listener (the other participant). The researcher used the Picture Arrangement subtest of the Wechsler Adult Intelligence Scale-Revised, Japanese version. Each set of pictures only had one correct sequence. The storyteller had to explain the intention of the main character to perform the actions described in the set of pictures. In the simple task, the single character had the intention of building a house whereas in the complex task, the main characters’ intentions were motivated by their perception of other characters’ thoughts and beliefs. The storytellers had a minute to decide the order of the story and then narrate it to their partners. Since the listener did
not have the story, s/he was able to ask questions. Other dimension factors were involved in the task, - planning time and + dual task. The storyteller had no time to plan the narration and had to think of sequence and narrating at the same time. No significant results were found for general outcomes for syntactic complexity measured by clauses per C-unit, accuracy as percentage of error free C-units and fluency by measures of syllables per second among the three groups. As for specific measures, increasing the complexity of the tasks suggests to promote a greater production of conjoined clauses but not infinitival or Wh-clauses. Finally, the number of turns, clarification requests and confirmation checks were greater for the more complex tasks; thus, leading participants to have more opportunities for negotiation and uptake.

Michel, Kuiken and Vedder (2007) explored the potential interaction between increasing the complexity of a task via the dimension of +/- few elements and task conditions (i.e., monologic or dialogic) in promoting L2 performance as measured by syntactic complexity, accuracy and fluency. 44 L2 learners of Dutch were randomly assigned to either the monologic or dialogic condition and each subgroup completed both the simple and complex versions of the task. The participants received a leaflet with either MP3 players or mobile phones and had to decide which electronic device to purchase. In the monologic conditions, the participants were instructed to leave a voice mail message on a friend’s answering machine giving advice on which device to buy while the participants in the dialogic condition discussed on the phone the electronic device they would buy. According to the results, increasing the cognitive demands of the task yielded overall greater accuracy as evidenced by number of errors and repairs to errors. The participants in the dialogic condition produced more accurate speech but the monologues seem to have more instances of repairs to errors. No significant interactions between task complexity and task conditions were found; however, complex tasks in the monologic condition resulted in the fewest errors and omissions as shown by countings.
Ishikawa (2007) tested the effects of manipulating task conditions along the lines of +/- here and now on the written production of L2 English as promoting complexity, accuracy and fluency. The participants were 54 L1 Japanese learners of English in high school who were assigned to either the simple [+here and now] or the complex condition [-here and now]. Each condition was instructed to narrate in written mode the events presented in a cartoon strip, with the learners in the complex condition having to write in the past tense whereas their counterparts in the simple condition narrated in the present tense. Furthermore, only the participants in the simple condition had the cartoon strip to refer to while narrating their story. The researcher employed a variety of measures to tap accuracy, complexity and fluency across task conditions. Overall, the study reports benefits for increasing task demands on learners’ writing performance as demonstrated, specifically for target-use of articles, production of greater structural complex clauses, and greater writing fluency in relation to longer narratives.

Gilabert, Barón and Llanes (2009) sought to test whether increasing the cognitive demands of a task would prompt learners to engage in more interaction; and hence, provide them with possibly more opportunities for negotiating meaning, producing more Language Related Episodes (LREs) and receiving more recasts (i.e., a less explicit form of feedback) as outcomes from more interaction (e.g., Mackey & Abbuhl, 2005). The researchers employed six tasks that varied in sequence and type. They gave 60 English L2 participants a narrative, instruction-giving and decision-making tasks that were manipulated for complexity, that is, they were either simple or complex. For the narrative task, they operationalized task complexity via the +/- here and now resource-directing dimension; for the instruction-giving task, they employed +/- number of elements; and for the decision-making task, the complex group was engaged in reasoning. They analyzed the participants’ self-repairs (i.e., clarification requests from previous utterances) during interaction and determined whether they were examples of negotiation of meaning,
recasts or LREs. They also administered an *Affective Perception Questionnaire* (adopted from Robinson, 2001) that tapped into learners’ perception of difficulty, stress and confidence of the task. Participants in the complex groups significantly rated their task to be more difficult and stressful compared to the simple task participants. Furthermore, the complex group felt less confident about completing the narrative task. Their results suggest that increasing task demands lead to more opportunities for interaction as evidenced mostly by the number of *negotiation for meaning* episodes during the narrative and instruction-giving tasks concluding that task type may play a role on the effects of task complexity as well as type of interactional move.

Kim (2009) investigated whether task complexity played a role in the production of Language Related Episodes (LREs) during interaction across proficiency levels and task type. Kim divided 34 L2 English learners into two proficiency levels (high vs. low) groups based on their TOEFL exam scores and enrollment in the language program. The study utilized a picture narration and picture difference task as materials, and the cognitive demands of the tasks were manipulated by +/- reasoning and +/- few elements, respectively. Participants also completed a Perception Questionnaire (adapted from Robinson, 2001b). The data reveal that the low proficiency group produced significantly more LREs for the simple picture narration task and the complex picture difference task whereas the high proficient group produced more LREs for the complex picture narration task and no significant difference was found for the picture difference task along the lines of task complexity. Overall, this study found effects for task complexity but contingent on task type and learners’ proficiency level.

In a classroom-based study, Révész (2011) studied the effects of task complexity, as operationalized by +/- few elements and +/- reasoning demands, on the accuracy and complexity of L2 oral output as well as its effects on interactional features (i.e., confirmation checks, clarification requests, recasts and metalinguistic talks) as manifested by participants’ Language
Related Episodes (LREs) during interaction. The study tested 43 L2 English learners who were divided into two groups in a classroom setting and completed both a simple and complex version of the task. The participants were involved in an imaginary scenario task in which they were board members of a foundation that had to decide and evaluate potential funding for three different community projects. The complex version of the task comprised of a larger fund and a higher number of community projects which would require the participants to justify their decisions-making process among a larger selection of projects. The data for measures of speech production reveal that, during the complex task, the participants produced significantly more accuracy and lexical diversity but not syntactic complexity, overall. However, instead of relying exclusively on global measures of syntactic complexity as recommended by other researchers, Révész analyzed more specific measures for syntactic complexity and found that the more complex condition lead learners to produce more advanced conjoined clauses. The participants also produced more instances of LREs while completing the complex task. Finally, based on the questionnaire, participants reported to pay more attention to their own and fellow classmate’s output while completing the complex task.

In Kuiken and Vedder (2011), the researchers tested the effects of task complexity on L2 performance by how L2 learners would perform on an oral task that had been utilized in previous studies as a written task (Sercu et al., 2006; Kuiken & Vedder, 2007); and therefore, whether L2 performance is affected by task modality. The study recruited 44 L2 learners of Italian who were divided between low and high proficiency groups according to a cloze test and were compared to the 91 participants in Sercu et al (2006). The task asked participants to give advice to their friends on a travel destination based on a number of requirements and participants needed to provide a justification for their choice. The complex version of the task had six requirements that had to be met while the simple version only had three that had to be considered when making the
decision. The researchers measured L2 performance by examining both oral and written output for accuracy, syntactic complexity and lexical variation. Results of the study suggest that increasing the cognitive demands of the task led to more accuracy when accounting for number errors and this finding is irrespective of task modality. However, the results for syntactic complexity demonstrate that while no differences were found between simple and complex versions in the written mode; for the oral mode, participants in the complex task produced fewer dependent clauses contra to the predictions of the Cognition Hypothesis.

Michel (2011) reports on the relationship between task complexity and interaction and its possible effects on L2 performance as measured by linguistic complexity, fluency and accuracy. The experimental design employed four groups that were manipulated for task complexity (i.e., +/- few elements) and condition (i.e., +/- monologic). 64 L2 learners of Dutch were assigned to either +monologic or -dialogic condition and all participants completed both versions of the task for each condition. The tasks consisted on participants deciding on a male-female couple for dating and on a Belgium-Dutch pair for studying. The complex versions of the tasks had 6 candidates with six characteristics versus four candidates in the simple versions; and thus, the complex tasks allowed for more possible combinations than the simple condition. The study only found that increase in task complexity led to greater lexical diversity across monologic and dialogic conditions.

Kim and Tracy-Ventura (2011) investigated whether increasing task complexity via +/- reasoning demands promoted the development of English past tense morphology during learner-learner dyads, and if learner anxiety interacted with task complexity. 88 beginner to high intermediate L2 English learners completed in pairs a communicative task that dealt with activities on campus as well as an anxiety questionnaire and assessment tasks. The communicative tasks consisted in having participants describe campus events, host an American
exchange student, talk about their experiences of university orientation and prepare for a mayoral campaign. Task complexity was manipulated for –complexity, +complexity and ++complexity by employing +/- reasoning demands for all conditions and an additional +/- few elements was included for the ++complexity group. L2 past tense development was measured by an individual oral production task in which participants had to describe eight pictures in the past and a pair oral production task based on True/False activities that were completed by a participant’s partner on a specific day. The findings indicate that both the +complex and ++complex groups scored significantly higher than the –complex group on both posttest 1 and posttest 2; however, no statistical differences existed between the +complex and ++complex groups. Also, low anxiety learners performed better than their high anxiety counterparts and no interaction between task complexity and anxiety was found.

Kim (2012) investigated the impact of task complexity during interaction on Language Related Episodes and English question development in a classroom of Korean learners of L2 English. In the study, task complexity was manipulated via +/-reasoning and also +/- few elements leading to the three different experimental groups --- simple, +complex and ++complex. The difference between the +complex and ++complex groups was due to the ++complex group having –few elements. 191 participants, with proficiency levels from beginning to intermediate according to the scores on the Test of English for International Communication (TOEIC), were assigned to an experimental condition or to a control group. The control group in the study only received traditional instruction in their class. The participants in the complex conditions had to decide on part time jobs for university students whereas the simple condition only had to provide a report on students’ part time jobs. The ++complex group had to consider four possibilities to only two for the +complex group. Participants’ L2 performance was measured through Language Related Episodes (LREs) and question
development was assessed with three oral production tasks (two individual tasks and one paired task) following a pretest-posttest 1-posttest 2 design. The results yielded significant more learning opportunities as evidenced by a greater number of LREs, and increases in stages of question development for the ++complex condition.

Baralt (forthcoming) examined the effects of task complexity via intentional reasoning and modality, that is, face-to-face (FTF) or computer mediated communication (CMC) modes during interaction. The participants were comprised of 84 Intermediate-level Spanish students randomly assigned into the following four experimental conditions: FTF mode, + complexity; FTF mode, -complexity; CMC mode, + complexity; and, CMC mode, -complexity. Participants read a story in their L1 and had to retell parts of the story in the L2 (Spanish) with the aid of picture comic strips. Both +complexity groups irrespective of mode had to provide the intentional reason of characters in the story to explain their actions whenever they saw an empty blurb on the picture comic strip. On the other hand, both –complexity groups had a prompt on the picture comic strip providing them with an intentional reason of the character. The picture comic strips prompted them to narrate in the past and use the imperfect Spanish subjunctive, which was the target form in the study as they interacted with the researcher. The researcher provided all participants with negative feedback in the form of recast for any non-targetlike production of the imperfect subjunctive during the treatment phase. All participants completed two production (similar to treatment tasks in both modes) tasks and a multiple-choice receptive task counterbalanced following a prettest-posttest-delayed posttest design. Baralt reports that participants in the FTF +complex and CMC –complex groups showed the most significant development of the imperfect Spanish subjunctive.
Table 1. Summary of Empirical Studies for Task Complexity Along Resource-Directing Variables

<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Resource-directing variable</th>
<th>Independent Measure of TC</th>
<th>CH Ancillary &amp; Outcome measures</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robinson (1995)</td>
<td>12 L2 English learners; Intermediate Level as per University of Hawaii’s Placement Test battery</td>
<td>+/- here and now Narrative Cartoon Sequence Task</td>
<td>None.</td>
<td>Output: S nodes per T-unit; Multipropositional Utterances; Pauses; Words per Pausal unit; Percentage of Lexical Words; Target-like use of articles</td>
<td>+/-TC led to more target-like use of articles and a higher percentage of lexical words</td>
</tr>
<tr>
<td>Robinson (2001b)</td>
<td>44 learners of L2 English; assigned either information-giver or information-receiver</td>
<td>+/- few elements Map Task (dialogic)</td>
<td>Affection Perception Questionnaire</td>
<td>Output; Uptake &amp; Interaction Information giver: accuracy, fluency and complexity Information receiver: clarification requests, confirmation checks</td>
<td>+/-TC led to more lexical variety for information givers and a greater number of confirmation checks for the information-receivers</td>
</tr>
<tr>
<td>Lee (2002)</td>
<td>84 L2 learners of Korean</td>
<td>+/- reasoning demands Two Picture-description tasks</td>
<td>None.</td>
<td>Output: Syntactic complexity and accuracy of Korean case particles and inflectional suffixes</td>
<td>No statistical differences for complex vs. noncomplex conditions</td>
</tr>
<tr>
<td>Nuevo (2006)</td>
<td>113 L2 English learners/Intermediate</td>
<td>+/- reasoning demands Narrative &amp; decision-making</td>
<td>None.</td>
<td>Output, Uptake &amp; Interaction L2 Opportunities; Interactional</td>
<td>+/-TC led to significant greater</td>
</tr>
<tr>
<td>Study</td>
<td>Participants</td>
<td>Tasks</td>
<td>Modifications</td>
<td>Scores on the oral production task for locative prepositions from pretest to posttest only; and more interactional modifications (comprehension checks &amp; uptake of recasts)</td>
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<tr>
<td>Sercu et al.</td>
<td>91 L2 Italian learners; 76 L2 French learners; low/advanced proficiency levels</td>
<td>Writing Tasks on travel destinations</td>
<td>Output: Lexical variation, Accuracy &amp; Syntactic complexity</td>
<td>+TC led to greater lexical variation &amp; accuracy</td>
<td></td>
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<tr>
<td>(2006)</td>
<td></td>
<td>+/- few elements</td>
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<tr>
<td>Robinson (2007)</td>
<td>42 L2 English learners; L1 Japanese; University setting</td>
<td>Picture Arrangement Subtest (Wechsler Adult Intelligence Scale-Revised, Japanese version)</td>
<td>Output, Uptake &amp; Interaction General Production Measures: Lexical complexity, type-token ration, syntactic complexity, accuracy &amp; fluency Specific Production Measures: infinitival phrases, conjoined clauses &amp; Wh-clauses Interaction: Turns taken, clarification requests and confirmation checks</td>
<td>+TC led to more use of conjoined clauses and to more interaction as revealed by increase number of turns, clarification requests and confirmation checks</td>
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<td></td>
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<td>+/- intentional reasoning demands</td>
<td>Post-Task Difficulty Questionnaire (adopted from Robinson 2001b)</td>
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<tr>
<td>Michel et al.</td>
<td>44 L2 Dutch learners; Intermediate level proficiency as per Common European Framework of References for Languages</td>
<td>+/- few elements Electronic Device Task (Monologic and Dialogic conditions)</td>
<td>Uptake &amp; Interaction; Output: Syntactic complexity; fluency; accuracy</td>
<td>+TC led to a greater ratio of accuracy as demonstrated by number of errors, omissions and repair to errors.</td>
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<tr>
<td>(2007)</td>
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<td>Ishikawa (2007)</td>
<td>54 L1 Japanese learners of English; proficiency levels were from low to intermediate according to the Michigan English Placement Test (MEPT)</td>
<td>+/- here and now Cartoon Strip Written Task</td>
<td>Output: Accuracy, Structural/ Lexical Complexity &amp; Fluency Measures</td>
<td>+TC led to more accurate use of articles, greater structural complex clauses and fluency in long</td>
<td></td>
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<tr>
<td>Study</td>
<td>Participants</td>
<td>Tasks</td>
<td>Measures</td>
<td>Findings</td>
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<tr>
<td>Gilabert et al. (2009)</td>
<td>80 L2 English learners, English majors at the University of Barcelona</td>
<td>+/- here and now, +/- few elements, +/- reasoning</td>
<td>Affective Perception Questionnaire (adopted from Robinson 2001)</td>
<td>Uptake &amp; Interaction: Number of clarification requests, confirmation &amp; comprehension checks; LREs, recasts during interaction. +TC led to more episodes of clarification requests, confirmation &amp; comprehension checks for narrative &amp; information-giving tasks.</td>
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<tr>
<td>Kim (2009)</td>
<td>34 L2 English learners; two proficiency levels (high vs. low)</td>
<td>+/- reasoning demands; +/- few elements</td>
<td>Perception Questionnaire (adopted from Robinson 2001)</td>
<td>Uptake &amp; Interaction: Number of Language Related Episodes (LREs)</td>
<td>Low proficient group: +TC led to more LREs in picture difference task. High proficient group: +TC led to more LREs in picture narration task.</td>
</tr>
<tr>
<td>Révész (2011)</td>
<td>43 L2 English learners; high-intermediate &amp; advanced level classes</td>
<td>+/- few elements, +/- reasoning demands</td>
<td>Task Perception Questionnaire</td>
<td>Output; Uptake &amp; Interaction: Syntactic complexity, accuracy, self-repair and LREs for interactional features. +TC led to more accuracy, lexical diversity and use of advanced conjoined clauses (a specific measure of syntactic complexity). +TC led to higher rates of LREs.</td>
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<tr>
<td>Kuiken &amp; Vedder (2011)</td>
<td>Oral mode: 44 L2 learners of Italian. Written mode: 91 L2 learners of Italian; Low and High proficiency levels</td>
<td>+/- few elements</td>
<td>None</td>
<td>Output</td>
<td>+TC led to more accuracy in both oral and written modes.</td>
</tr>
<tr>
<td>Michel (2011)</td>
<td>64 L2 learners of Dutch; most at intermediate</td>
<td>+/- few elements</td>
<td>Affective Perception Questionnaire</td>
<td>Output; Uptake &amp; Interaction: Linguistic complexity, fluency.</td>
<td>+TC led to more lexical complexity.</td>
</tr>
<tr>
<td>Study</td>
<td>Sample Description</td>
<td>Complexity Hypothesis</td>
<td>Uptake &amp; Interaction</td>
<td>Findings</td>
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<tr>
<td>Kim &amp; Tracy-Ventura (2011)</td>
<td>88 learners of L2 Korean; beginner to high intermediate per TOEIC Bridge test</td>
<td>+/- reasoning demands; +/- here and now Two-way communicative tasks on university life events</td>
<td>Uptake &amp; Interaction Individual Oral Production Test; Pair Oral Production Test</td>
<td>+TC facilitated the development of English past tense morphology</td>
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<td>English Past Tense Morphology</td>
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<tr>
<td>Kim (2012)</td>
<td>191 L1 Korean learners of L2 English; proficiency levels varied from beginning to intermediate according to TOEIC</td>
<td>+/- reasoning demands; +/- few elements University Students’ Part-Time Job Question Development</td>
<td>Output; Uptake &amp; Interaction Language Related Episodes &amp; Three Oral Production Tasks</td>
<td>+TC led to more LREs and higher stages of question development</td>
<td></td>
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<tr>
<td>Baralt (forthcoming)</td>
<td>84 L2 Spanish learners; Intermediate level Spanish classes; University level</td>
<td>+/- intentional reasoning Interactive Dialogic Story Retell Imperfect Spanish Subjunctive</td>
<td>Uptake &amp; Interaction Face-to-face (FTF): Productive task Computer Mediated Communication (CMC): Productive task Receptive task</td>
<td>+TC led to more significant gains for the FTF group in both productive and receptive tasks</td>
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</tbody>
</table>
2.27 The Cognition Hypothesis and Individual Differences

In SLA, researchers have highlighted the role of individual differences (ID) in L2 development (e.g., Larsen-Freeman & Long, 1991; Dörnyei, 2005; Bowden, Sanz & Stafford, 2005; Ortega, 2009; Sanz, 2012). IDs have included but are not limited to the following: age, L2 aptitude, working memory capacity, sex and motivation. Dörnyei (2005) defines IDs as “characteristics or traits in respect of which individuals may be shown to differ from each other.” (p. 1). Robinson’s CH model proposes that ID may affect the outcomes, which he refers to as task difficulty, of learners’ performance on the complex version of a task (e.g., Robinson, 2010). Robinson classifies some of the ID between ability and affective variables that include, for example, working memory, reasoning ability, aptitude, task motivation, processing anxiety and willingness to communicate to name a few. Robinson (2010) states that the list of task difficulty variables is a point of departure to conduct research examining the interaction between task complexity and task difficulty. Finally, Robinson’s (2011) fifth ancillary of the CH states that individual differences will manifest themselves as the cognitive demands on tasks increase.

Niwa (2000) as reported in Robinson (2005) studied the role of individual differences (intelligence, aptitude and working memory capacity) during task completion along the dimensions of reasoning demands and dual task in a monologic production task. Using four picture strips from the Wechsler Adult Intelligence Scale-Revised PA subtest, 22 Japanese L1 participants had to decide on the sequence of picture strips while also telling a story in English based on the pictures. The set of pictures varied in complexity along the dimension of reasoning demands during a monologic task. The results suggest that individual differences (working memory capacity and aptitude) affect performance of learners when completing a task with an increase in complexity. Robinson (2007) examined the role of participants’ anxiety level during the completion of an interactive task along the lines of intentional reasoning. The results suggest
that anxiety was negatively correlated during output processing for all tasks and increasing across simple, medium and complex tasks. Kim and Tracy-Ventura (2011) also looked at participants’ anxiety levels and if it affected their development of L2 past tense and found that learners with low anxiety did better than their high anxiety counterparts. Baralt (2010) employed a working memory capacity test as a moderator variable of L2 development in her study. Baralt reports that working memory as measured by an operational span test seems to only moderate L2 development during a multiple-choice receptive test for the immediate posttest for the FTF-C condition (face-to-face, -complexity); and interestingly, she found a negative correlation for the CMC-C (computer mediated communication, -complexity) group. Another study that looked at working memory capacity, Kormos and Trebits (2011) employed a backward digit span test, and even though they found that differences in working memory capacity did not affect the performance in the complex condition as predicted by the Cognition Hypothesis, a relationship did exist between high working memory and the greater production of syntactically complex sentences. In Révész’s (2011) study, overall, she did not find any correlation between learner’s individual differences in self-perceived communicative competence, linguistic self-confidence and language-use anxiety played and performance in the complex version of her task, except for a relationship between greater lexical production and linguistic self-confidence in the complex task. Albert (2011) administered advanced L2 learners of English narrative tasks that were manipulated for complexity via resource-dispersing dimensions as well as a Standardized Creativity Test and found two of its subtests that correlated with some aspects of task performance for the complex condition.
2.3 Inhibitory Control

2.31 Green’s Inhibitory Control Model

One of the issues in bilingual processing literature has been whether bilinguals’ two languages are stored in single or independent mental lexicons (e.g., for a review, see Kroll and Sunderman, 2003). Today, it is widely accepted, especially in word recognition research (e.g., Kroll & Stewart, 1994; Dijkstra et al., 1998; Dijkstra et van Heuven, 2002), that bilinguals rely on one mental lexicon for both languages even though some researchers (e.g., Costa et al., 2006) have cautioned about the possible methodological caveats in research and suggest that the issue is still not solved. If bilinguals store both languages in one compartment, and both languages are then supposedly active, the question of how bilinguals suppress the output of language A while producing language B has been also a topic of inquiry in the field. While some models have attempted to account for this phenomenon (e.g., Paradis, 1997; Grosjean, 1997; Dijkstra & van Heuven, 1998; de Bot, 1992), David Green’s Inhibitory Control Model (Green, 1998) has been the most influential and the one of interest for this study. In Green’s model, the basic assumption is that both languages in the bilingual are active at the conceptual or lemma level. The idea is that both languages share the same lemma (or semantic information) as some models such as Kroll and Stewart’s (1994) Revised Hierarchal Model posits -- both the L1 and L2 share concepts, especially as an L2 speaker’s proficiency increases; and, Jiang’s (2000) model of L2 vocabulary acquisition predicts that learners’ L1 lemma gets copied onto an L2 word through repeated form-meaning mappings between the L1-L2 lexical items. Green employs the notion of language tags, that is, labels provided by each language to associate with the concepts. Therefore, when a speaker thinks of a particular concept, tags from both languages for that concept are activated simultaneously, and it is the job of the bilingual to inhibit the production of the non-target tags. Green proposes that this is achieved by SAS or supervisory attentional system (SAS)
(based on Shallice and Burgess, 1996), which is mainly sub-served by the prefrontal cortex of the brain as other cognitive systems such as working memory (e.g., Abutalebi and Green, 2007). The SAS is responsible for regulating control over the activation and inhibition of the language tags at the lemma level. Inhibition is reactive and behaves according to the activation of the language tags triggered by external input or from a speaker’s conceptualizer, that is, a preverbal stage in which the speaker sets her/his intentions, selects and sorts information before converting it to language (de Bot, 1992).

One of the sources for empirical evidence for Green’s Inhibitory Control Model comes from studies on language switching and selection. For example, Meuter and Allport (1999) examined bilingual’s behavioral cost on switching between languages using reaction times tasks. The researchers predicted that, based on the Task Set Inertia Hypothesis, bilinguals in this study would take longer to switch from the L2 to the L1 instead of the L1 to the L2. Even though this may seem counterintuitive, the premise is that it takes more cognitive effort to inhibit the L1 during production of the L2; and thus, the switching cost from the L2 to the L1 is greater. In the study, 16 bilinguals whose L1 and L2 ranged from English to a European language (French, Italian, German, Portuguese, Spanish) and who reported being “reasonably proficient in the second language” (p. 29) completed a self-paced numeral naming task. For this task, the participants had to read as quickly as possible a list of 20 numerals in each of the languages. Within each list of numerals, participants had a sequence with trials in which they had to switch from one language to another while for the non-switch they did not switch languages. The numerals appeared on a color rectangle that indicated to the participant the language they had to use to produce the numeral they saw. The results did indeed suggest a higher switching cost in reaction time from the L2 to the L1 (143 ms) than from the L1 to the L2 (85 ms) suggesting that it takes more effort to inhibit a stronger L1 for bilingual speakers during production.
Another source of evidence for the role of inhibition on bilingual processing comes from neurocognitive studies. In a neuroimaging study that combined event-related potential (ERP) and fMRI, Rodríguez-Fornells and colleagues (2005) tested Spanish-German bilinguals and monolingual controls on a go/no-go picture-naming task that looked at the role of phonological interference from an unwanted language (i.e., for the bilinguals) during the completion of the task. In this task, participants saw a number of pictures and had to name the picture only if the word began with a consonant. The following two conditions were administered: the coincidence condition in which the names for both languages lead to the same response; and the noncoincidence, that is, when the responses were different for both languages. The results do suggest phonological interference from the unwanted or nontarget language as evidenced by bilinguals’ longer latency scores on both the fMRI and ERP data. Furthermore, bilinguals had fewer accurate responses for the trials under the noncoincidence condition suggesting simultaneous activation of both languages. More interestingly, the fMRI data reveal that during the interference trials, the bilingual participants demonstrate activation patterns in the areas of left prefrontal cortex and the supplementary motor area (SMA) --- both areas responsible for access to executive functions (e.g., inhibitory control) as shown by previous studies. Therefore, it seems that bilinguals tap into this ‘executive functions area’ of the brain to help them solve interference conflicts from the nontarget language. The previous two studies are examples of empirical evidence for the role of inhibitory control for suppressing the nontarget language during bilingual processing (for reviews on this issue, see Kroll, Bobb, Misra & Guo, 2008; Abulatebi & Green, 2007; Rodríguez-Fornells, Balaguer & Munte, 2006).

2.32 Effects of Early Bilingual Experience on Inhibitory Control

Additional empirical evidence for Green’s Inhibitory Control Model comes from Ellen Bialystok and colleagues who have examined how prior language experience may play a role in
the development of aspects of executive control, particularly the ability to inhibit distracting information in non-verbal tasks. Bialystok’s research in this area has sought to investigate whether early bilinguals have superior executive control abilities due to their experience growing up with two languages, that is, their constant need to suppress one of their languages while utilizing the other. Bialystok (2007, 2009) offers an overview of studies that support the notion that growing up with two languages gives bilingual individuals an edge for inhibiting distracting and unnecessary stimuli in both linguistic and non-linguistic contexts.

Bialystok (1999) examined both monolingual and bilingual children’s (ages 3.2 to 4.9 for the younger age group and ages 5.0 to 6.3 for the older age group) performance on the dimensional change card sort task. The task presents pairs of two rules in conflict for which children pay attention to one pair at a time. Children are asked to sort two types of cards according to one pair of rules (e.g., color), and then the pair of rules is changed to another that may require them to sort the cards following another dimension (e.g., shape). The research demonstrates that children up to the age of 4 or 5 have difficulty solving the post rule-switch of the task. Zelazo and Frye (1997) base this inability to children’s underdeveloped complex rule systems and executive function abilities that account for reflective behavior as posited by the Cognitive Complexity and Control Theory (CCC). The data on the performance of the dimensional change card sort task show that the bilingual groups (both younger and older children) performed significantly better than their monolingual counterparts. The results of the study suggest that growing up with two languages can influence a child’s cognitive development, at least for executive function processes.

Bialystok, Craik, Klein and Viswanathan (2004) studied whether bilingual children’s advantage for superior executive control ability is maintained in young and older bilingual adults. In the first study that they report, the researchers administered the Simon Task to forty
participants of which 20 were young adults whose ages ranged from 30 to 54 and 20 were older adults ages 60 to 88. The participants were English monolingual speakers from Canada and Tamil-English bilinguals from southern India. Both English and Tamil were languages of instruction from the beginning of their schooling for the bilingual participants. To complete the Simon task, participants saw either a blue or red square on a computer screen and were instructed to press the right shift key when they saw the blue square and the left shift key when they saw the red square. For the congruent trails, the color square appeared on the side of the corresponding shift key, however, the opposite occurred for the incongruent trials with the color square appearing on the side of the non-corresponding shift key. The task consisted of 28 experimental trials – half of which were congruent or incongruent; in addition, they were randomly presented to the participants. The Simon effect occurs when the response times of the incongruent trials are slower than the congruent trials. The results reveal that the reaction times of bilingual participants, regardless of age, were significantly smaller than the monolingual participants. These results suggest that bilinguals’ advantage for inhibiting distracting information due to their language experience seem to be retained during adulthood.

Bialystok (2006) compared the potential effects of bilingualism and computer video games on the performance of the Simon task. In this study, Bialystok predicts that bilingualism and video games affect differently performance on the Simon task since one requires inhibition (bilingualism), and the other one is based on speeded processing demands and the ability to remember stimulus-response associations by rules in working memory (video games). Therefore, Bialystok employs two versions of the Simon task to test this prediction. Participants in this study, 40 monolingual English speakers and 57 bilingual speakers of different languages completed two versions of the Simon task. Out of these 97 participants, 40 were regular video game players and 57 non-players – distributed among the monolingual and bilingual groups. The
first version required the participants to press a response key (right or left SHIFT computer key) determined by the color of the square presented. As previously stated in the above study, the congruent trials were the ones that had the color square in the corresponding position of the response key while the incongruent trials did not – the successful completion of this version was contingent on maintaining the rule in working memory. For the second version, the response was determined only by the direction of arrowheads; and thus, not requiring the participants to remember any rule. The results suggest that both experiences --- bilingualism and playing with video games --- have a different impact on performance on the Simon task according to experience. Bialystok discusses that the video game players demonstrated increased speed, especially during the first version of the task, while the bilingual group were better at the second version when having to solve perceptual conflict with the arrowheads at the most demanding level. In this case, bilinguals seemed to perform significantly better at the task that placed more demands on inhibitory control concluding that type of experience may play a role on the development of different types of cognitive abilities.

Martin-Rhee and Bialystok (2008) present studies to examine more in depth different levels of inhibitory control through tasks completed by monolingual and bilingual children. For the first experiment, 34 children (half English monolinguals and English/French bilinguals), completed three versions of the Simon task. All three versions of the task follow the same process as described in the above studies. During the first version, participants had to respond immediately and as quickly as possible as they saw the stimulus. For the subsequent tasks, children were not able to respond to the stimulus until the appearance of a cue. There was a short delay for the second version, that is, after the presentation of the stimulus, a 800 ms delay was in effect through the appearance of an icon of a hand with a finger pointing downwards before they were able to respond; and a 1000 ms delay for the long delay version or third version. The results
of the response times suggest that the bilingual advantage for inhibitory control seem to hold only for the immediate response version while the results were comparable for the delay versions. The second experiment was designed to identify the source for bilinguals’ advantage at solving perceptual conflict. The researchers present literature on different types of inhibitory control --- interference suppression and response inhibition. *Interference suppression* is invoked when a person is trying to solve two conflicting dimensions of a task, especially when the two features of the task do not correspond like the color and position of the stimulus on the computer screen (i.e., Simon task). Tasks that present a stimulus that require the option of two responses --- either a habitual or an unfamiliar response to the same stimulus enabling the unfamiliar response to substitute the habitual one requires *response inhibition*. According to the authors, the bilingual advantage for inhibitory control should become evident for tasks that require interference suppression since bilinguals have to solve the conflict of the activation of two languages that compete for the same goal of communicating an idea or thought. To test this prediction, 20 English monolingual and 21 English-French bilingual children completed the Simon task and a Stroop Picture Naming Task. The Strop Picture Naming task consisted of pictures showing a bright sun or dark sky. The participants had to say “day” when they saw the dark sky and “night” when they saw the bright sun sky. As the authors discuss, in this task, participants only need to change their habitual response to the same picture, and they also highlight that no conflicting perceptual stimuli are presented which makes the task ideal to test response inhibition. The results show that the bilingual children had smaller response times for the Simon task replicating experiment 1 and previous studies. However, no differences were found between both groups of children on the Stroop naming task. To ensure that the results for the Stroop naming task were not based on the bilingual participants’ disadvantage on lexical retrieval (see Gollan and Kroll, 2001 for studies showing that bilinguals are slower than monolinguals in picture naming tasks), a
third study was conducted adapting the Simon task to measure both interference suppression and response inhibition without the dependency on verbal ability. Instead of squares as the previous Simon task, the researchers designed the Simon task using arrows pointing to the either the left or right positioning them on either end of the screen. To mirror the Stroop task without verbal content, they utilized the same arrows but these always appeared in the center of the computer screen so the participants only relied on response inhibition. The results indicate that the bilingual children still responded faster to the Simon task with the arrows in different positions of the computer screen whereas no differences were found between bilingual and monolingual participants in the version where the arrows remained in the center. In conclusion, the three studies provided a more detailed explanation of bilinguals’ advantage over monolinguals in tasks that require attentional control --- the bilingual experience enhances an individual’s executive control when attending to particular stimuli when in conflict with other cues.

Bialystok, Craik and Luk (2008) studied the performance of participants who were younger or older and monolingual or bilingual on executive control, verbal fluency and working memory tasks. Twenty-four young monolinguals, 24 young bilinguals, 24 older monolinguals and 24 older bilinguals completed the following tasks: (a) for working memory: Forward and backward Corsi blocks and Self-ordered pointing task; (b) for verbal fluency: Peabody Picture Vocabulary Test and Boston naming task; (c) for executive control: Simon arrows task, Stroop color-naming task and Sustained Attention to Response Task (SART). For purposes of this study, descriptions only for the executive control tasks will be provided (see p. 862 & 863 for descriptions of other tasks). The purpose for the three tasks was to capture different aspects of executive control. The researchers employed three conditions of the Simon arrows tasks. The first was a control condition in which participants saw an arrow in the center of the screen pointing either to the right or left and had to press a response key accordingly as quickly as
possible. The second was a reverse condition and participants were instructed to press the response key in the opposite direction of where the arrows were pointing. The third was called the conflict condition since the arrows could be pointing to the right or left as well as appear on either side of the computer screen. Two blocks for each condition were presented counterbalanced for each participant in these two orders --- control, reverse, conflict, reverse, conflict, control or control, conflict, reverse, conflict, reverse, control. The Stroop color-naming task consisted of color names (red, green, blue) that appeared in the center of the screen. The researchers gave names to the four conditions: color, word, congruent, Stroop. The color condition was presented with a series of Xs in one of the target colors; the word condition consisted of the name of colors in black font; the congruent condition presented the matching color word and color font; and the Stroop condition consisted on the mismatch between the color name and color font. The participants had to respond using a voice key to 24 trials for all eight blocks. The SART was used to measure the participants’ sustained attention. For this task, participants saw a number from 1 – 9 presented in the center of the screen and had to press a response key as quickly as possible except when they saw the number 3. If participants saw the number 3, they were instructed to not press the response key and to wait for the following number. The overall results show that both younger and older bilinguals were faster in the Simon and Stroop tasks but no differences with their monolingual counterparts in the SART. Furthermore, monolinguals performed better on the verbal fluency task and no differences between both groups in the working memory tasks. The researchers argue that the non-significant performance in the SART is that it was a task that required response inhibition and this type of executive control is not shaped by bilingual experience as in Martin-Rhee and Bialystok (2008). This empirical study provides more evidence for bilingual advantage for
interference suppression. Therefore, they conclude that the bilingual experience shapes certain types of inhibitory control.

Costa, Hernández and Sebastián-Galles (2008) aimed to further tap into subcomponents of attentional networks (i.e., alerting, orienting and executive control) and examine how these are moderated by the bilingual experience. They sought to provide more evidence for potential advantages in inhibitory control for young bilingual speakers who are at their cognitive peak with their monolingual peers since the studies by Bialystok and colleagues show strong findings for children and older adults but not so much for a younger population. This is also the first study to explore the impact of bilingualism on other subcomponents such as alerting and orienting. For the purposes of this study, the discussion will limit itself to the findings for inhibitory control. The researchers employed an ANT or attentional network task (Fan et al., 2002) as an alternative to the Simon task. Essentially, they argue that the ANT task is more appropriate to measure inhibitory control since it does not confound other cognitive processes such as working memory capacity (see p. 65 for complete discussion). The study reports on data from 200 participants, 100 of whom were Catalan-Spanish highly proficient bilinguals and 100 monolingual Spanish speakers. Participants’ ages ranged from 19 to 32 for the bilingual group and 17 to 32 for the monolingual group. The stimuli consisted of a row of 5 black horizontal lines with arrowheads pointing to the right or left. The participants were instructed to focus on the middle line and press a key on the computer with their left hand if the arrowhead pointed to the left and vice-versa (i.e., press a key with their right hand when the arrowhead pointed to the right). The three types of stimuli were neutral, congruent and incongruent. In the neutral trials, the non-central lines (four other black horizontal lines) did not have arrowheads; for the congruent trials, the middle arrowhead pointed in the same direction as the other four arrowheads whereas for the incongruent trials, the middle arrowhead points in the opposite direction of the other four. The
results of the study show faster reaction times for the congruent trials and that the bilingual participants responded significantly faster than their monolingual counterparts as illustrated by the differences in reaction times between the incongruent and congruent trials during the first two blocks of the task. The authors conclude that younger bilinguals still have an advantage over their monolingual counterparts during their cognitive peaks of attentional abilities.

The above studies have replicated findings for superior inhibitory control abilities among bilinguals. However, most of the bilingual participants in these studies seemed to have grown up using two languages and also seem to be rather highly proficient in both languages. Stafford (2011)’s exploratory study analyzed if different bilingual experiences may influence inhibitory control development. Stafford divided her Spanish-English bilingual participants into MEB (more experienced bilinguals) and LEB (less experienced bilinguals). The MEB participants were bilinguals who used both languages regularly since childhood while the LEB participants learned and used English after adolescence. Both groups completed a version of the Simon task. The stimuli consisted of red and blue circles that were presented on a computer screen. Participants had to press a response key for the red circles and another key for the blue circles. The bilinguals responded to 10 congruent trials (i.e., the color and the position of the circles on the computer screen converged) and 10 incongruent trials (i.e., the color and the position of the circles on the computer screen did not converge) that were presented in random order. The results demonstrate that both groups were faster at responding to the congruent trials than the incongruent ones. However, no statistical differences were found between both groups as far as Simon effects. The author does report that the MEB group responded about 50 ms faster in both trials showing a trend that supports previous studies (e.g., Bialystok, 2006). The non-significant results may be attributed to low number of participants (n = 20, 10 participants per cell). Therefore, caution needs to be taken when interpreting the trend in the data.
Finger, Billig and Scholl (2011) investigated an older bilingual population of Hunsrückisch and Portuguese speakers in Brazil and their performance on executive functions tasks. Additional profiles of these bilinguals are having low levels of formal education and literacy that were mostly farmers. The average age for the monolingual group was 64.3 and 63.8 for the bilingual group. The participants in the study were all from the same region with similar social backgrounds. The participants completed a Simon arrows task of 24 trials in which they pressed a response key to indicate the direction of the arrowhead. As in previous studies, the incongruent trials consisted of a conflict between the direction of the arrowhead and the position of the stimulus on the computer screen. The participants also completed a Stroop task in which they saw color names that appeared in the center of the screen. The incongruent trials were those in which the color name and the color of the font did not match. The researchers wanted to test inhibitory control using a non-linguistic and linguistic task. For the Simon task, the data show that the bilingual group was more accurate in the incongruent trials. Although the trend of the data shows that the bilingual group was somewhat faster than the monolinguals, results were not statistically significant. No significant results were found either for the performance on the Stroop task even though the researchers report the bilinguals actually being somewhat slower and less accurate than the monolinguals. Overall, the researchers conclude that the trends in the data for the Stroop task can be due to the profile of these older bilinguals, that is, their low level of literacy and education since this was a more linguistic task but seem to perform slightly better at the nonlinguistic Simon arrows task. However, as in Stafford (2011), they also caution the interpretation of their results due to a small sample size.

2.33 Individual Differences in Inhibitory Control

Many studies on individual differences on executive function (i.e., including inhibitory control) abilities have focused on studying student populations who have been classified as
gifted, that is, learners who demonstrate superior executive function processes (e.g., Borkowski & Peck, 1986) or pupils with learning disabilities and attention-deficit/hyperactivity disorder (ADHD) (e.g., Denckla, 2007). Furthermore, Fischer and Daley (2007) propose that students show different executive function abilities depending on the type of task they are completing; therefore, suggesting a more multi-dimensional view of executive function across different domains. These research findings contribute to a deeper understanding of executive function abilities in learners as well as to the design of curricula that promote ‘strategic classrooms’ so that learners may utilize efficient strategies that promote executive function processes (Meltzer, Pollica & Barzillai, 2007). Another line of research, especially in the medical field, has examined how individuals with brain lesions perform different daily tasks that require high cortical functions. For example, (Godefroy & Rousseaux, 1996) provide evidence that participants with injuries in the frontal lobe region of the brain demonstrated deficits in novel decision-making when compared to normal subjects.

For example, an interesting study by Engelhardt, Corley, Nigg and Ferreira (2010) looked at the relationship between inhibition and language production, particularly looking at output disfluencies. Disfluency refers to when speech production contains pauses, corrections or utterances such as _uh, um_. The corrections can manifest themselves as repetition of words or phrases and/or when a speaker stops and begins a new word or phrase. According to the researchers, since ADHD is linked to dysfunctions in inhibitory control, the study recruited participants diagnosed with two types of ADHD – subtype PI shows symptoms of inattention but not hyperactivity, and subtype C shows signs of inattention and hyperactivity. Participants, ages ranging from 13 to 35, with both subtypes of ADHD as well as a control group (with no form of ADHD) completed a sentence production task. The participants were instructed to construct sentences with a bias toward passive constructions. The stimuli consisted of pictures of
inanimate and animate objects as well as English past participles. The experiment included past participles that were straightforward (e.g., ridden) or more ambiguous (i.e., moved) since these can be a past tense form in English. All participants saw the pictures presented to them one at a time with alternations between the animate and inanimate object as the first picture. The participants saw the verb after the second picture. One conflict occurred when participants would see an animate object first and then an unambiguous past participle (i.e., ridden) since the presentation of the animate object would prompt the use of an active construction instead of a passive one --- to use an active construction tends to be a default for English speakers in the first place. The second conflict occurred when the participants saw the inanimate object first with an ambiguous verb (i.e., moved) since the verb tends to favor an active construction. The researchers measured participants’ filled pauses, repetitions and repairs as dependent variables for speech disfluency. According to their data, more disfluency occurred with the appearance of a past participle verb and when inanimate objects were presented first. The results show that participants with ADHD subtype C produced significantly more repairs than the subtype PI and control groups, especially for the most conflicting conditions. The researchers conclude that inhibitory control seems to play a role on preventing repair disfluencies, and these disfluencies worsen with individuals who have poor inhibitory control abilities.

2.34 Inhibitory Control and L2 Development

Studies are beginning to document how individual differences in inhibitory control can moderate L2 processing (e.g., Linck, Hoshirno & Kroll, 2008). Furthermore, researchers in the field are also beginning to suggest that cognitive abilities like working memory and inhibitory control may contribute to language aptitude (e.g., Abulatebi & Green, 2007), that is, an individuals’ innate ability to learn a language (e.g., Skehan, 2002). So far, a couple of SLA studies have examined the role of inhibitory control in moderating L2 development. Linck and
Weiss (2011) investigated whether individual differences in working memory and inhibitory control were predictive factors for L2 development in a classroom context as demonstrated through a change in proficiency. The researchers tested L1 English learners of Spanish (third semester) and German (first semester). The first testing session took place during the sixth week of classes and then again at the end of the semester. Participants also reported GPA, SAT scores and completed a motivation questionnaire to control for other potential variables. The L2 Spanish participants completed the DELE (Diplomas de Español como Lengua Extranjera) published by the Instituto Cervantes and measures items for grammatical and lexical knowledge. The German students completed a language placement exam from the University of Wisconsin that consisted of fifteen fill-in-the-blank questions. To measure inhibitory control, the participants completed the Simon task in which they saw a number of colored squares and had to respond according to the color of the squares. The squares appeared either on the side of the computer monitor that corresponded with the response key (i.e., congruent trials) or on the opposite side of the response keys (i.e., incongruent trials.) The premise is that participants need to suppress the location of the square during the incongruent trials. The Simon effect is the difference in response times between the incongruent and congruent trials. The results of the two testing sessions suggest a robust predictive role for working memory but not for inhibitory control. The researchers discuss that perhaps beginning learners have not developed enough experience to exercise inhibitory control as experienced bilinguals (e.g., studies by Bialystok & colleagues). They pose questions as whether inhibitory control may play more of a role during more advanced stages of L2 learning and in a different context like an immersion setting.
2.4 Target Form: Subjunctive Mood in Spanish Adjectival Relative Clauses

2.41 Brief Theoretical Approaches to the Subjunctive Mood

In broad terms, Portner (2009) cautiously defines modality as “…the linguistic phenomenon whereby grammar allows one to say things about, or on the basis of, situations which not need be real.” (p. 1). Mood is a grammatical mechanism to express modality when the speaker expresses his/her views about probability or obligations, for instance (Comrie, 1976; Cinque, 1999). Spanish, like other Romance languages, selects mood through a morphological system so that verbs are inflected to mark distinctions between the indicative and subjunctive mood. For example,

(1) Juan dice que los padres llegan temprano.
    Juan says that the parents arrive-IND; 3rd PLU early
    ‘John says that the parents arrive early.’

(2) Juan dice que (pro) llegues temprano.
    Juan says that (pro) arrive-SUBJ; 2nd SING early
    ‘John says to arrive early.’

While an indicative mood is employed to correspond to the factuality of events, a subjunctive mood is preferred for events that a speaker finds to be unknown or doubtful (Zagona, 2002). According to Bybee (1985), it is the speaker who assesses the degree of factuality of an event, and hence, chooses the appropriate verb ending to mark linguistically his or her view of a given proposition. Furthermore, Lunn (1995) also claims that a speaker evaluates the truth value information of a proposition, and based on the speaker’s opinion, decides whether or not the information of a given proposition is flawed. If the information is not asserted to be true, this will lead the speaker to opt for the subjunctive mood. As a result, a speaker’s ability to judge the quality of a proposition and freely elect the subjunctive presents a challenge theoretically for explaining the use of this mood.
The use of the subjunctive is contingent on syntactical constraints. Traditionally, grammarians considered the subjunctive a dependent mood since it usually can only appear in a subordinate clause whereas the indicative can be found in both matrix and embedded clauses. Under the rubric of Universal Grammar (UG), a theoretical position that assumes a person’s linguistic knowledge is independent of other general cognitive processes; generativist grammarians have recognized the importance of inflectional morphology as it pertains to syntactic processes. Chomsky (1981 and other work) has proposed in his generative model lexical categories that contain information that categorizes a word (i.e., nouns, verbs…), as well as functional categories that hold inflectional, semantic and pertinent morphological features (i.e., tense, aspect…) that are derived from the lexicon. Both lexical and functional categories are then arranged in a particular order by a computational system, and it is the job of syntacticians to explain the variance of order that occurs across languages. Cinque’s (1999) book on adverbs and functional heads introduces MoodP as a functional category based on cross-linguistic research. This MoodP will contain a mood feature that is accompanied by corresponding inflectional morphemes, and will go above the lexical category VP. Since Spanish is a morphologically rich language, verb movement is triggered due to its strong agreement system; and as a result, verbs move from V to the heads of functional categories (e.g., Mood) to check its features as illustrated by the tree diagram in (3).

(3)

```
MoodP
  Mood
    [+/-feature]
      VP
        V
```

The field of formal semantics has posited theoretical accounts (for a review, see Villalta, 2007) that attempt to explicate the licensing conditions of the subjunctive mood, and some of these include the following: predicates that are non-assertive (Hooper, 1975); to mark irrealis for
propositions that are not part of the actual world (Bergen, 1978); non-factive modal contexts (Portner, 1997); strong intensional predicates that do not require the belief of a proposition (Farkas, 1992); the notion of nonveridical predicates (Giannakidou, 1999); utilizing non-null ordering sources in conversational contexts (Giorgi and Pianesi, 1997); marking a model shift when evaluating propositions (Quer, 2001); a referential approach that suggests the subjunctive to be a default mood (Schlenker, 2005); and a cognitive model of utterance interpretation (Jary, 2009). For purposes of this dissertation, Quer’s ‘model shift’ will be adapted since it provides the most appropriate account of the target linguistic form of this study. Quer’s model, based on embedding predicates and context change, assumes that the indicative mood is the default in a discourse context since it relies on a speaker’s epistemic knowledge, and that a speaker’s evaluation of the proposition of an embedded clause is what contributes to a change in context – and this is what Quer refers to as ‘model shift.’ This change in context occurs when the speaker’s epistemic knowledge makes a shift to an individual’s (i.e., the referent in the matrix clause) epistemic knowledge that may be triggered by strong intensional predicates, for example. Therefore, according to this proposal, when a speaker makes this shift, s/he will elect the subjunctive mood to express this shift in evaluation (Quer, 1998, 2001). For a critique of Quer’s model, refer to Jary (2009).

2.42 Restrictive Relative Clauses in Spanish

Adjectival relative clauses are found in the embedded or subordinate clause of a sentence and serve as a way to describe, qualify or specify the antecedent/referent of the matrix clause (Campos, 1993). For example,

(4) Los estudiantes [que trabajan mucho]  
the students that work-IND-3rd pl a lot  
‘The students that work a lot.’  
(Campos, 1993, p. 98)
In sentence (4) the embedded clause *que trabajan mucho* serves to specify or narrow a subset group of hard-working students (the antecedent) from a possible universal set of students. In these restrictive relative clauses, Spanish speakers may employ either the indicative or subjunctive mood in the embedded clause. Campos (1993, p. 109) provides the following examples:

(5) Tengo un amigo [que estudia rumano].  
I have a friend who studies-IND Romanian  
‘I have a friend who studies Romanian.

(6) Necesito un traductor [que entienda rumano].  
I need a translator who understands-SUBJ Romanian  
‘I need a translator who understands Romanian.’

In prescriptivist grammars, the use of the indicative in sentence (5) leads to the interpretation of an existent referent in the matrix clause (i.e., *un amigo*); on the other hand, the subjunctive mood in (6) indicates a non-existent *traductor* for the speaker. This dichotomy of existent vs. non-existent elements may determine the licensing of the indicative vs. subjunctive mood respectively. Donnellan (1966) describes sentence (5) as *referential*, that is, the antecedent is a specific individual or object in the interlocutor’s mind while (6) is *attributive*, a non-specific antecedent that may fit the description in the embedded clause. However, Rivero (1975) expands this interpretation by presenting a notion of *acquaintance* with these types of clauses, that is, a lack of *acquaintance* with the referent is what may prompt a speaker to make use of the subjunctive mood. For example,

(7) Este trabajo enlaza con el que ya se publicara la semana anterior.  
this work connects with the one already published-SUBJ the week before  
‘This work connects with the one which was already published last week’  
(p. 43)
Sentence (7) expresses the existence of *Este trabajo* since its publication took place in the past, and in this case, the use of the subjunctive is an indication of the speaker’s lack of acquaintance with the publication. Rivero does maintain the distinction between existent/non-existent or referential/attributive as the only alternative for contexts in which the speaker makes a future presupposition such as (8):

(8) **Juan bailará con la chica que tenga ojos azules, la cual no existe.**

   *Juan dance-FUT with the girl that has-SUBJ eyes blue the one does not exist*

   ‘Juan will dance with the girl who has blue eyes, who doesn’t exist yet.”

   (Rivero, 1975, p. 44)

Velasco-Zárate (2006) argues that the use of mood oftentimes determines the specificity of a relative clause since a marker of definiteness of a DP (determiner phrase) may be limiting to the specificity interpretation of a clause. According to Velasco-Zárate, the English language utilizes pragmatic context to disambiguate the specific/non-specific interpretation; however, Spanish speakers depend on the selection of indicative/subjunctive to accomplish the same task as illustrated in her examples:

(9) **La empresa contratará a la secretaria que sabe inglés.**

   ‘The company will hire the secretary who knows-IND English. (Her name is Rosa).

(10) **La empresa contratará a la secretaria que sepa inglés.**

   ‘The company will hire the secretary who knows-SUBJ English. (They hold the interviews tomorrow.)

Unlike many accounts that suggest a lexical selection in the matrix clause for the licensing of the subjunctive (e.g., Villalta, 2008), as (9) and (10) show, restrictive relative clauses do not follow this same pattern since the same predicate can allow both the indicative and subjunctive mood.
Therefore, it must be the speaker’s evaluation of the outcome of a proposition in these clauses that determines the selection of the appropriate mood.

2.43 L1 Acquisition of the Spanish Subjunctive

At around age 2, data reveal that monolingual Spanish-speaking children begin to produce subjunctive mood verb endings in the present to express negative imperatives. López-Ornat and colleagues (1994) analyze Spanish data from a longitudinal study of María, a monolingual child from Madrid, between the ages of 1.7 and 3. In this volume, Fernández-Martínez reports on María’s use of the present subjunctive to express negative imperatives in Spanish such as *no comas* (Don’t eat) at the stage of 25-26 months, and thus, replacing the indicative mood endings in this same context. Gallo Valdivieso’s chapter provides the following speech samples of María utilizing correctly subjunctive verb endings in negative imperatives:

(11) **María:** ¡No te bañ**és tu**!

    ‘Don’t shower.’

    **P:** ¿Qué has dicho?

    ‘What did you say?’

(12) **María:** No me lo cos**as**.

    ‘Don’t sew it for me’

    (Gallo-Valdivieso, p. 55)

Blake’s (1983) study on mood acquisition among Spanish monolingual children in Mexico City ages 4 to 12 also replicates the findings in López-Ornat et al. (1994), that is, the first indication of subjunctive among children is in the production of subjunctive verb endings in negative commands. 134 children took a sentence completion task, based on a situation with an illustration and followed by a couple prompts about the situation, and then had to provide the
verb of an embedded clause. Based on cross-sectional error-rate data, Blake (1983) suggests the following order of subjunctive mood development among the participants:

![Subjunctive Mood Development Diagram]

Even though the data suggest that children by the age of 5 seem to have developed the necessary cognitive capacity to make selections between the indicative and subjunctive moods, Blake (1983) also notes that between the ages of 5 and 8, what he refers to as a transitional period, children still experience difficulties with choosing between the indicative and subjunctive.

Pérez-Leroux’s (1998) provides evidence that children’s acquisition of the subjunctive mood corresponds with their cognitive development such as distinguishing between reality and belief and attributing false beliefs onto others. Pérez-Leroux cites research that suggests that children develop the cognitive ability to attribute beliefs onto others around the age of 4. In this study, she hypothesized that children’s acquisition of the subjunctive in relative clauses coincided with their capacity to attribute beliefs. The study recruited 22 Spanish monolingual children between the ages of 3.5 and 6.11 from upper middle class families. The first task consisted of two stories with props designed to evaluate the children’s capacity to comprehend a character’s false beliefs. For example, the children were told that a mother puts a sponge cake in
the pantry and then leaves the kitchen. While the mother was gone, the baby takes the sponge cake from the pantry and puts it under the table. The researcher would ask the child, “When the mom returns… where will she look for the cake?” The children who answered that the mom would look for the sponge cake in the pantry demonstrated that they are able to assign false beliefs onto others. The second task was a subjunctive elicitation story in which participants saw a picture that offered no solutions to the main character’s request. In one illustration, the participants saw a picture of a cook looking for hens because she needed eggs to make breakfast. However, the hens in the picture are occupied performing other actions. The researcher would ask then, “What is the hen looking for? - a hen that would lay eggs.” The child is expected to employ the subjunctive mood in this case since the referent (i.e., the hen laying eggs) may not exist in the cook’s possible worlds. The results of the study show a positive correlation between the participants’ ability to assign false beliefs onto others and the production of the subjunctive mood. Therefore, this study suggests that the use of the subjunctive in relative clauses is contingent on the semantic interpretation of a given situation.

In L1 bilingual acquisition, Merino (1983) reports on two studies that examined Chicano children’s use of past tense, relatives and subjunctive. For purposes of this study, only the data on the subjunctive will be highlighted. The study employed the following uses of the subjunctive mood: emotive predicates, predicates of doubt and adverbial clauses. In study 1, a cross-sectional study of 41 bilingual children from kindergarten to the fourth grade completed the Bilingual Language Acquisition Scale (BLAS) test for both English and Spanish. The comprehension component of the BLAS consisted in the children listening to a statement, and then pointing to the picture that matched the sentence they heard. For production, the participants completed a delayed imitation task in which the researcher showed the children two pictures while saying a sentence about each picture. It is important to note that the researcher’s sentences for the pair of
pictures contrasted grammatically. Then, the researcher would point to the picture and ask the participant to repeat the sentence the researcher had said for the particular picture. The overall results on production show significant differences between kindergarten and subsequent grades for both English and Spanish suggesting development of the structures; however, a significant decline appears in the Spanish data in grade four. The comprehension scores appear to be stable for Spanish while English shows a significant improvement from kindergarten to the other grades. As for the data on the subjunctive, Merino reports that the 4th grade children were performing at the level of the kindergarten children on the production task. The second study was longitudinal in nature and tested the 32 children from the original sample of 41 two years later with the same instruments. While English scores improved significantly, conversely, the Spanish scores declined for past tense, relatives and subjunctive. So, for example, children who had produced sentence (13) utilizing the subjunctive mood, opted for using incorrectly a non-finite verb as in (14).

(13) El señor saca un libro para que lea.

the man takes out-IND a book so that (he) reads-SUBJ
‘The man looks takes out a book to read.’

(14) El señor saca un libro para que *leer.

the man takes out-IND a book so that (he) to read-INF.
‘The man takes out a book to read.’

(Merino, 1983, p. 291)

Merino’s (1983) data suggest that Spanish-English bilingual children, especially the ones who use both languages constantly, show strong signs of attrition or language loss in the area of production for certain grammatical features such as the subjunctive.

Silva-Corvalán (2003) aimed to examine if bilingual adults with a simplified grammar in their L1, as suggested in Silva-Corvalán (1994, 1995), was a result of an impoverished input environment that commenced during childhood, and whether the signs of omission of certain
features in their grammars were present already in childhood. She collected data from 7 children in the Los Angeles area, ages 5.1 to 5.11, two of which only spoke Spanish at home (Daisy and Cindy), three spoke both English and Spanish at home (Bryan and Mike), and three (Chris, Bren and Nico) only spoke English at home. For purposes of this study, only data on the subjunctive and the 4 children who received some exposure of Spanish at home. Data from the 5 children were collected at school in their kindergarten class, 3 hours for each language. The researchers elicited data from the children by engaging them in free conversation, playing with puppets, answering questions to hypothetical situations and completing the narrative story, *Frog, where are you?* The 5 children seem to follow the same developmental pattern in spite of the amount of exposure to either language. The results show that Daisy and Cindy, whose dominant language is Spanish, produced the present subjunctive as a Spanish monolingual speaker as well as some instances of the imperfect subjunctive. However, Bryan and Mike produced no exemplars of the imperfect subjunctive, and while Bryan produced the present subjunctive to a certain degree, Mike was not consistent in producing it in obligatory contexts. These results suggest that onset of bilingualism that causes a significant reduction of input in one of the languages may lead to the non-acquisition of certain grammatical features, and if the weaker language is never attended to through education or a different environment, this may explain bilingual adults’ simplified grammars of the weaker language.

**2.44 L2 Development of the Spanish Subjunctive**

The use of the subjunctive presents a challenge for L2 learners of Spanish, and those who teach Spanish easily evidence this. To begin, Collentine (2003) points out that for English L2 learners of Spanish, the immediate challenge is that the subjunctive is not highly used in English as it is in Spanish. Collentine also states that the use of the subjunctive mood presents a two-fold problem for L2 learners – it requires learners to employ accurately a morphological system as
well as utilize a complex syntactic system that provides subordinate clauses for the subjunctive to appear. Furthermore, in the case of relative clauses, as previously stated, a speaker relies on semantic or pragmatic interpretation of a proposition that contribute to additional layers of difficulty that may present a challenge for L2 learners’ processing capacity. In other words, all of these components may cause cognitive overload for a learner to process as well as temporarily store the different types of information (e.g., syntactic and semantic) in working memory to produce the correct subjunctive inflectional morpheme. Collentine (2003) summarizes additional potential explanations based on other findings that may explain difficulties on the development of the subjunctive that include: subjunctive morphemes are not phonologically salient; the subjunctive mood lacks communicative value since learners seem to understand and be understood by native speakers without using it correctly; learners’ inability to attend to it in the input; and finally, the acquisition of the subjunctive may be contingent on proficiency levels indicating that learners must have in place some linguistic base first before intake can take place. Collentine (1995) also claims that the development of the subjunctive will only occur when an L2 learner is ready to process complex syntax which may require the presence of certain linguistic foundation.

Selinker (1972) coined L2 learner’s development of language X at a given point as interlanguage, a system that behaves as natural languages. Ortega (2009b) summarizes studies that attest to the systematic nature of interlanguages, that is, linguistic growth for L2 learners is constrained by stages of development that not even the best method of instruction can alter. Processability theory (Pienemann, 1998, 2007) claims that for an L2 learner to move to a subsequent stage in his/her interlanguage path, the learner has to be developmentally ready due to the constraints of the language processor that can only deal with the linguistic data at the
current stage. Pienemann proposes a hierarchical model consisting of a number of procedures or stages of interlanguage development. The following table illustrates this hierarchy:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Processing Procedure</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Subordinate Clauses</td>
<td>Use of subjunctive in subordinate clauses</td>
</tr>
<tr>
<td>5</td>
<td>Sentence</td>
<td>Subject-verb agreement</td>
</tr>
<tr>
<td>4</td>
<td>Verb phrase</td>
<td>Moving an adverb out of the verb phrase to the front of a sentence</td>
</tr>
<tr>
<td>3</td>
<td>Noun phrase</td>
<td>Matching plurality as in “two kids”</td>
</tr>
<tr>
<td>2</td>
<td>Category</td>
<td>Adding a past tense morpheme to a verb</td>
</tr>
<tr>
<td>1</td>
<td>None</td>
<td>Producing simple words such as yes</td>
</tr>
</tbody>
</table>

As a result, L2 learners of Spanish need to have become proficient at processing sentences at stage 5 as evidenced by subject-verb agreement, for example, before they can produce subjunctive forms in embedded clauses in stage 6. The role of instruction or pedagogical interventions may facilitate the rate in which a learner moves from one stage to another. A number of empirical studies has examined different treatments to help foster the development of the subjunctive in L2 learners, and these treatments include providing learners with metalinguistic information (e.g., Correa, 2011), altering learners’ processing strategies through Processing Instruction (e.g., Farley, 2004) and output-based problem-solving activities (e.g., Woodson, 1997). However, the field of SLA has a lack of research studies that has utilized task-based approaches to L2 Spanish subjunctive development (Collentine, 2010). To best of my knowledge, only two dissertation studies (Medina, 2008; Baralt, 2010, forthcoming) have employed the subjunctive mood as a target linguistic item to explore the effects of task-based pedagogical interventions.

2.45 The Spanish Subjunctive and HL Development

One of the vulnerable features in HL grammars is the use of the subjunctive mood --- whether is caused by attrition that occurs during childhood (Merino, 1983) or never being acquired/stabilized in a child’s grammar during a transitional period (Blake, 1983). Both
phenomena, however, are due to an environment that exposes the child to infrequent or poor quality of input in the HL. Silva-Corvalán (1994) reports on the loss of the subjunctive mood in English-Spanish bilinguals from the Los Angeles area based on sociolinguistic interviews. The data reveal signs of indicative mood replacing the subjunctive in optional contexts, that is, occurrences in which the selection of mood depends on the speakers’ interpretation of the events in that possible world. On the other hand, the uses of the subjunctive in obligatory contexts seem to resist this simplification process. These results were mostly salient for the HL speakers who began their schooling in the United States. Montrul (2007) compared Spanish monolingual and heritage speakers’ interpretation of the subjunctive mood in adverbial and relative clauses as well as cuando and de manera que. The results of the study suggest that advanced proficient HL speakers were better at interpreting the subjunctive mood in obligatory contexts (e.g., adverbial clauses) than their intermediate proficient counterparts, but the advanced proficient group also had difficulties interpreting the subjunctive in optional contexts (e.g., cuando, relative clauses). These studies provide evidence that the subjunctive mood system, especially in optional contexts like relative clauses, is not completely represented in the grammars of heritage speakers of Spanish due to either never acquiring it or attrition.

Potowski, Jegerski and Morgan-Short (2009) examined the effectiveness of traditional and processing instruction along with feedback on the development of the Spanish imperfect subjunctive as demonstrated on interpretation (aural mode) and production (written mode) tasks as well as a grammaticality judgment test (written mode) on a pre to posttest design. They only compared HL learners to a HL control group that received no treatment and only attended regular class sessions. The results show that both HL and L2 learners significantly improved from pre to posttest under both types of instruction for both interpretation and production tasks; however, only the L2 learners demonstrated improvement on the grammaticality judgment test.
Another significant finding was the effect size of treatment for the interpretation and production tasks. The researchers report that effect size differed between both populations showing significant stronger net gains for the L2 learners on both tasks.
2.5 Research Questions and Hypotheses

Based on the review of the literature, the current study first aims to provide more empirical evidence as to the design of tasks along the lines of complexity and in relation to learners’ individual differences. Second, to investigate if and how HL learners may benefit from task-based approaches by considering HL learners’ prior language learning experience. Third, another goal of the study is to find out whether heritage bilingual linguistic experiences in the U.S. context also confer a cognitive advantage for inhibitory control abilities. Finally, if researchers want to consider inhibitory control as a component of language aptitude, a dire research agenda examining learners’ individual differences in inhibitory control and its role on language development is in place. In sum, the goals of the study are the following: (a) to operationalize task complexity through *intentional reasoning* as proposed by the Cognition Hypothesis (e.g., Robinson, 2011) and its potential effectiveness in leading to language learning; (b) to determine whether task-based approaches are effective in promoting the development of the Spanish present subjunctive in adjectival relative clauses; (c) to understand the interaction between task effects and inhibitory control in HL and L2 learners; (d) to investigate the potential mediating role of inhibitory control during learning outcomes.

2.5.1 Research Questions 1-3: On Task Complexity

1. Does changing the cognitive demands on a task via intentional reasoning have an effect on L2 development as measured through the accurate oral production of the Spanish present subjunctive in adjectival relative clauses?

*Hypothesis:* Based on the predictions of the Cognition Hypothesis, there will be positive effects of increased task complexity via intentional reasoning on the oral production of the Spanish present subjunctive in adjectival clauses.
2. Does changing the cognitive demands on a task via intentional reasoning have an effect on L2 development as measured through the accurate written production of the Spanish present subjunctive in adjectival relative clauses?

*Hypothesis: Based on the predictions of the Cognition Hypothesis, there will be positive effects of increased task complexity via intentional reasoning on the written production of the Spanish present subjunctive in adjectival clauses.*

3. Does HL/L2 status moderate the effects of changing the cognitive demands on a task?

2.52 Research Questions 4-6: On Inhibitory Control

4. Do HL and L2 learners show comparable inhibitory control abilities?

*Hypothesis: Based on the literature by Bialystok and colleagues, HL learners will demonstrate superior inhibitory control abilities due to their early bilingual experience.*

5. Does inhibitory control *mediate* the effects of task complexity on the development of the Spanish subjunctive in adjectival relative clauses?

*Hypothesis: The Cognition Hypothesis predicts that inhibitory control will mediate the learning outcomes of the complex condition.*

6. Do any mediating effects of inhibitory control differ according to HL versus L2 status?
CHAPTER 3: STUDY DESIGN AND METHODOLOGY

This chapter presents the operationalization of three key constructs or variables --- heritage language learner, task complexity and inhibitory control. It details the design and methodology of the current empirical study to answer the six research questions and test the hypotheses at the end of Chapter 2. Data are reported on the validity and reliability of assessment instruments as well as quantitative and qualitative measures to validate the tasks along their lines of complexity. The chapter ends with biodata on the HL and L2 learners that include age, age of onset for each language, language use, proficiency measures, education background and computer/video game use.

3.1 Operationalizations and Key Terms

3.11 Heritage Language Learners

This study will adopt the definition for heritage language learner set forth by Valdés (2001). Valdés defines a heritage language learner as “a student who is raised in a home where a non-English language is spoken, who speaks or at least understands the language, and who is to some degree bilingual in that language and in English.” (p. 38). Therefore, the heritage language learners are students who have decided to take a college-level Spanish course to (re)-learn their heritage language. Another requirement for the participants will be that they need to have completed their education primarily in English, especially during the elementary school years. So, participants who attended a bilingual, immersion or dual language program will not be included in the final analysis of this study since these programs have the goal of maintaining/fostering student’s heritage language even though empirical evidence is still needed to attest the effectiveness of these programs (see Potowski, 2007). The participants will fill out a Language Background Questionnaire and provide information on their education (Appendix L).
3.12 Task Complexity

This study will operationalize task complexity through +/- intentional reasoning as suggested by Robinson (2010, 2011). As previously discussed in Chapter 2, Robinson provides dichotomous variables that are more feasible for operationalizing unlike Skehan’s model (e.g., Skehan, 2001). Robinson (2011) describes intentional reasoning as “tasks which require complex reasoning about the intentional states that motivate others to perform actions can be expected to draw heavily on the use of cognitive state terms for reference to other minds…” (p. 16). For the complex group in this study, the participants will be required to engage in the experimental task by selecting the most probable reason behind the people’s actions while the noncomplex group will have the reason given to them. Studies that test the Cognition Hypothesis tend to test other variables such as recasts (e.g., Révész, 2009) and how it interacts with task complexity. In the current study, feedback will be held constant for all experimental groups. If the participants choose an incorrect verb choice, they will get a message from the computer program in form of a recast that they need to repeat.

3.13 Inhibitory Control

This study defines inhibitory control as “cognitive control to attend to the relevant property and ignore a misleading property that is perceptually salient and presented with the target feature.” (Martin-Rhee & Bialystok, 2008, p. 81). To measure inhibitory control, the study will use the ANT or attentional network task (Fan, McCandliss, Sommer & Posner, 2002). Although most studies have employed the Simon task, the ANT task is a more robust test of inhibitory control. As Costa and colleagues (2008) argue, the Simon task requires the learners to hold the rules for pressing the correct response key that corresponds with the color of the squares in working memory while for the ANT it is not an issue since the participants only pay attention to the direction of the arrowhead in the center. Furthermore, the misleading stimuli are the four
flankers to the side and these have the same dimensions as the target arrowhead (see Figure 4 on the next page) unlike the Simon Task that has color of the square and position on the computer screen. Although results have been found for the Simon Task, as Costa et al. (2008) state, “the flanker task is more suitable to explore the functioning of inhibitory control given that it may be less contaminated by other cognitive factors.” (p. 65). Also, only one study up-to-date has investigated the effects of bilingualism on inhibitory control have utilized this task, and according to my current knowledge, no study in SLA has used the flanker task.

| The participants need to make a judgment on the direction of the middle arrowhead. |
|-----------------------------------|-----------------------------------|
| Neutral trials                    |                                   |
| (a). —— → ——                     | (b). —— ← ——                      |
| Congruent trials                  |                                   |
| (a). → → → →                     | (b). ← ← ← ←                      |
| Incongruent trials                |                                   |
| (a). → —— ← →                     | (b). ← → ← ←                      |

**Figure 4.** Representations of the stimuli of the flanker type component of the ANT.

Finally, although Robinson does not include specifically inhibitory control as one of the task difficulty or learner factors, he does not limit learner factors to his proposed list and seems to recognize the relevance of other factors not included in his model. He states the following, “… the selective listing of the ability and affective Task Difficulty factors in Figure 1 is intended as a starting point…” (Robinson, 2010, p. 255).
3.2 Target Structure: Present Spanish Subjunctive in Adjectival Clauses

3.21 Justification of Target Structure

For the current dissertation, it seems appropriate to select the subjunctive mood in adjectival relative clauses as the target linguistic form. First, the use of the subjunctive mood is problematic for both L2 and HL learner populations as revealed by the literature. L2 learners need to be developmentally ready to process and evaluate matrix clauses in order to make a proper morphological selection between the indicative or subjunctive mood. As for HL learners, they show greater signs of omission of the subjunctive in optional contexts such as in the case of relative clauses. Second, more studies are needed on task-based approaches for promoting the development of the subjunctive. Third, from a pedagogical standpoint, L2 or foreign language learners are overwhelmingly, in many instances, being exposed to lessons on the proper use of the subjunctive. The subjunctive in relative clauses, specifically, tends to be taught widely in second/foreign language classrooms, especially in intermediate Spanish classes (Collentine, 1995). The selection of this form will shed light on how both populations process language input given the proposed pedagogical intervention, and thus, make potential sound recommendations for educators. The target form is also appropriate for the proposed treatment task of this study.

As previously stated, this study operationalizes task complexity via intentional reasoning, that is, the beliefs that a speaker has regarding the behavior of others or their intentional states. Therefore, the use of the indicative or subjunctive in adjectival relative clauses will reflect the speaker’s epistemic knowledge of a situation and should select the subjunctive when his/her knowledge of the existence of a particular referent that may explicate the intentional state of another subject is questioned. In this case, as Quer (2001) would argue, the speaker attempts to make a shift from his/her epistemic model to that of the individual (e.g., a subject displaying a certain intentional state) as a result of the given situation. So, basically, the speaker will need to
use the subjunctive mood when a referent, reflected as an antecedent in the matrix clause, may be non-existent to explain the intentional state of another individual whereas the use of the indicative will reflect an assurance of a referent that contributes to the mind state of a subject.

3.22 Optional Context with Adjectival Relative Clauses

As described in the literature review section, adjectival relative clauses may require either the subjunctive or indicative mood. The selection of the subjunctive mood is contingent on the speaker’s knowledge of the antecedent in the matrix clause --- whether s/he thinks the antecedent exists or not --- as well as the predicate in the matrix clause. For example,

(11) Busco un profesor que habla francés.

I am looking for a professor who speaks – IND French.

(12) Busco un profesor que hable francés.

I am looking for a professor who speaks – SUBJ French.

First, the verb busco is a predicate that may require the use of the subjunctive or indicative of the verb in the embedded clause (Villalta, 2008) --- this is a case of optional context as suggested by Silva-Corvalán (1994), and heritage language speakers always opt for the indicative in all cases making it the default. What prompts the use of the subjunctive in (12) for native speakers of Spanish is that in the speaker’s possible world, the antecedent “un profesor” may not exist. That is, the speaker does not know if University X has a French-speaking professor since the university does not have a French department, for example, whereas the contrary may be true in example (11).

3.23 Present Indicative and Subjunctive Verbal Paradigms

The Spanish language is comprised of three verbal groups or conjugations with infinitives including -a, -e, and -i as thematic vowels and the morpheme –r that marks the infinitive (nonfiniteness) added to the root of the verb --- for example, cantar (to sing), comer (to eat) and escribir (to write). To conjugate a verb, one simply drops the infinitive ending and adds a
corresponding thematic vowel, morpheme(s) to indicate tense, aspect or mood (TAM) and a suffix to indicate number and person only for the following: second person singular (-s), first person plural (-mos) and third person plural (-n). A speaker decides this information based on the subject in mind as well as what s/he tries to convey. For the subjunctive mood, it is important to note that the root of the verb is based on the root of the first person singular of the present indicative. Therefore, learners have to be aware of irregular verbs in the present tense that are due to alternations between thematic vowel and diphongs. A short list of irregular verbs also exists that do not follow any particular pattern. Refer to Table 2 on the next page for a brief summary of verb endings and common irregular verbs for the both the present indicative and subjunctive.
3.3 Study Design and Procedure

During the first session of the study, students will read and complete a consent form approved by Georgetown University’s Institution Review Board (see Appendix A) and this approval sufficed for the three other institutions (Catholic University of America, University of Maryland, College Park and University at Albany, State University of New York) where data were collected as well. With the guidance of Georgetown University’s Center for New Designs in Learning and Scholarship (CNDLS), the researcher created a web-based research blog\(^{1}\) (https://blogs.commons.georgetown.edu/juliotorres-research) that hosted all the necessary tasks and materials to carry out the current study. Moreover, the researcher utilized the website Survey Monkey (www.surveymonkey.com) to create and host the questionnaires and a test to estimate the level of Spanish proficiency of the participants. The links for the questionnaires were available through the blog site. The study consisted of three sessions that lasted for about 1.5 hours with a week in between Session 1 and 2 and one to two weeks between Session 2 and 3. The participants, who completed a stimulated recall session, were asked to attend only one session during which they completed the DELE proficiency test, pretest and the experimental task to which they were assigned. The first session consisted of the researcher explaining and answering any questions pertaining to the components of the study. If the participant agreed and signed the consent form, they completed a modified version of the DELE test (Diploma de Español como Lengua Extranjera) as an attempt to measure their proficiency in Spanish. During

\(^{1}\) I would like to give a special thanks to William Garr, CNDLS Assistant Director of Research and Development, for all his guidance and availability in answering questions pertaining to the creation of the tasks and creating the blog space.
<table>
<thead>
<tr>
<th>Root</th>
<th>Verb ending</th>
<th>English Equivalent</th>
<th>Root</th>
<th>Verb ending</th>
<th>English Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>cant-</td>
<td>o</td>
<td>I sing, I do sing, am singing</td>
<td>cant-</td>
<td>e</td>
<td>I sing, I do sing, am singing</td>
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<tr>
<td></td>
<td>as</td>
<td>You (singular, informal)</td>
<td></td>
<td>es</td>
<td>You (singular, informal)</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>He/She/It; You (singular, formal)</td>
<td></td>
<td>e</td>
<td>He/She/It; You (singular, formal)</td>
</tr>
<tr>
<td></td>
<td>áis</td>
<td>You (plural, informal in Spain)</td>
<td></td>
<td>eimos</td>
<td>We</td>
</tr>
<tr>
<td></td>
<td>an</td>
<td>They, You formal; informal in Latin</td>
<td></td>
<td>és</td>
<td>You (plural, informal in Spain)</td>
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<td>en</td>
<td>They, You (plural, formal; informal in Latin</td>
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<td>com-</td>
<td>o</td>
<td>I eat, I do eat, I am eating</td>
<td>com-</td>
<td>a</td>
<td>I eat, I do eat, I am eating</td>
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<td></td>
<td>es</td>
<td>You (singular, informal)</td>
<td></td>
<td>as</td>
<td>You (singular, informal)</td>
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<td></td>
<td>a</td>
<td>He/She/It; You (singular, formal)</td>
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<td>amos</td>
<td>We</td>
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<td>áis</td>
<td>You (plural, informal in Spain)</td>
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<td>viv-</td>
<td>o</td>
<td>I live, I do live, I am living</td>
<td>viv-</td>
<td>a</td>
<td>I live, I do live, I am living</td>
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<td>Some common irregular verbs:</td>
<td>Some common irregular verbs:</td>
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<tr>
<td>Ir – to go: voy, vas, va, vamos, vais, van</td>
<td>Ir – to go: vaya, vayas, vaya, vayamos, vayáis, vayan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estar – to be: estoy, estás, esté, estamos, estás, están</td>
<td>Estar – to be: esté, estés, esté, estemos, estés, estén</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ser – to be: soy, es, es, somos, sois, son</td>
<td>Ser – to be: sea, seas, sea, seamos, seas, sean</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hacer – to make, to do: hago, haces, hace, hacemos, hacéis, hacen</td>
<td>Hacer – to make, to do: haga, hagas, haga, hagamos, hagás, hagan</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Verbal Paradigms for the Present Indicative and Subjunctive
the first session, they also completed the Attentional Network Task (ANT) that lasted about 20 minutes. The session ended with the completion of the versions of the oral production and written production assessment task. The study employed a split-block design in which the three versions of the assessment tasks were counterbalanced to avoid test effects. The assessment tasks were piloted with a group of different L2 learners to test for comparability and reliability. The participants were asked to schedule the second session with no specific time in between. During the second session, the participants were randomly assigned to a control, complex or noncomplex condition. The control group only completed a different version of the oral and written production assessment task. The control group did not complete the treatment or any other alternative activity in order to provide evidence that the results were not due to test effects. The experimental conditions completed one treatment task (either the complex or noncomplex condition) and completed a Task Perception Questionnaire (see Appendix B for complex condition and Appendix C for noncomplex condition) immediately after the treatment to measure their perceived difficulty of the task. The participants proceeded to complete a version of the oral and written production assessment task. The L2 participants returned to complete the experiment about two weeks after the second session whereas the heritage language participants, due to time constraints, were asked to return a week after the second session. During the last session, the participants completed their respective version of the oral and production assessment task as well as a Language Background Questionnaire (see Appendix D) and Exit Questionnaire (see Appendix E). To account for any potential exposure outside the experiment to the target form, during the Exit Questionnaire, the participants answered whether or not they looked up any information on what they thought the target form was. Refer to Figure 5 on the next page for a visual representation of the procedure for the study.
Figure 5. Visual Representation of Experimental Procedure

- **Heritage Language Learners**
  - n=34

- **Second Language Learners**
  - n=49

**Session 1**

- 1. Information and Consent Form
- 2. DELE Proficiency Test
- 3. ANT Task
- 4. Oral Production & Written Production Tasks

**Session 2**

**Treatment Conditions:** Completion of computerized tasks by +complex and –complex groups only

**Task Perception Questionnaire:** Completed by +complex and –complex groups only

**Immediate Posttests:** Oral Production Task → Written Production Task

**Session 3**

**Delayed Posttests:** Oral Production Task → Written Production Task

**Questionnaires:** 1. Language Background Questionnaire 2. Exit Questionnaire

A few participants partook in a stimulated recall session upon completion of the treatment task.
3.31 DELE (Diploma of Spanish as a Foreign Language)

The DELE Proficiency Test (Diploma of Spanish as a Foreign Language) is an exam administered by the Instituto Cervantes (a non-profit organization created by the Spanish government to disseminate information about cultures of Spanish speaking countries and the teaching of Spanish) and recognized officially for accreditation by the Ministry of Education, Culture and Sport in Spain. Researcher Silvina Montrul (e.g., Montrul, 2002, 2005) has adopted and modified a version of the DELE to make comparisons between monolingual Spanish speakers, L2 speakers and HL speakers in an attempt to gauge into different proficiency levels for research purposes. Statistical analyses by Montrul (2005) show significant differences between monolingual Spanish speakers and L2/HL speakers. Furthermore, there were differences in the mean scores of the beginning, intermediate and advanced HL/L2 participants; however, some difference was also found between the intermediate L2 and HL speakers due to standard deviations. Even though it may not be the most robust measure for proficiency, it has been consistently used for studies with HL speakers/learners of Spanish. Bowles (2011) also utilized the DELE to ensure that the HL and L2 participants were more or less comparable to proficiency levels when pairing them up to complete task-supported treatments. This study will utilize the DELE as well as one measure to capture proficiency in Spanish in order to make comparisons to previous studies with the target populations. The version of the DELE\textsuperscript{ii} is the same one given by Montrul and colleagues that consists of a brief vocabulary test and cloze passage (Appendix F). For the vocabulary section, the participants will read a number of sentences that contain a blank. They need to choose one of the options that makes most sense to complete the sentence. The cloze passage also has blanks but it measures participants’ random grammatical knowledge of Spanish. They also get four options and have to choose the correct one.

\textsuperscript{ii} A special thanks to Dr. Silvina Montrul for sharing without hesitation the DELE version she uses in her studies as well as the coding scheme for the test.
3.32 Attentional Network Task (ANT)\textsuperscript{iii}

To measure inhibitory control, the participants completed the ANT (Appendix G) as developed by Fans and colleagues (2002), and employed by Costa and colleagues (2008) to study bilingual advantages on different components of the attentional system. The ANT task is a more inclusive measurement of networks of attention in that Fans and colleagues combined Posner’s (1990) cue alerting time task and Eriksen and Eriksen’s (1974) flanker task. For the purposes of this study, the experimenter will limit himself to examining the flanker type condition to measure inhibitory control. Participants completed a total of three blocks with 8 trials per block that leads to a total of 96 trials (12 X 8). Moreover, to avoid giving participants an advantage over predicting the timing of a subsequent stimulus, the inter-trial (ITI) was jittered to 400ms, 1000ms and 1600ms. The participants received instructions to focus on the fixation point in the center of the screen and to respond by pressing a computer key (i.e., “z” key for left and “/” for the right) as quickly and as accurately as possible according to the direction the center arrow was pointing toward. A training phase of 24 stimuli was presented and both training and experimental stimuli were presented through SuperLab 4.0 on a MAC computer.

3.33 Language Background Questionnaire

All participants completed a Language Background Questionnaire (see Appendix D) that elicits different types of information including age of onset for Spanish and English, type of schooling, parents/caretakers’ profession, dominant language(s) in different stages of life (0-5, 6-12, 12-17 and 18+), self-rated proficiency in English and Spanish, attitudes toward use of Spanish and daily language use of both Spanish and English across different settings.

\textsuperscript{iii} A special thanks also to two wonderful colleagues, Kaitlyn Tagarelli and Ellen Johnson for giving me their version of the ANT they created for a class project.
3.34 Exit Questionnaire

Participants in the study completed an Exit Questionnaire E (see Appendix E) that consisted of two sections. For the first part of the questionnaire, the participants answered three questions on the following: if they knew what the experiment was about, if they looked up information on the target form in between sessions, if they were able to report what they learned or formulate a grammatical rule based on their participation in the study, and general comments about the task. In the second part, participants responded to a question on the number of daily hours they spend on the computer and a question if they have ever been diagnosed with Attention Deficit (Hyperactivity) Disorder AD(H)D. They also rated the frequency with which they perform a number of tasks on the computer and play videogames. The purpose of these questions was to ensure that results of the ANT were not influenced by differences in computer/videogame use and a diagnosis of AD(H)D indicates a dysfunction of an individual’s attentional system which includes inhibitory control.
3.4 Treatment Task: Operationalization of Task Complexity through Intentional Reasoning

Two treatments were applied for the complex and noncomplex experimental conditions through the use of a computer and delivered through the software program Adobe Captivate 5.5 (2011). Both tasks differed on the levels of cognitive demands through intentional reasoning as postulated by the Cognition Hypothesis (Robinson, 2011 and elsewhere). During the first part of the experiment, the participants read the instructions for the experiment, and these differed slightly for both experimental conditions (see Appendix B for complex group and Appendix C for noncomplex group). Basically, the participants were playing the role of a resident or dorm director at a new residence hall at the University of Puerto Rico due to their experience living in the dorms and proficiency in Spanish. Their task was to give reasons for some disconcerting behavior of the students in the dorm. The task presented 30 different situations or instances of disconcerting behavior in the dorms through images and prompts in aural and written mode. Therefore, the task was bimodal to take into account learning experiences from both L2 and HL participants. For both experimental groups, in the first slide, the participant saw, reads and listened to a disconcerting behavior that a student or a group of students were showing in the residence hall. The second slide presented a thought bubble from the resident director that provided information of whether or not s/he knew the reason for the behavior that applied to the antecedent of the matrix clause of the following sentence. For the third slide, the participants read and listened to a matrix clause with an antecedent that began to express the director’s reasoning for the student(s)’ behavior (see Appendix H for samples of the three slides). The fourth slide required action from the participant. In this slide, the participants received the information from the previous slides to review --- the description of the disconcerting behavior, the thought bubble of the director’s knowledge of the student’s reason for the behavior and the
matrix clause. Furthermore, there was one photo (for the noncomplex group) or four photos (for the complex group) as well as two verb choices (one in the indicative and one in the subjunctive). The participant needed to produce an embedded clause with the guide of a photo --- whether only one that was provided to them or one that they needed to select contingent on the experimental condition. Once the participant had produced the embedded clause and submitted her/his selection(s), s/he received feedback on their verb choice. The participants in the complex group also received feedback for the photo selection. The instructions asked the participants to read out loud the feedback when they got the answer incorrect before continuing to the next situation.

Below are snapshots of an example of a screen in which the participants had to produce their sentence and note how the difference between the conditions is on the number of pictures with the complex condition having four options with the goal to promote intentional reasoning.

**Figure 6. Complex and Noncomplex Sample Versions of Treatment Tasks**

The response of the participants was recorded using the audio software Audacity 2.02 as well as click on the verb that they chose to produce their response. Once the participants produced orally and clicked on their response, they were instructed to click the SUBMIT button. Participants

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**iv** ENGLISH SUBTITLES: Unas estudiantes tocan música demasiado alta. [Students (female) play very loud music]; Ahí sé la razón por la música alta. [Yes, I know the reason for the loud music.]; Las estudiantes desean escuchar música alta que... [The students wish to listen to music that...]; las anima/e [encourages them...]

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received two possible types of feedback based on the verb that they clicked on. If their verb choice were correct (i.e., they chose correctly between the present indicative and subjunctive), they would receive a message box with the word “Sí,” the word yes in Spanish to indicate that their sentence was correct. However, if the participant chose the incorrect verb form, they received feedback in the form of a recast, that is, a less explicit form of feedback with the repetition of the first part of their utterance (the matrix clause) along with the targetlike form of the verb. If the participants received the message box with the recast, they had to repeat it out loud the recast. Below are examples of the message boxes with the two types of feedback.

**Figure 7. Sample Message Boxes of Written Feedback**

![Sample Message Boxes](image)

Furthermore, the participants, who were assigned to the complex condition, also received feedback on the picture selection. They read the letter of the correct picture that supposedly best explained the reason for the behavior of the student(s).
3.5 Independent Measures of Task Complexity

3.51 Quantitative Measure: Task Perception Questionnaire

Upon completion of the treatment task and immediate posttests, every participant will complete a Task Perception Questionnaire that will differ according to the experimental condition, that is, complex versus noncomplex. The participants will answer a total of 10 questions pertaining to different aspects of the experimental task they completed. There are five key or complexity questions (questions 2, 3, 5, 6 and 10) that tap into the participants’ perception of the difficulty of the task. The other items serve as distractors as well as items that do not differ (questions 4, 7 and 9) from each task version, and therefore, no differences are expected between both experimental groups in their responses to these items. The participants needed to respond to their perceived difficulty based on a Likert scale from 1 through 6 with 1 being not difficult at all and 6, the most difficult. The questionnaires have images of the different components of the task to facilitate participants’ memory. The researcher computed a score for each participant based on his/her numeric sum of the responses for each category of questions according to the Likert scale of the questionnaire. This score was entered into an SPSS v. 20 data sheet for analysis.

3.511 Results: Cronbach’s Alpha and One-Way ANOVA

A Cronbach’s alpha coefficient was run for the complexity item questions and the distractor item questions to test for internal reliability estimate: complexity item questions (α = .815) and distractor items (α = .627). The distractor item questions show a smaller effect size than the complexity item questions but this may due to the fewer items (n=3) that may have affected the size of Cronbach’s alpha (Cortina, 1994). Overall, Cronbach’s alpha seems to be fairly reliable for the questionnaires. The responses to the questionnaires were quantified by adding the responses based on the ordinal scale (1 – 6) of the questionnaire. Two separate scores
were calculated for both complexity and distractor questions. The descriptive statistics for the scores per group are described in Table 3 below:

**Table 3. Descriptive Statistics for Task Perception Questionnaire Results**

<table>
<thead>
<tr>
<th>Group</th>
<th>Complexity Questions</th>
<th>Distractor Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>complex</td>
<td>21.02 (3.6)</td>
<td>6.0 (2.0)</td>
</tr>
<tr>
<td>noncomplex</td>
<td>17.10 (4.5)</td>
<td>5.2 (2.2)</td>
</tr>
</tbody>
</table>

Mean scores (SD)

The scores were submitted to a one-way ANOVA with Group (complex vs. noncomplex) as a between-group variable and type of questions (complex vs. distractor) as within-subject variables. The results of the one-way ANOVA show a statistically significant effect for task condition and complexity questions, $F(1, 74) = 292, p < 0.01$, but no significant effects for task condition and distractor questions, $F(1, 74) = 11, p =.127$. Based on the results of the questionnaires, the participants in the complex condition seem to perceive the treatment task as more difficult than the ones in the noncomplex condition. This finding becomes more robust as both groups did not significantly differ in the way they perceived components of the task that were exactly the same in both conditions.

**3.52 Qualitative Measure: Stimulated Recall Protocol**

Stimulated recall is an introspective methodological tool that can serve to “… prompt participants to recall thoughts they had while performing a task or participating in an event.” (Gass & Mackey, 2000, p. 17). The use of stimulated recall in this study was an attempt for participants to reveal their cognitive processing during the completion of the task. That is, it helped determine if there were differences in processing --- and in the particular case of this study, to examine qualitative differences in intentional reasoning between the complex and
noncomplex participants. However, one must bear in mind one of the major caveats of using stimulated recall, and it is the potential inaccuracy of the recalling episodes from the participants. This study carefully implemented some steps as suggested by Gass and Mackey (2000) when implementing stimulated recall to maximize the benefits of this research technique. First, by utilizing the software *IshowU HD 2.1.2* (2009)<sup>1</sup>, the researcher recorded the computer screen of the subset of participants who participated in the stimulated recall session. Recording the screen while the participants were completing the task helped to prompt participants’ thought processes of what they *were* thinking while completing that component of the task. This was demonstrated by the use of their mouse and the appearance of feedback messages from the program supporting the treatment, for example. Second, participants received written and explicit instructions of what they were supposed to do during the session (see Appendix I). The researcher also modeled a stimulated recall session as if he were a participant as well as the participant doing a practice trial. Third, the participants who completed the stimulated recall session did so upon completion of the treatment task to minimize memory decay. These participants only completed the DELE proficiency test and pretest to ensure that they were comparable to the other participants. To avoid reactivity, the participants did not complete the subsequent assessment tasks.

3.521 Results: Summary of Recall Comments

A total of 10 L2 subjects participated in a stimulated recall session immediately followed by the completion of either the complex or noncomplex version of the treatment task. However, due to technological difficulties, one participant was unable to complete the session, and this results in 5 participants for the complex condition and 4 for the noncomplex condition. The participants were instructed to pause the video if they remembered experiencing difficulty when producing the response. Furthermore, they also knew that the researcher would pause the video if

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<sup>1</sup> I would like to give a warm and special thanks to my very esteemed colleague and friend, Dr. Melissa Baralt, for suggesting and giving me a pilot version of this program to me.
he thought they were experiencing difficulty. The researcher paused the video if he observed pausing, signs of hesitance, frustration, repeating or correcting an utterance and/or difficulty producing the response. If a participant was unable to recall what was going through her mind at moment in time, the researcher simply proceeded with the video. The recall session was recorded with a digital recorder and the researcher transcribed the sessions. Below is a table with a summary of the comments per group that each participant gave after pausing the video:

Table 4. Stimulated Recall Comments

<table>
<thead>
<tr>
<th>Complex Condition</th>
<th>Noncomplex Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR_01</td>
<td>SR_02</td>
</tr>
<tr>
<td>#1. I wanted to make sure… I know you said not to click the picture and I wanted to make sure that it would give me an option to go over the pictures and then I realized it would be this one.</td>
<td>#1. I guess I was like confused as to what tense I was supposed to use.</td>
</tr>
<tr>
<td>#2. I looked at the pictures but then I was more concerned with the grammatical aspect if it was subjunctive or not.</td>
<td>#2. I think I thought it was supposed to be the present tense.</td>
</tr>
<tr>
<td>#3. I noticed that the two discrepancy answers were not the masculine or feminine group nor singular or plural, just the subjunctive so I just focused on that.</td>
<td>#3. I didn’t know what was the answer for that one.</td>
</tr>
<tr>
<td>SR_03</td>
<td>SR_04</td>
</tr>
<tr>
<td>#1. Hmm.. I was trying to decide which picture made the most sense. Like they wouldn’t be listening to real loud music if they’re doing yoga. Or they could maybe. Or they can’t when they were doing homework so it can’t be that one either. So, I guess it’s when they’re hanging out with their friends. I don’t know.</td>
<td>#1. What I was thinking when I was doing this when you are not sure of something that’s when you use the subjunctive?? I don’t know if I was right. I was going for that? At some points I got confused. Was I doing it right?</td>
</tr>
<tr>
<td>#2. I’m looking at the two verbs and then some of these [pictures] could have been the same. Or some of them could have worked.</td>
<td>#2. This one they’re putting on makeup so it’s maquilla or something. But then I was like maquillarse.</td>
</tr>
<tr>
<td>#3. At this point, I was beginning to understand where the focus of the experiment was. I quickly chose my verb and then decided on the picture that made more sense where at the beginning of the experiment I was doing the opposite.</td>
<td>#3. Here I was trying to figure out if it was an –ar verb or what kind of verb it was. I went with it was an –ar verb.</td>
</tr>
<tr>
<td>SR_05</td>
<td>SR_06</td>
</tr>
<tr>
<td>#1. I wasn’t sure of this verb. So, I kind of went for this.</td>
<td>#1. I remember thinking about the response.. I didn’t know… I would’ve answered the question differently. I was thinking of different verbs.</td>
</tr>
<tr>
<td>#2. With the pictures I went to A first because I wanted to say that they got the food to save money to help them save money.</td>
<td>#2. It was more once again about the response. The verb [the matrix clause] was throwing me off.</td>
</tr>
<tr>
<td>#3. I remember talking about their schedules they didn’t</td>
<td></td>
</tr>
</tbody>
</table>
have compatible schedules so that’s why I went with A. 
#4. I’m taking from the sentence and then looking through all the pictures thinking of what I’m capable of saying through the pictures. And he’s lonely because he has friends who leave the university a lot.

#3. I was thinking about the response for the picture if it was supposed to be sell drugs or what…. 
#4. Here I was thinking about the verb querer being one of those verbs that require the subjunctive so when it was wrong I was like I don’t know why. I was trying to figure it out. 
#5. I remember for this response uuh… I wasn’t too sure what to say.

SR_07
#1 So umm you listen to music play and las anima is lift your spirits so I thought it was to get ready which is C. So, I kind of canceled the rest of them out because they don’t look like situations that you would listen to music.

SR_08
#1. Seriously, I didn’t remember what the verb meant so it was hard for me to know what to say. 
#2. I couldn’t think what to say when I looked at the picture. I didn’t know how to complete the sentence. I knew what the sentence was saying but it was hard to think how to say something afterwards. 
#3. I think I was trying to think what to say after the dot dot dot...

SR_09
#1. Throughout the videos I had a hard time figuring out when to use the subjunctive or when not. 
#2. I was looking at the stuff and I was like… I was looking at each choice and I was trying to figure out what the verb meant and what the music has to do with what each of them are doing. And then I thought people listen to music when they are getting dressed, when they’re doing exercise, they listen to music when they’re talking to their friends… I listen to music when I’m doing homework. So, I was like I don’t really know. So, let me think what a good student would do, not listening to music when doing homework. 
#3. So, the use of the word escape threw me off. So, they’re look for an escape for food.
#4. In this part I was trying to figure out what the sentence I wanted to say was because I wanted to choose D. So, that’s why it took me so long trying to. 
#5. I didn’t know what to make of this. I knew that I didn’t want to choose B but the choice was really between and I didn’t…. I looked at it and thought they’re both studying but then D is actually on the computer and not doing anything. C is probably a loser.. hahaha.. and D is actually doing work. That’s why it took me a long time in making a choice.

According to the recall episodes, the participants who completed the more complex version task reported instances of being engaged in intentional reasoning whereas the ones in the noncomplex condition never reported reasoning. The comments of the noncomplex group were more geared toward difficulties with retrieving lexical items and they reported more Language Related Episodes in relation to the use of the subjunctive form --- SR_02, SR_04 and SR_06 recalled
trying to figure out the use of the subjunctive. These comments suggest that the participants in the noncomplex condition were directing their overt attention more to components of the Formulator, that is, encoding their pre-verbal message with the appropriate vocabulary word and verb mood. In the comments produced by the complex group, only a couple of participants (SR_01 and SR_09) reported remembering having difficulty with the use of the subjunctive. According to their comments during the recall session, they reported more difficulties at conceptualizing their answer based on the given situation and picture choices, that is, they were more attentive to choosing the picture that best fit the situation. Overall, the comments suggest that the complex group seemed to be indeed engaged in intentional reasoning to complete the task.
3.6 Measurements of Learning Outcomes

3.61 Oral Production Task

Three versions of an Oral Production Task (Appendix J) were administered in a split-block design, and they consisted of 24 items – 12 experimental items and 12 distractor items and the task was delivered through the computer using the program Adobe Captivate 5.5 (2011). This task followed the same format as the treatment task; that is, it is a bimodal task in which the stimuli are presented in both aural and written modes, and the participants produced orally the response. The participants were instructed to complete a sentence based on an available picture to them as a reference. In addition to the sentence and the picture, another sentence was presented to provide context and guide their production of the verb. For example, for some of the distractors, the sentence that provided context may prompt the participant to produce their response in the past or future tense; otherwise, the contextual sentence for the other distractors are just present to be consistent with the task and to not influence participants’ responses for the experimental items. On the experimental items, participants always needed to rely on the context of the first sentence to decide whether to employ the indicative or subjunctive mood in their response --- in other words, the (non)existence of the antecedent in the speaker’s mind. As outlined in Chapter 2, the non-existence or impossibility of the antecedent of the matrix clause should trigger the use of the subjunctive in the embedded clause. Below is a screenshot of one of the test items:
Figure 8. Oral Production Task: Example of Test Item

No sé si hay estas obras de arte
Preferimos ir a museos que...

3.611 Results: Repeated-Measures ANOVA and Cronbach’s Alpha

To ensure that the three versions of the assessment tasks were comparable, the tasks were piloted with a group of 15 L2 learners that did not partake in the actual experiment or the pilot study. The participants attended three different sessions to complete a version of the task with about a week in between sessions. The tasks were administered following a split-block design but were analyzed by version and not in the order that the participants completed them to control for potential differences in difficulty. The following table summarizes the descriptive statistics for the scores on the experimental items:

Table 5. Descriptive Statistics for Oral Production Task Comparability

<table>
<thead>
<tr>
<th>Test Version</th>
<th>Mean Score (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=15)</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>8.87 (1.8)</td>
</tr>
<tr>
<td>B</td>
<td>9.25 (1.5)</td>
</tr>
<tr>
<td>C</td>
<td>7.76 (2.5)</td>
</tr>
</tbody>
</table>

vi ENGLISH SUBTITLES: No sé si hay estas obras de arte [I don’t know if they have these works of art]; Preferimos ir a museos que… [We prefer to go to museums that…]
The scores of the three assessment tasks were submitted to a Repeated-Measures ANOVA with Time as the dependent variable. The results of the Repeated-Measures ANOVA were not significant $F(2,30) = 2.62, p = .090$. Overall, these results suggest that the items in the three versions of the oral production task were comparable. A Cronbach’s alpha coefficient was calculated to estimate the internal reliability for each task version: A ($\alpha = .685$), B ($\alpha = .723$) and C ($\alpha = .661$). Versions A and C fall a little short from the .70 – .80 acceptable range, however, this may be due to the fact that there were fewer than 20 items (n=12). Therefore, Cronbach alpha suggests that the oral production tasks are fairly reliable.

3.62 Written Production Task

In an attempt to gauge into the issue of modality and potential transfer effects to the written mode, the participants also completed a Written Production task following a similar visual layout to the Speaking Production Task. The difference consisted in that the participants had to read the prompts and write their responses for the written version – so, unlike the oral version; the participants did not listen to the items nor produced orally their response. All three versions of the Written Production task (Appendix K), that were administered employing a split-block design and also delivered through the computer using Adobe Captivate 5.5 (2011), consisted of 24 items. For all 24 items, the participants saw a Spanish sentence that needed to be completed utilizing a picture available to them as reference. Furthermore, the participants read a first sentence to help contextualize the sentence that they completed. This is crucial for the experimental items because the sentence gave information of the subject’s knowledge of the antecedent --- whether it existed or not, for example, and consequently, this would prompt the use of the indicative or subjunctive mood. It does not add any relevant information for the distractor items; however, the sentences are present to be consistent and to not influence the participants’ responses. Out of the 24 items, 12 of the items are experimental and the other 12 are
distractors. For the 12 experimental items, the participants read a matrix clause with a predicate that either required the use of the indicative or subjunctive. Based on the information they received of the antecedent in the first sentence, they needed to write an embedded sentence employing correctly the verb in the indicative or subjunctive.

3.621 Results: Repeated-Measures ANOVA and Cronbach’s Alpha

To examine comparability among the three versions of the written assessment task, 15 L2 learners of Spanish who did not participate in the current or pilot study, completed the three versions of the tasks in three different occasions with about a week in between sessions. A split-block design approach was employed, however, the results were analyzed for each separate version and not in the order that the participants completed the tasks to ensure no significant differences among the three versions. A summary of the descriptive statistics for the experimental items follows below:

Table 6. Descriptive Statistics for Written Production Task Comparability

<table>
<thead>
<tr>
<th>Test Version</th>
<th>Mean Score (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=15)</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>10.06 (1.7)</td>
</tr>
<tr>
<td>B</td>
<td>9.75 (1.6)</td>
</tr>
<tr>
<td>C</td>
<td>10.06 (1.7)</td>
</tr>
</tbody>
</table>

The scores of the three assessment tasks were submitted for analysis to a Repeated-Measures ANOVA test with Time as the dependent variable. Due to a violation of Sphericity (p<0.01), the main effects for Time reported here fall under Huynh-Feldt, and the results were not statistically significant, \( F(2, 30) = 1.34, p = .276 \). Therefore, the findings suggest that the three versions of the written production task were comparable. Furthermore, to estimate the internal reliability of
the three oral assessment tasks, a Cronbach’s alpha coefficient was calculated for all three versions: A ($\alpha = .634$), B ($\alpha = .715$) and C ($\alpha = .720$). Cronbach alpha suggests that the three versions of the task are fairly reliable.
3.7 Coding Procedure

3.71 DELE Test

The vocabulary section of the DELE consists of 30 items and participants received 1 point for each correct response. For the cloze passage of 20 items, the participants got 1 point for each correct response adding up to a total of 50 points. The following is the classification of proficiency levels: advanced proficiency (40 to 50 points); intermediate proficiency (30 to 39); and low proficiency (0 to 29).

3.72 Attentional Network Task (ANT)

The program SuperLab provided an output sheet with the coding of the task that included accuracy of responses and reaction times. The experimenter calculated the percentage of error rate for the neutral, congruent and incongruent trials for each learner group. To calculate the ANT effect (or conflict effect as used in Costa et al., 2008), the mean reaction time of the congruent trials was subtracted from the mean reaction time from the incongruent trials. Furthermore, to calculate cost effect as a result from the ANT, the mean reaction time of the neutral trials was subtracted from the mean reaction time of the incongruent trials. The outliers in the results were replaced with the average RT group mean.

3.73 Language Background Questionnaire

The section on self-rated proficiency is based on a Likert scale and the participants were asked to rate their proficiency in Spanish and English for listening, speaking, reading and writing using the following Likert scale: Native proficiency = 6, Near-native proficiency = 5, Advanced Proficiency = 4, Intermediate Proficiency = 3, Basic Proficiency = 2, and Beginning Proficiency = 1. The researcher reported the average of responses for each subskill per language for both L2 and HL participants. Questions that did not get answered were left blank. For the section on language use, the participants were asked to rate the frequency with which they use Spanish and
English daily in their lives. The participants answered the questions based on the following Likert scale: *Always* = 5, *Frequently* = 4, *Sometimes* = 3, *Rarely* = 2, *Never* = 1, *Doesn’t Apply* = 0. Any items that did not get a response were simply left blank. The researcher added up the number of responses based on the above scale to arrive to two separate scores --- one for language use of Spanish and another for English use. Then, the researcher calculated the mean of the responses for both the L2 and HL groups.

### 3.74 Exit Questionnaire

For the Exit Questionnaire, the researcher calculated the mean of total number of hours that the participants reported on their daily use of the computer for L2 and HL learners. Additionally, the researcher added the total number of responses based on a Likert scale that related to how often they rated their use of different computer programs and how often they played video games using the following scale: *Always* = 5, *Frequently* = 4, *Sometimes* = 3, *Rarely* = 2, *Never* = 1, *Doesn’t Apply* = 0. Any items that did not get a response were simply left blank. The researcher computed the mean for the total number that each participant per group (HL vs. L2) received for how often they used computer programs and videogames.

### 3.75 Oral and Written Production Assessment Tasks

Both Production Tasks consisted of 12 experimental items that were coded. Participants received 1 point for each experimental item for producing the correct mood (i.e., subjunctive or indicative) for a total of 12 points. A “0” was granted for participants who produced an incorrect mood, no verb or a non-finite form (infinitive) of the verb in the embedded clause. Participants received credit even though they may have produced partially the correct stem of the verb. The researcher coded 100% of the data and an independent coder, who is a Spanish Linguistics graduate student, coded 20% of randomly selected data following the above coding scheme for

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vii I would like to thank my research assistant Arnaldo Robles at the University at Albany, SUNY for coding 20% of the data.
inter-rater reliability. To calculate inter-rater agreement, the scores were submitted to Cohen’s kappa, and $K = .80$. 
3.8 Pilot Study

The pilot study took place during November 2011 and the main goal of the study was to examine the overall effects of the treatment for both experimental conditions --- complex and noncomplex as well as any technical difficulties with the program Adobe Captivate 5.5. No need to pilot the attentional network task was necessary since previous studies have found reliable results (e.g., Fans et al, 2002; Costa et al., 2008). Therefore, participants in this pilot completed a series of Oral and Written Production Tasks, Aural Grammaticality Judgment Test (GJT), Multiple-Choice Recognition Task, Treatment (complex or noncomplex) and immediate posttests for only the Oral/Written Production Tasks, Multiple-Choice Recognition Task and Task Perception Questionnaire. Due to technological issues, participants were not able to complete a second aural GJT as an immediate posttest and the first version completed during the pretest was not complete. The computer program froze at the same place for each different version of the task. Therefore, the participants only responded to 46 out of the 60 items of the aural GJT.

3.81 Participants

The participants for this pilot study were all recruited from two sections of an Advanced I Spanish course taught by the same instructor. This level was selected since they were not going to cover the target linguistic item in class according to the syllabus. In this Spanish program, students learned the target item in the Advanced II course, the subsequent semester. A total of 27 participants signed a Georgetown University approved Institution Review Board (APPENDIX L) consent form for the pilot study. All participants received 4 extra credit points for their participation in the pilot study.
3.82 Sessions

First, the data during the first session of the pilot has been discarded since technological glitches impeded to get uniform results from all the participants. As a result of the issues, the experimenter was able to fix most of the glitches for the second session of piloting. Interestingly, the program only allowed 46 items for the aural GJT to run for all three versions. The experimenter tried to figure out the problem and decided to discard the task altogether since even the items that the participants completed seemed too cognitively taxing and they did not seem engaged in completing the test. Upon completion of the treatment tasks and the assessment tests, the researcher briefly interviewed the participants to get insight into the quality of the pictures, use of vocabulary, comprehension of instructions and so forth. The researcher jotted down the comments from the participants and made the necessary changes to the treatment and assessment tasks accordingly. Upon completion of the pilot study, the researcher discarded the Multiple Choice Recognition Test as well since the results were not reliable. Additionally, the Cognition Hypothesis (Robinson, 2011) makes more explicit predictions on L2 output. Therefore, the researcher decided to keep the production assessment tasks.
3.9 The Current Study: Participants

A total of 135 participants were recruited for the current study from four different institutions of higher education in the east coast of the United States, two large and public, and two medium in size and private. However, due to issues of technology where some data were lost, attrition and participants who did not qualify for the study based on pretest scores because they showed prior knowledge of the target structure or did not seem to be developmentally ready, the total number of participants who actually participated in the study was 84 of which 49 were L2 and 34 were HL learners. The researcher also examined the Exit Questionnaire to investigate whether or not any of the participants had looked up information on the target structure during the study, and all the participants reported not looking up any information on the target form. Additionally, some participants, particularly with the group of HL learners, their data were discarded for one of the tasks due to probabilistic production of the target form. For example, some of the HL learners produced instances of the correct verb form during the oral production pretest but failed to do so during the written production task. This is not surprising since HL learners’ prior experience with the language is oral and not written so studies have shown differences in performance across modality (e.g., Montrul, 2012). The opposite trend was true for a few of the L2 participants as well --- they produced the target form a couple of times on the written task but did not produce the form at all on the oral production task. The group of 84 participants was comprised of 45 females and 39 males with a current average age of 19.8 (.88) for L2 learners and 20 (1.8) for HL learners. Based on the results of the DELE test and self-rating proficiency, the HL group of participants were slightly more proficient than the L2 group; however, the L2 learners reported studying Spanish in a classroom setting longer than the HL group. None of the participants studied in a bilingual education, dual immersion or full immersion Spanish program as children. Both group of participants reported using English much
more in their daily lives than Spanish, but the HL learners’ use of Spanish was greater than their L2 counterparts. Additionally, most of the HL learners who seem to use only Spanish between the ages of 0-5, make a transition to using both languages during the period that coincides with the onset of their schooling. The average age of onset (AO) of Spanish for the HL learners was 1.2 years and 12.9 years for the L2 participants while the AO of English was 1.5 for the L2 group and 3.9 for heritage. According to the Exit Questionnaire, both group of learners seem comparable in the number of hours they spend using the computer on a daily basis as well as the frequency with which they use different computer programs and play video games. None of the participants has been diagnosed with Attention Deficit (Hyperactivity) Disorder. Table 7 below summarizes the biodata of both groups and some analyses were made for any differences between both HL and L2 groups.

**Table 7. Summary of Biodata Information**

<table>
<thead>
<tr>
<th></th>
<th>HL Learners (n=34)</th>
<th>L2 Learners (n=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>Female</td>
<td>16</td>
<td>29</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Age</td>
<td>20.0 (1.8)</td>
<td>19.8 (.88)</td>
</tr>
<tr>
<td>AO English</td>
<td>3.9 (3.1)</td>
<td>1.5 (2.4)</td>
</tr>
<tr>
<td>AO Spanish</td>
<td>1.2 (1.7)</td>
<td>12.9 (3.2)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of formal Spanish study</td>
<td>4.1 (2.4)</td>
<td>5.6 (2.3)</td>
</tr>
<tr>
<td>Studied in a bilingual program (dual or full immersion programs)</td>
<td>No (n=34)</td>
<td>No (n=49)</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
</tbody>
</table>

**Language Use**

| Use of English | 60.1 (7.0) | 68.3 (10.1) |
| Use of Spanish | 32.5 (13.3) | 12.9 (8.4) |
| Language Use (0-5 years of age) | SPN\(^2\) (n=27) | ENG\(^3\) (n=42) |
| | Both\(^4\) (n=7) | Other (n=7) |
| Language Use (6-12 years of age) | SPN (n=2) | ENG (n=46) |
| | Both (n=32) | Other (n=3) |
| Language Use (13-18 years of age) | Both (n=25) | ENG (n=48) |
| | ENG (n=9) | Other (n=1) |
| Language Use (18+ years of age) | Both (n=25) | ENG (n=48) |
| | ENG (n=9) | Other (n=1) |

**Proficiency**

**Self-Rated Proficiency**

| English: Speaking | 5.6 (.73) | 5.9 (.19) |
| English: Reading | 5.7 (.63) | 5.9 (.37) |
| English: Writing | 5.5 (.91) | 5.9 (.56) |
| English: Listening | 5.7 (.63) | 5.9 (.18) |
| Spanish: Speaking | 4.7 (.93) | 2.5 (.69) |
| Spanish: Reading | 4.8 (1.0) | 3.1 (.58) |
| Spanish: Writing | 4.0 (1.4) | 3.2 (.72) |
| Spanish: Listening | 5.3 (.89) | 3.0 (.72) |

**DELE Test**

| 32.5 (7.1) | 25.2 (7.1) |
Computer/Videogames

<table>
<thead>
<tr>
<th></th>
<th>Hours on computer per day</th>
<th>Frequency of computer &amp; videogame use</th>
<th>Diagnosed with AD(H)D$^5$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.68 (1.4)</td>
<td>19.1 (4.0)</td>
<td>No (n=39)</td>
</tr>
<tr>
<td></td>
<td>4.44 (2.1)</td>
<td>18.33 (3.6)</td>
<td>No (n=45)</td>
</tr>
</tbody>
</table>

$^1$Age of Onset  $^2$Spanish  $^3$English  $^4$Both English and Spanish  $^5$Attention Deficit (Hyperactivity) Disorder

3.91 Group Comparability

To compare some of the biodata provided by the participants and gauge at potential significant differences between the two bilingual groups, statistical analyses using one-way ANOVAs were run for some of the data. For the number of years of formal Spanish study, there was a marginal significant difference between the two groups, $F(1, 45) = 4, p = .052$ showing that L2 learners have had slightly more exposure to Spanish in a classroom setting than the HL group. The descriptive data on language use reveal that, as previously stated, both group of participants use English more than Spanish; however, they differ significantly in their use of English and Spanish, with the L2 learners using English significantly more often than the HL learners, $F(1, 50) = 10.6, p < 0.05$ while HL learners’ use of Spanish was significantly higher, $F(1, 47) = 39.6, p < 0.01$. For proficiency measures, both HL and L2 participants reported, based on an ordinal scale, to have native proficiency in all four skills (i.e., speaking, reading, writing and listening) in English. In Spanish, they rated themselves lower than in English with the exception of listening skills in Spanish for the HL group for which they reported to have native proficiency. Both groups did differ on the ratings they gave themselves for Spanish --- the HL
learners mostly reported having advanced proficiency of Spanish whereas the L2 learners reported to have intermediate proficiency except in speaking skills for which they chose basic proficiency. The scores of the DELE test were submitted to a one-way ANOVA, and the results were significant, $F(1, 87) = 22.6, p < 0.01$, suggesting that the HL group was more proficient than the L2 learners. According to the scale for this version of the DELE test, the mean score of the HL learners categorizes them in the Intermediate proficiency range whereas the L2 learners scored in Low proficiency range. Even though the results of the self-rated proficiency questionnaire and the DELE do not match exactly as far as intermediate versus advanced proficiency for the HL learners, for example, both measurements suggest the pattern that the HL learners are more proficient in Spanish than the L2 learners. This may not be surprising based on the data that the HL learners utilize Spanish significantly more than the L2 learners. One-way ANOVAs were also run for the number of hours that both groups spend on the computer on a daily basis as well as frequency of use for different computer programs and videogames. The results from both analyses reveal that both groups are comparable as far as the two variables since no significant results were found, $F < 1$ for hours spent on the computer and $F < 1$ for frequency of use for computer programs and video games. In addition to the participants reporting that they have never been diagnosed with AD(H)D, this data analysis helps to control for other variables that may account for potential differences in inhibitory control abilities.

3.911 Group Comparability by Experimental Conditions

The participants were randomly assigned to two experimental groups (complex and noncomplex) and control. To ensure that the groups were comparable at the beginning of the experiment, a one-way ANOVA was run on the pretest scores for both oral and written production tasks. This analysis combines both L2 and HL participants into each condition. Table
summarizes the mean scores of the pretest scores for the three groups per production task and reveals no significant differences among the three conditions at the beginning of the experiment.

**Table 8. Pretest Scores for Experimental Conditions**

<table>
<thead>
<tr>
<th>Experimental Condition</th>
<th>N</th>
<th>Oral Production Task</th>
<th></th>
<th>N</th>
<th>Written Production Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>23</td>
<td>5.87 (.34)</td>
<td></td>
<td>21</td>
<td>5.86 (.36)</td>
</tr>
<tr>
<td>Complex</td>
<td>30</td>
<td>5.73 (.58)</td>
<td></td>
<td>30</td>
<td>5.67 (.60)</td>
</tr>
<tr>
<td>Noncomplex</td>
<td>28</td>
<td>5.54 (.69)</td>
<td></td>
<td>26</td>
<td>5.58 (.70)</td>
</tr>
</tbody>
</table>

Mean score (SD) $^1_1F(2, 80) = 2.22, p = .12$ $^2F(2, 76) = 1.35, p = .40$
CHAPTER 4: RESULTS

This chapter presents a quantitative analysis on the mean scores for the oral production and written production tasks as well as the mean Reaction Times (RTs) for the results on the Attentional Network Task (ANT). The chapter is divided into sections based on each separate research question (RQ) proposed at the end of Chapter 2 for a total of six RQs. For each research question or section, two subsections will follow in this order --- descriptive statistics and inferential statistics to examine the results. All the results were analyzed with the statistical software package, SPSS v. 20. The last section of this chapter provides a summary of the results for each research question.

4.1 Research Question #1 on Task Complexity

Does changing cognitive demands on a task via intentional reasoning have an effect on L2 development as measured through the accurate oral production of the Spanish present subjunctive in adjectival relative clauses?

4.11 Descriptive Statistics for RQ#1

The mean scores and standard deviations are reported below for task complexity as an independent variable by Time in Table 9 as well as graphic figures for those results on Figure 9:

Table 9. Oral Production: Mean Scores and Standard Deviations for Group x Time

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Pretest</th>
<th>Immediate Posttest</th>
<th>Delayed Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>23</td>
<td>5.87 (.34)</td>
<td>5.87 (.34)</td>
<td>5.91 (.51)</td>
</tr>
<tr>
<td>Complex</td>
<td>30</td>
<td>5.73 (.58)</td>
<td>8.07 (1.9)</td>
<td>8.17 (1.8)</td>
</tr>
<tr>
<td>Noncomplex</td>
<td>28</td>
<td>5.53 (.69)</td>
<td>8.29 (1.7)</td>
<td>8.14 (1.2)</td>
</tr>
</tbody>
</table>

Mean Score (SD)
Figure 9. Oral Production Task: Mean Scores for Task Complexity x Time
4.12 Inferential Statistics for RQ#1

The mean scores for the Oral Production Task were submitted to a Repeated-Measures ANOVA analysis, with Time as the within-subject variable and Group as the between-subject variable. The results yielded significant findings for Time, $F(2, 156) = 76.56, p < 0.01, \text{partial } \eta^2 = .458$ and a significant interaction for Time x Group, $F(4, 156) = 17.53, p < 0.01, \text{partial } \eta^2 = .279$. Since a significant interaction was found for Time x Group, a post-hoc Scheffé was run, and the results show that both the Complex and Noncomplex groups outperformed the Control group; however, no differences were found between the experimental conditions. The following two tables summarize within and between subject contrasts:

**Table 10. Oral Production Task: Tests of Within Subject Contrasts**

<table>
<thead>
<tr>
<th></th>
<th>SS</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Sq.</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>114.85</td>
<td>1</td>
<td>114.85</td>
<td>100.09</td>
<td>&lt;0.01</td>
<td>.562</td>
<td>1.00</td>
</tr>
<tr>
<td>Time * Group</td>
<td>50.61</td>
<td>2</td>
<td>25.30</td>
<td>22.05</td>
<td>&lt;0.01</td>
<td>.361</td>
<td>1.00</td>
</tr>
<tr>
<td>Error</td>
<td>89.50</td>
<td>78</td>
<td>1.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 11. Oral Production Task: Tests of Between Subject Contrasts

<table>
<thead>
<tr>
<th>SS</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
<th>Sig.</th>
<th>Partial η²</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>11234.40</td>
<td>1</td>
<td>11234.40</td>
<td>5163.23</td>
<td>&lt;0.01</td>
<td>.985</td>
<td>1.00</td>
</tr>
<tr>
<td>388.83</td>
<td>2</td>
<td>194.42</td>
<td>23.47</td>
<td>&lt;0.01</td>
<td>.365</td>
<td>1.00</td>
</tr>
<tr>
<td>169.71</td>
<td>78</td>
<td>2.18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Further analyses were made to gauge at the potential differences as far as net gains between the experimental conditions since there were no significant differences between both groups in the first analysis; therefore, the scores on the Oral Production Task from the Control and Complex groups were submitted to a Repeated-Measures ANOVA analysis, and due to violation to Sphericity (p = .05), the results were analyzed under Huynh-Felt. Significant results were found for Time, $F(1.8, 102) = 28.62, p < 0.01$, partial $\eta^2 = .330$, and interaction for Time x Group, $F(1.8, 102) = 24.16, p < 0.01$, partial $\eta^2 = .321$; likewise, significant results were found for the scores of the Control and Noncomplex group for both Time and interaction Time x Group; however, due to a violation of Sphericity (p < 0.05), the results reported here fall under Huynh-Feldt. So, for Time, $F(1.8, 98) = 28.90, p < 0.001$, partial $\eta^2 = .371$ and Time x Group, $F(1.8, 98) = 29.98, p < 0.001$, partial $\eta^2 = .356$. Since findings for Time were also significant, an analysis to examine pretest to immediate posttest and pretest to delayed posttest scores were submitted to a Repeated-Measures ANOVA for any differences; and significant results were found for interaction Group x Time for pretest to immediate posttest, $F(2, 78) = 21.78, p < 0.001,$
partial \( \eta^2 = .358 \), and pretest to delayed posttest, \( F(2, 78) = 22.05, p < 0.01, \) partial \( \eta^2 = .361 \).

The results suggest no major differences between the time in which the participants completed the immediate posttest and the delayed posttest and the net gains were somewhat comparable. A Post-hoc Scheffé analysis for both tests also revealed that both experimental conditions significantly outperformed the control group from pretest to immediate posttest and pretest to delayed posttest, but no differences existed between the complex and noncomplex conditions.
4.2 Research Question#2 on Task Complexity

Does changing the cognitive demands on a task via intentional reasoning have an effect on L2 development as measured through the accurate written production of the Spanish present subjunctive in adjectival relative clauses?

4.21 Descriptive Statistics for RQ#2

The mean scores and standard deviations are reported below for task complexity as an independent variable by Time in Table 12 as well as graphic figures for those results on Figure 10:

Table 12. Written Production Task: Mean Scores and Standard Deviations for Group x Time

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Pretest</th>
<th>Immediate Posttest</th>
<th>Delayed Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>21</td>
<td>5.86 (.36)</td>
<td>5.80 (.40)</td>
<td>5.90 (.30)</td>
</tr>
<tr>
<td>Complex</td>
<td>30</td>
<td>5.67 (.61)</td>
<td>7.60 (2.1)</td>
<td>7.10 (2.0)</td>
</tr>
<tr>
<td>Noncomplex</td>
<td>26</td>
<td>5.58 (.70)</td>
<td>8.73 (1.9)</td>
<td>7.92 (1.7)</td>
</tr>
</tbody>
</table>

Mean Score (SD)
Figure 10. Written Production Task: Mean Scores for Task Complexity x Time
4.22 Inferential Statistics for RQ#2

The mean scores for the Written Production Task were submitted to a Repeated-Measures ANOVA analysis, with Time as the within-subject variable and Group as the between-subject variable. Due to violation of Sphericity (p < 0.05), the findings were analyzed under Huynh-Feldt. The results yielded significant findings for Time, \( F(1.9, 148) = 43.33, p < 0.001 \); partial \( \eta^2 = .369 \) and a significant interaction for Time x Group, \( F(3.9, 148) = 11.91, p < 0.001 \); partial \( \eta^2 = .244 \). Since a significant interaction was found for Time x Group, a post-hoc Scheffé was run, and the results show that both the Complex and Noncomplex groups outperformed the Control group; however, no differences were found between the experimental conditions. The following two tables summarize within and between subject contrasts:

**Table 13. Written Production Task: Tests of Within Subject Contrasts**

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Sq.</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>61.33</td>
<td>1</td>
<td>61.33</td>
<td>45.79</td>
<td>&lt;0.001</td>
<td>.382</td>
<td>1.00</td>
</tr>
<tr>
<td>Time * Group</td>
<td>30.81</td>
<td>2</td>
<td>15.40</td>
<td>15.40</td>
<td>&lt;0.001</td>
<td>.237</td>
<td>.992</td>
</tr>
<tr>
<td>Error</td>
<td>99.10</td>
<td>74</td>
<td>1.34</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 14. Written Production Task: Tests of Between Subject Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Sq.</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>10105.72</td>
<td>1</td>
<td>10105.72</td>
<td>2996.39</td>
<td>&lt;0.001</td>
<td>.976</td>
<td>1.00</td>
</tr>
<tr>
<td>Group</td>
<td>84.36</td>
<td>2</td>
<td>42.18</td>
<td>12.51</td>
<td>&lt;0.001</td>
<td>.240</td>
<td>.995</td>
</tr>
<tr>
<td>Error</td>
<td>249.75</td>
<td>74</td>
<td>3.37</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Since both experimental conditions did not differ from each other on the post-hoc Scheffé test from the previous analysis, an additional analysis was run to gain insight into the separate net gains from each experimental condition; therefore, the written production scores were submitted to a Repeated-Measures ANOVA for the complex condition, and the findings were significant for Time $F(2, 98) = 9.88, p < 0.001$, partial $\eta^2 = .168$ and for interaction for Time * Group, $F(2, 98) = 10.35, p < 0.001$, partial $\eta^2 = .174$. The scores for the noncomplex condition were also submitted separately to a Repeated-Measures ANOVA, with significant findings for Time, $F(2, 90) = 33.62, p < 0.01$, partial $\eta^2 = .428$ and for interaction for Time * Group, $F(2, 90) = 34.60, p < 0.01$, partial $\eta^2 = .435$. For the written production task, the effect sizes suggest that the net gains for the noncomplex condition were larger than for the complex counterpart. Since Time was significant in the first analysis as well, a separate analysis for pretest to immediate posttest and pretest to delayed posttest was run to investigate any differences between these two times. So, a Repeated-Measures ANOVA was run for pretest to immediate posttest scores, with significant results for Time * Group interaction, $F(2, 74) = 18.02, p < 0.01$, partial $\eta^2 = .327$ as...
well as significant results for pretest to delayed posttest scores for Time * Group interaction, $F(2, 74) = 11.50, p < 0.01$, partial $\eta^2 = .237$. The effect sizes suggest a slightly higher net gain for pretest to immediate posttest time. A post-hoc Scheffé reveal that both complex and noncomplex groups outperformed the control from pretest to immediate posttest, but only the noncomplex group outperformed the control group from pretest to delayed posttest. However, no differences were found between the noncomplex and complex groups for both times, that is, even from pretest to delayed posttest, the noncomplex did not outperform the complex condition. To further explore this issue and given the differences in net gains between the complex and noncomplex conditions, a Repeated-Measures ANOVA was conducted for time and separate experimental condition. For the complex condition, from pretest to immediate posttest, significant findings for Time * Group interaction were found, $F(1, 49) = 16.63, p < 0.01$, partial $\eta^2 = .253$ as well as from pretest to delayed, $F(1, 49) = 8.78, p = 0.05$, partial $\eta^2 = .152$. As for the noncomplex condition, from pretest to immediate posttest, significant results were found for Time * Group interaction, $F(1, 45) = 48.56, p < 0.01$, partial $\eta^2 = .519$ and $F(1, 45) = 38.99, p < 0.01$, partial $\eta^2 = .464$ for Time * Group interaction from pretest to delayed posttest. Overall, the effect sizes suggest that the noncomplex group enjoyed larger net gains as a result of their participation in the experimental condition than the complex group for the written production task.
4.3 Research Question#3 on Task Complexity

Does HL/L2 status moderate the effects of changing the cognitive demands on a task?

4.31 Descriptive Statistics for RQ#3

Table 15, Table 16 and Figure 11, 12, 13 and 14 provide the mean scores and standard deviations for each production task divided by both experimental condition and bilingual experience.

Table 15. Oral Production Task: Mean Scores and Standard Deviations for Time * Group * Bilingual Experience

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Oral Production Task</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PRETEST</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HL</td>
<td>10</td>
<td>6.00 (.00)</td>
</tr>
<tr>
<td>L2</td>
<td>13</td>
<td>5.77 (.43)</td>
</tr>
<tr>
<td>Complex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HL</td>
<td>11</td>
<td>6.00 (.00)</td>
</tr>
<tr>
<td>L2</td>
<td>19</td>
<td>5.58 (.69)</td>
</tr>
<tr>
<td>Noncomplex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HL</td>
<td>11</td>
<td>5.90 (.30)</td>
</tr>
<tr>
<td>L2</td>
<td>17</td>
<td>5.29 (.77)</td>
</tr>
</tbody>
</table>
Table 16. Written Production Task: Mean Scores and Standard Deviations for Time *
Group * Bilingual Experience

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Written Production Task</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PRETEST</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HL</td>
<td>10</td>
<td>5.80 (.42)</td>
</tr>
<tr>
<td>L2</td>
<td>11</td>
<td>5.91 (.30)</td>
</tr>
<tr>
<td>Complex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HL</td>
<td>14</td>
<td>5.57 (.65)</td>
</tr>
<tr>
<td>L2</td>
<td>16</td>
<td>5.75 (.58)</td>
</tr>
<tr>
<td>Noncomplex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HL</td>
<td>12</td>
<td>5.83 (.39)</td>
</tr>
<tr>
<td>L2</td>
<td>14</td>
<td>5.36 (.84)</td>
</tr>
</tbody>
</table>

HL=heritage language learners   L2=second language learners   Mean Score (SD)
Figure 11. Oral Production Task: Mean Scores for Time x Bilingual Experience
Figure 12. Written Production Task: Mean Scores for Time x Bilingual Experience

Estimated Marginal Means of MEASURE_1

Time

BilExp
L2
heritage

Estimated Marginal Means

6.00
7.00
8.00
9.00
10.00

Pretest
Immediate Posttest
Delayed Posttest
Figure 13. Oral Production Task: Mean Scores for Group x Bilingual Experience

Estimated Marginal Means of MEASURE_1

BilExp
   L2
   Heritage

Estimated Marginal Means

control  complex  noncomplex

Group
Figure 14. Written Production Task: Mean Scores for Group x Bilingual Experience
4.32 Inferential Statistics: Oral Production Task

To examine possible interactions among Time, Group and Bilingual Experience, scores for the Oral Production Task were submitted to a Repeated-Measures ANOVA with Time as the within-subject variable and Group and Bilingual Experience as between-subject variables. The results yielded significant findings for Time * Bilingual Experience interaction, $F(2, 150) = 12.01, p < 0.01, \text{partial } \eta^2 = .138$ and a significant triple interaction for Time * Group * Bilingual Experience, $F(4, 150) = 2.99, p = .017, \text{partial } \eta^2 = .077$. Tables 17 and 18 below report on the findings for Within-Subject Contrasts and Between-Subject Effects.

Table 17. Oral Production Task: Tests of Within Subject Contrasts

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Sq.</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time * BilExp</td>
<td>12.75</td>
<td>1</td>
<td>12.75</td>
<td>14.49</td>
<td>&lt;.001</td>
<td>.162</td>
<td>.964</td>
</tr>
<tr>
<td>Time * Group *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BilExp</td>
<td>8.73</td>
<td>2</td>
<td>4.37</td>
<td>4.96</td>
<td>.009</td>
<td>.117</td>
<td>.796</td>
</tr>
<tr>
<td>Error</td>
<td>65.99</td>
<td>75</td>
<td>.880</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 18. Oral Production Task: Tests of Between Subject Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Sq.</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>10565.14</td>
<td>1</td>
<td>10565.14</td>
<td>5619.97</td>
<td>&lt;.001</td>
<td>.987</td>
<td>1.000</td>
</tr>
<tr>
<td>Group</td>
<td>84.61</td>
<td>2</td>
<td>42.31</td>
<td>22.51</td>
<td>&lt;.001</td>
<td>.375</td>
<td>1.000</td>
</tr>
<tr>
<td>BilExp</td>
<td>11.79</td>
<td>1</td>
<td>11.79</td>
<td>6.27</td>
<td>.014</td>
<td>.077</td>
<td>.696</td>
</tr>
<tr>
<td>Group*BilExp</td>
<td>14.43</td>
<td>2</td>
<td>7.22</td>
<td>3.84</td>
<td>.026</td>
<td>.093</td>
<td>.680</td>
</tr>
<tr>
<td>Error</td>
<td>140.99</td>
<td>75</td>
<td>1.88</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Given the significant results for bilingual experience, additional analyses were run to understand better the effects of bilingual experience on the results. To investigate the treatment effects and net gains for each separate bilingual group, scores of the Oral Production Task for each group of learners was submitted to a Repeated-Measures ANOVA with Time as within-subject variable and Group (i.e., control, complex and noncomplex) as between-subject variable. The results for the heritage language learners violated Sphericity (p < 0.05); therefore, the results reported are under a Huynh-Feldt analysis. The findings were significant for Time, $F(1.4, 60) = 15.76, p < 0.01$, partial $\eta^2 = .334$ and for Time * Group interaction, $F(2.8, 60) = 4.96, p = 0.05$, partial $\eta^2 = .249$. A post-hoc Scheffé analysis reveals that both complex and noncomplex groups significantly outperformed the control; however, both experimental groups were comparable. To further examine the variable Time, scores of the oral production task were submitted to a Repeated-Measures ANOVA for two separate analyses of Time, pretest to immediate posttest and pretest to delayed posttest. A significant interaction was found for Time * Group, $F(1, 30) =$
14.20, \( p < 0.01, \) partial \( \eta^2 = .486 \) and a post-hoc Scheffe analysis reveals that both the complex and noncomplex groups significantly outperformed the control group but no differences between the complex and noncomplex groups. For pretest to delayed posttest analysis, a significant interaction was also found for Time * Group, \( F(2, 30) = 8.97, p = 0.001, \) partial \( \eta^2 = .374. \) A post-hoc Scheffé analysis reveals that only the noncomplex group outperforms the control with no differences between the complex and noncomplex groups. To gauge at the separate effects of each experimental condition on the scores for heritage language learners, the scores of the oral production task were submitted to a Repeated-Measures ANOVA, with Time as the within-group variable and each experimental condition was considered separately (complex vs. noncomplex) for between-subject variables. Due to a violation to Sphericity \( (p < 0.05) \), the results were analyzed under Huynh-Feldt for the complex group, and the findings were only reaching significance for Time * Group, \( F(1.4, 40) = 3.28, p = .066, \) partial \( \eta^2 = .141. \) A separate analysis employing a Repeated-Measures ANOVA analysis for the noncomplex condition was conducted, and the findings were significant for the interaction Time * Group, \( F(1.4, 38) = 14.14, \) \( p < 0.001, \) partial \( \eta^2 = .427. \) Taking into account the last analyses for each separate condition for the heritage language learners, the results suggest that the HL participants in the noncomplex condition benefitted more from the treatment than the complex group.

Similar analyses were run for the L2 population in the current study to gain more insight into the bilingual experience variable. The scores of the oral production task were submitted to a Repeated-Measures analysis with Time as the within-subject variable and Group (i.e., control, complex and noncomplex) as the between-group variable, and the results were significant for Time, \( F(2, 92) = 61.20, p < 0.01, \) partial \( \eta^2 = .571 \) and Time * Group interaction, \( F(4, 92) = \)
13.63, \( p < .001 \), partial \( \eta^2 = .372 \). A post-hoc Scheffé analysis demonstrates that both complex and noncomplex groups significantly outperform the control group but no differences were found between both experimental groups. To explore further the variable Time, an additional analysis was conducted by submitting L2 group’s oral production task scores to a Repeated-Measures ANOVA with a separate analysis for pretest to immediate posttest and pretest to delayed posttest. A significant interaction for Time * Group was found, \( F(2, 46) = 20.01, p < 0.01 \), partial \( \eta^2 = .465 \) and a post-hoc Scheffé analysis shows that both conditions significantly outperformed the control group; however, no differences were found between both experimental groups. The scores for pretest to delayed posttest were also submitted to a Repeated-Measures ANOVA, and significant findings were found for Time * Group interaction, \( F(2, 46) = 20.52, p < 0.001 \), partial \( \eta^2 = .472 \) with post-hoc Scheffé revealing that only the noncomplex group means were significantly higher than the control group, but no differences between the two groups were found. To examine the overall effects of each experimental condition on the dependent variable, two separate analyses were run for the complex and noncomplex conditions. Due to violations of Sphericity (\( p < 0.05 \)) for both conditions, the findings are analyzed under Huynh-Feldt. The results for the complex condition were significant for Time * Group interaction, \( F(1.6, 60) = 24.24, p < 0.001 \), partial \( \eta^2 = .447 \) and also significant for the noncomplex condition, \( F(1.4, 56) = 31.02, p < 0.001 \), partial \( \eta^2 = .526 \). Although the results suggest that participants in both experimental conditions outperformed the control group, the net gains for the noncomplex group were slightly greater than the complex group.

4.33 Inferential Statistics: Written Production Task

To investigate potential interactions between Time, Group and Bilingual Experience,
scores on the Written Production Task were submitted to a Repeated-Measures ANOVA, with Time as the within-subject variable and Group and Bilingual Experience as between-subject variables. The results were significant for Time * Bilingual Experience interaction, $F(2, 142) = 11.09, p < 0.01$, partial $\eta^2 = .135$ and a significant triple interaction for Time * Group * Bilingual Experience, $F(4, 142) = 7.43, p < 0.01$, partial $\eta^2 = .173$. Tables 19 and 20 below report on the findings for Within-Subject Contrasts and Between-Subject Effects.

**Table 19. Written Production Task: Tests of Within Subject Contrasts**

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Sq.</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time * BilExp</td>
<td>17.37</td>
<td>1</td>
<td>17.37</td>
<td>17.81</td>
<td>&lt;.001</td>
<td>.201</td>
<td>.986</td>
</tr>
<tr>
<td>Time * Group *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BilExp</td>
<td>8.37</td>
<td>2</td>
<td>4.19</td>
<td>4.29</td>
<td>.017</td>
<td>.108</td>
<td>.731</td>
</tr>
<tr>
<td>Error</td>
<td>69.25</td>
<td>71</td>
<td>.975</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 20. Written Production Task: Tests of Between Subject Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Sq.</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>9977.01</td>
<td>1</td>
<td>9977.01</td>
<td>3783.92</td>
<td>&lt;.001</td>
<td>.982</td>
<td>1.000</td>
</tr>
<tr>
<td>Group</td>
<td>79.42</td>
<td>2</td>
<td>39.71</td>
<td>15.06</td>
<td>&lt;.001</td>
<td>.298</td>
<td>.999</td>
</tr>
<tr>
<td>BilExp</td>
<td>38.13</td>
<td>1</td>
<td>38.13</td>
<td>14.46</td>
<td>&lt;.001</td>
<td>.169</td>
<td>.963</td>
</tr>
<tr>
<td>Group*BilExp</td>
<td>16.03</td>
<td>2</td>
<td>8.02</td>
<td>3.04</td>
<td>.054</td>
<td>.079</td>
<td>.571</td>
</tr>
<tr>
<td>Error</td>
<td>187.21</td>
<td>71</td>
<td>2.64</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To investigate the treatment effects and net gains for each separate bilingual group, scores of the Written Production Task for each group of learners was submitted to a Repeated-Measures ANOVA with Time as within-subject variable and Group (i.e., control, complex and noncomplex) as between-subject variable. The results for the HL group yielded significant findings for Time, $F(2, 66) = 8.55, p < 0.001$, partial $\eta^2 = .361$ and for Time * Group interaction, $F(4, 66) = 7.86, p < 0.001$, partial $\eta^2 = .323$. A post-hoc Scheffé analysis reveals that the noncomplex group significantly outperformed both the complex and control groups, and no differences were found between the control and complex groups. Due to the significant results for Time, a separate analysis was conducted from pretest to immediate posttest and pretest to delayed posttest. The results from a Repeated-Measures ANOVA reveal a significant Time * Group interaction, $F(2, 33) = 6.28, p = .005$, partial $\eta^2 = .276$ from pretest to immediate posttest; moreover, significant findings were found for Time * Group interaction, $F(2, 33) =$
10.80, \( p < 0.001 \), partial \( \eta^2 = .396 \) from pretest to delayed posttest. A post-hoc Scheffé analysis reveals that the noncomplex group significantly outperformed only the control group from pretest to immediate posttest and both the complex and control groups from pretest to delayed posttest. Since the noncomplex group was the only experimental condition for which significant results were found in the written production task, and to gauge into the overall effect size of the experimental condition, a separate Repeated-Measures Analysis was run for the noncomplex condition, with Time as within-subject variable and Group (control and noncomplex) as between-subject factor, and a significant interaction was found for Time * Group, \( F(2, 40) = 10.28, \ p < 0.001 \), partial \( \eta^2 = .339 \).

For the L2 group, the results from the Written Production Task were also submitted to a Repeated-Measures ANOVA, with Time as the within-subject variable and Group (control, complex and noncomplex) as the between-subject factor, and the findings were significant for Time, \( F(2, 76) = 40.80, \ p < 0.001 \), partial \( \eta^2 = .518 \) and Time * Group interaction, \( F(4, 76) = 13.31, \ p < 0.001 \), partial \( \eta^2 = .412 \). The results of a post-hoc Scheffé show that both complex and noncomplex conditions significantly outperformed the control group, but no differences were found between experimental conditions. To examine further the results for Time, a separate analysis was conducted to investigate the effects of the experimental conditions on the dependent variable from pretest to immediate posttest and pretest to delayed posttest. The results of a Repeated-Measures ANOVA reveal a significant interaction for Time * Group, \( F(2, 38) = 19.69, \ p < 0.001 \), partial \( \eta^2 = .509 \) and a post-hoc Scheffé analysis demonstrates that both the complex and noncomplex groups outperformed the control with no differences between the experimental conditions for pretest to immediate posttest. Likewise, a Repeated-Measures ANOVA analysis suggest significant findings for Time * Group interaction for the pretest to delayed posttest, \( F(2, \)
A post-hoc Scheffé analysis shows that both the complex and noncomplex groups significantly outperform the control group; however, no significant differences exist between the performances of participants in both conditions. To gain insight into the overall effects of each experimental condition on the scores of the written production task, separate analyses were run for each experiment condition. For the L2 complex condition, a significant Time * Group interaction was found, \( F(2, 50) = 8.63, p = 0.001 \), partial \( \eta^2 = .257 \). As for the L2 noncomplex condition, significant results were also found for Time * Group interaction, \( F(2, 46) = 49.25, p < 0.001 \), partial \( \eta^2 = .682 \). Overall, these results reveal larger net gains for the noncomplex group in comparison to the complex condition. Furthermore, when comparing the noncomplex L2 participants to their HL counterparts, the L2 noncomplex group also showed greater gains from the treatment.
4.4 Research Question #4 on Inhibitory Control

Do HL and L2 learners show comparable inhibitory control abilities?

4.41 Descriptive Statistics on RQ#4

To answer this research question, first, as the biodata show, both group of HL and L2 participants were comparable in their use of the computer and playing videogames as well as none of the participants reported being diagnosed with Attention Deficit (Hyperactivity) Disorder. Furthermore, the reported data takes into account socioeconomic status (SES) as a factor that may influence the results as has been suggested when working with bilingual populations (e.g., Pearl & Lambert, 1962). Based on the Language Background Questionnaire to try to control for SES, the analysis below is for the participants who reported having caretakers who have a job that would classify them as working class, that is, jobs that do not require a college education. The mean scores and standard deviations for accuracy and reaction times (RTs) for each flanker type (neutral, congruent, incongruent trials) as well as mean scores for RTs for conflict effect and cost effect for each bilingual group will reported through Tables 21, 22 and both conflict and cost effects are represented through Figure 15.
Table 21. Attentional Network Task (ANT): Mean Scores and Standard Deviations for Accuracy and Reaction Times

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Flanker Type</th>
<th>Neutral Trial</th>
<th>Congruent Trial</th>
<th>Incongruent Trial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Accuracy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HL</td>
<td>29</td>
<td>22.03 (3.2)</td>
<td>22.24 (3.3)</td>
<td>21.41 (4.3)</td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>22</td>
<td>22.55 (3.5)</td>
<td>22.68 (3.5)</td>
<td>21.55 (3.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Reaction Times</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HL</td>
<td>29</td>
<td>645.62 (87.92)</td>
<td>648.52 (98.21)</td>
<td>735.14 (66.76)</td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>22</td>
<td>608.13 (78.12)</td>
<td>612.45 (81.50)</td>
<td>722.72 (99.21)</td>
<td></td>
</tr>
</tbody>
</table>

HL=heritage language learners    L2=second language learners    Mean Score (SD)
Table 22. ANT Effects: Mean Scores and Standard Deviations for Reaction Times for both Conflict and Cost Effects

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>ANT Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Cost Effects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(incongruent trials – neutral trials)</td>
</tr>
<tr>
<td>Reaction Times</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HL</td>
<td>29</td>
<td>115.42 (48.9)</td>
</tr>
<tr>
<td>L2</td>
<td>22</td>
<td>135.73 (123.2)</td>
</tr>
</tbody>
</table>

HL=heritage language learners  L2=second language learners  Mean Score (SD)
Figure 15. ANT Effects: Mean Scores for Reaction Times for both Conflict and Cost Effects

Estimated Marginal Means of MEASURE_1

Cost Effect  Conflict Effect

ANT Effect

Estimated Marginal Means

BiExp
heritage
L2
To investigate whether the mean scores for accuracy, RTs for flanker type and RTs for each ANT effect were significant, a few analyses were conducted. First, accuracy scores were submitted to a Repeated-Measures ANOVA, with flanker type as within-subject variable and bilingual experience as between-subject factor. Due to a violation of Sphericity \((p < 0.01)\), the results were analyzed under Huynh-Feldt, and the results were nonsignificant for both Flanker Type, \(F(2, 98) = 6.69, p = 0.09\) and Flanker Type * Bilingual Experience interaction, \(F < 1, p = .781\). Therefore, these results suggest that both groups were comparable in their accuracy response for each flanker type. Second, the mean scores for RTs were submitted to a Repeated-Measures ANOVA, with flanker type as within-subject variable and bilingual experience as between-subject factor, and significant results were found under a Huynh-Feldt analysis for Flanker Type, \(F(2, 98) = 73.91, p < 0.01\) but no significant results for Flanker Type * Bilingual Experience interaction, \(F(2, 98) = 1.093, p = .339\). An additional analysis was run to examine potential differences between both bilingual groups in respect to mean scores for cost and conflict effects; so, RT mean scores for conflict and cost effects were entered separately into a one-way ANOVA, with cost effect (and conflict effect on a separate analysis) as dependent variable and bilingual experience as factor. No significant findings were found for cost effect, \(F<1, p = .422\) as well as no significant findings for conflict effects, \(F(1, 50) = 1.27, p = .265\). In sum, even though flanker type did play a role on the RTs for both groups, and HL participants did have a smaller RT average for both conflict and cost effects, the mean scores were not significant between both groups. Table 23 and Table 24 below will show Tests of Within-Subject Contrasts and Tests of Between-Subject Effects, respectively for flanker type and bilingual experience.
Table 23. Attentional Network Task: Tests of Within Subject Contrasts

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Sq.</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flanker Type</td>
<td>260580.1</td>
<td>1</td>
<td>260580.1</td>
<td>108.97</td>
<td>&lt;.001</td>
<td>.690</td>
<td>1.000</td>
</tr>
<tr>
<td>Flanker Type*</td>
<td>3932.4</td>
<td>1</td>
<td>3932.4</td>
<td>1.644</td>
<td>.206</td>
<td>.032</td>
<td>.242</td>
</tr>
<tr>
<td>Error</td>
<td>117176.3</td>
<td>49</td>
<td>2391.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 24. Attentional Network Task: Tests of Between Subject Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Sq.</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>65807837.9</td>
<td>1</td>
<td>65807837.9</td>
<td>3736.1</td>
<td>&lt;.001</td>
<td>.987</td>
<td>1.000</td>
</tr>
<tr>
<td>BilExp</td>
<td>30810.5</td>
<td>1</td>
<td>30810.5</td>
<td>1.75</td>
<td>.192</td>
<td>.034</td>
<td>.254</td>
</tr>
<tr>
<td>Error</td>
<td>863092.9</td>
<td>49</td>
<td>17614.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Since all the participants completed three separate blocks for the ANT, an additional analysis was conducted to find out whether significant differences between both bilingual groups would appear at a given block. Therefore, the mean RTs for each flanker type (neutral, congruent and incongruent trials) were submitted to a two-way Repeated-Measures ANOVA, with flanker type
as within subject variable and block and bilingual group as between-subject factors, and no significant interaction was found for flanker type, block and bilingual experience, $F(4, 294) = 1.80, p = .127$. Likewise, no significant interaction for flanker type and block, $F < 1, p = .891$.

Moreover, another analysis was conducted for mean RTs for both conflict and cost effects under each block event. Mean RTs for each block were submitted separately to a one-way ANOVA, with RT as dependent variable and bilingual group as factor. The results are summarized in Tables 25 suggesting that the HL group was significantly faster during the first block at solving conflicting information:

**Table 25. One-way ANOVA Analysis for Conflict and Cost Effects per Block and Bilingual Group**

<table>
<thead>
<tr>
<th></th>
<th>HL</th>
<th>L2</th>
<th>F</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conflict Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 1</td>
<td>72.51 (68)</td>
<td>133.54 (77)</td>
<td>5.14</td>
<td>.028*</td>
</tr>
<tr>
<td>Block 2</td>
<td>103.24 (81)</td>
<td>92.64 (97)</td>
<td>.18</td>
<td>.673</td>
</tr>
<tr>
<td>Block 3</td>
<td>111.34 (69)</td>
<td>109.18 (56)</td>
<td>.14</td>
<td>.905</td>
</tr>
<tr>
<td><strong>Cost Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 1</td>
<td>92.59 (86)</td>
<td>132.59 (88)</td>
<td>2.63</td>
<td>.111</td>
</tr>
<tr>
<td>Block 2</td>
<td>110.93 (85)</td>
<td>114.18 (93)</td>
<td>.02</td>
<td>.898</td>
</tr>
<tr>
<td>Block 3</td>
<td>119.90 (112)</td>
<td>98.05 (61)</td>
<td>.68</td>
<td>.413</td>
</tr>
</tbody>
</table>

HL=heritage language learners  L2=second language learners  Mean Score (SD)
4.5 Research Question #5 on Inhibitory Control

Does inhibitory control *mediate* the effects of task complexity on the development of the Spanish subjunctive in adjectival relative clauses?

4.51 Statistical Analysis for RQ#5

The following Table 26 and Table 27 show mean RT scores and standard deviations for conflict effects for each experimental group and production task.

Table 26. Mean Scores and Standard Deviation for Conflict Effects for Oral Production and Written Production Task

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Conflict Effect</th>
<th>Oral Production Task</th>
<th>Written Production Task</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complex</td>
<td>30</td>
<td>100.21 (49.30)</td>
<td>101.33 (43.37)</td>
<td></td>
</tr>
<tr>
<td>Noncomplex</td>
<td>28</td>
<td>113.82 (48.06)</td>
<td>109.65 (50.33)</td>
<td></td>
</tr>
<tr>
<td>Mean Score (SD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To ensure that both groups were comparable in their conflict effect mean scores, the scores were submitted to a one-way ANOVA, with conflict effect as dependent variable and Group (complex vs. noncomplex) as factor for each production task, and the results were not significant for the oral production task, $F<1, p = .408$ or written production task, $F<1, p = .509$. Therefore, to investigate if inhibitory control may have accounted for outcome measures, a Pearson’s correlation was conducted with conflict effect, oral production (posttest and delayed posttest scores) and written production scores (both immediate posttest and delayed posttest), and no
correlation was found between inhibitory control and oral production: immediate posttest (p = .428) and delayed posttest (p = .220). Likewise, no correlation was found between inhibitory control and results for the immediate posttest (p = .326) or delayed posttest (p = .093) for the written production task. Therefore, since no significant correlation was found between inhibitory control and dependent measures, a linear regression analysis was not run.

An additional analysis was conducted on pre-to-post and pre-to-delayed gain scores. To calculate the gain scores for each production task, the proportion was computed by dividing the number of correct posttest or delayed items minus the number of correct pretest items by the number of incorrect pretest items. For the oral production task, no correlation was found between inhibitory control ability and pre-to-post gains (p = .454) or pre-to-delayed (p = .256). Similarly, no correlation was found for the written production task, pre-to-post (p = .364) or pre-to-delayed (p = .106). No linear regression was run since no correlations were found.
4.6 Research Question #6 on Inhibitory Control

Does HL/L2 status moderate the effects of changing the cognitive demands on a task?

4.61 Statistical Analysis for RQ#6

To ensure that scores for all groups were comparable, one-way ANOVA analyses were conducted for each bilingual group and production task. For the HL group, conflict effect scores were submitted to a one-way ANOVA with conflict effect as dependent variable and Group as factor for both oral and written production tasks and the findings were not significant for oral production $F<1, p = .988$ or for the written production task, $F<1, p = .976$. Similarly, for the L2 group, no significant differences for the oral production task, $F(1, 35) = 1.19, p = .281$ or for the written production task, $F(1, 29) = 1.31, p = .262$. A Pearson’s correlation coefficient was computed for each bilingual group’s posttest and delayed posttest scores and conflict effect mean score for oral production and written production task. No significant correlations were found for inhibitory control and dependent measures ($p > 0.05$) for each bilingual group across experimental conditions. A linear regression analysis was also conducted to ensure that inhibitory control was not a predictor for learning outcomes per bilingual group with immediate posttest and delayed posttest as dependent variables. Table 28 below summarizes the results for the linear regression analysis:
Table 27. Linear Regression Analysis for Bilingual Experience * Inhibitory Control for Oral and Written Production Tasks

<table>
<thead>
<tr>
<th></th>
<th>Oral Production Task</th>
<th>Written Production Task</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Immediate</td>
<td>Delayed</td>
</tr>
<tr>
<td><strong>Conflict Effect</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complex</td>
<td>.617(^a)</td>
<td>.271</td>
</tr>
<tr>
<td>Noncomplex</td>
<td>.637</td>
<td>.291</td>
</tr>
<tr>
<td>L2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complex</td>
<td>.703</td>
<td>.584</td>
</tr>
<tr>
<td>Noncomplex</td>
<td>.293</td>
<td>.571</td>
</tr>
</tbody>
</table>

\(^a\)p values  
HL=heritage language learners  
L2=second language learners

Overall, the results suggest that inhibitory control did not mediate learning outcomes across task condition and bilingual experience.
4.7 Summary of Results for Research Questions #1 through #6

1. Does changing cognitive demands on a task via intentional reasoning have an effect on L2 development as measured through the accurate oral production of the Spanish present subjunctive in adjectival relative clauses?

No. The results suggest that changing the cognitive demands of a task had no superior effect on the oral production of the Spanish present subjunctive in adjectival relative clauses when compared to the participants in the noncomplex condition.

2. Does changing cognitive demands on a task via intentional reasoning have an effect on L2 development as measured through the accurate written production of the Spanish present subjunctive in adjectival relative clauses?

No. The results suggest that changing cognitive demands of a task had no superior effect on the written production of Spanish present subjunctive in adjectival relative clauses. In fact, it was the noncomplex group that demonstrated larger net gains and superior performance from pre to delayed posttest contra to the predictions of the Cognition Hypothesis.

3. Does HL/L2 status moderate the effects of changing the cognitive demands on a task?

Yes. The results suggest an overall advantage for HL learners under the noncomplex condition. For the oral production task, the HL group under the simple condition, showed greater net gains and superior performance from pre to delayed posttest. The results from the complex condition were only reaching significance. The findings for the written production task suggest the same trend since the noncomplex condition outperforms the control group from pretest to immediate posttest and both the control and complex conditions from pretest to delayed posttest. Furthermore, the HL learners differed from their L2 counterparts in that L2 participants achieved significant higher net gains in the written production task.
4. *Do HL and L2 learners show comparable inhibitory control abilities?*

Partially. Based on the results, the HL participants were significantly faster at solving conflicting information as created by the incongruent trials during the ANT only on the first block of the experiment. However, the results were not sustained for the two subsequent blocks since no significant differences were found between both groups.

5. *Does inhibitory control mediate the effects of task complexity on the development of the Spanish subjunctive in adjectival relative clauses?*

No. Based on the results, no correlation was found for inhibitory control and experimental condition. Therefore, inhibitory control did not mediate the effects of task complexity on the development of the Spanish subjunctive in adjectival relative clauses.

6. *Do the mediating effects of inhibitory control differ according to HL versus L2 status?*

No. The results for RQ#5 reveal that inhibitory control did not mediate the effects of task complexity and these results were not due to bilingual experience since no correlations were found for inhibitory control and dependent measures for both groups.
4.8 Exit Questionnaire for Question #2

Can you explain what you learned while solving the task of the dorm? Can you provide some type of rule for the grammar?

4.81 Summary of Responses

Due to the different quantitative results that were found between the HL and L2 group, particularly for the written production task, the answers to Exit Questionnaire #2 are summarized below as an attempt to gain insight into the types of knowledge that both bilingual groups reported as a result of the experiment.

Exit Questionnaire #2: Can you explain what you learned while solving the task of the dorm? Can you provide some type of rule for the grammar?

<table>
<thead>
<tr>
<th>Heritage Language Learners</th>
<th>Second Language Learners</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Didn't learn anything new really.</td>
<td>(1) Subjunctive expresses uncertainty</td>
</tr>
<tr>
<td>(2) Certain grammatical rules get lost when you do not practice them properly.</td>
<td>(2) I have been able to identify faster where to use subjunctive and where indicative</td>
</tr>
<tr>
<td>(3) I learned that I can speak spanish in my own domain but when asked a question either I know it or I don't. I can't explain why I just know it.</td>
<td>(3) When to use subjunctive.</td>
</tr>
<tr>
<td>(4) It was hard to find a proper word to make the sentence correct without extending it into a possible sentence fragment. I was confused with my grammar on what time tense to apply.</td>
<td>(4) The task helped to reinforce when and when not to use the subjunctive tense. A rule could be take the verb in the &quot;yo&quot; form, drop the &quot;o&quot; ending, and then add the &quot;opposite&quot; ending (AR to ER/IR vice versa).</td>
</tr>
<tr>
<td>(5) To look at the pictures more intently in order to understand what the answer should be.</td>
<td>(5) I started to understand some rules of use of the subjunctive. If you're speaking of something you're not sure of, use subjuntivo. If it's something that's certain, use indicativo.</td>
</tr>
<tr>
<td>(6) How to find out what the problem was.</td>
<td>(6) when to use and not use the subjunctive</td>
</tr>
<tr>
<td>(7) I learned that even though we perceive a photo to mean something, we might not always give it the correct meaning.</td>
<td>(7) For adjective phrases, use the subjunctive when it is unsure if the object exists. Use the indicative when it is certain.</td>
</tr>
<tr>
<td>(8) I learned that I need a lot of improving to do in my Spanish. I am currently learning the grammar rule in Spanish class; therefore, I cannot provide a rule yet.</td>
<td>(8) I learned that when discussing something with certainty, or else referring to something in particular, to use the indicative mood, but when unsure of something to express that</td>
</tr>
</tbody>
</table>
Uncertainty with the subjunctive.

(9) We were leaning about how to use the subjunctive. Maybe one rule would be that the context of the situation is very important in determining the use of the subjunctive or indicative.

Overall, the comments provided by the participants show qualitative differences in the knowledge that they obtained based on the treatment tasks. The comments by the heritage language learners suggest implicit knowledge, as none of the participants was able to verbalize some type of rule. However, for the L2 group, every comment has the word *subjunctive* in it; and thus, suggesting that learners may have reached some level of awareness of the intended target form. The responses to the exit questionnaire suggest that the L2 learners arrived at more explicit knowledge of the target form use whereas the HL learners reported no evidence of having explicit knowledge.
CHAPTER 5: DISCUSSION AND CONCLUSION

This chapter will present a more detailed discussion on the findings of the current study as it relates to the research questions proposed at the end of chapter 2. Furthermore, a discussion on theoretical, methodological and pedagogical implications will follow as well as limitations and suggestions for future research.

5.1 Effects of Task Complexity on Oral Production

Research Question #1 posited if changing task demands along resource-directing variables as suggested by the Cognition Hypothesis would have an effect on the accurate oral production of the present Spanish subjunctive in adjecitival clauses. The results show no advantage for the participants who completed the complex condition since they did not outperform the simple condition. The findings on effect size suggest rather comparable net gains with a slight advantage for the noncomplex group. The fact that no differences were found between both groups is interesting despite the fact that independent measures of task complexity in chapter 3 provide evidence for increases in task demands. These results align themselves with Lee (2002) that found no statistical differences between the complex and simple conditions in promoting the accurate use of Korean particles and inflectional suffixes. It does not support the favorable results of Kim and Ventura (2011) and Kim (2012) who found that participants in the complex condition demonstrated significant learning gains or Baralt’s (2010) findings for the face-to-face condition. The major difference between these studies is that the current study and Lee (2002) employed monologic or one-way flow tasks while Kim and colleagues and Baralt had their participants engage in an interactive task.

Also, this result is especially surprising considering the role of feedback in the study and in the Cognition Hypothesis, Robison (2011) states, “…there should be more uptake of oral recasts on complex, compared to simpler tasks or more use of written input provided to help
learners perform tasks” (p. 19). Participants in both conditions received written recasts as a form of feedback – the provision of recasts was held constant in the two conditions. Meta-analyses conducted on feedback have found indeed that it plays a facilitative role on L2 development (e.g., Li, 2010). Recasts are suggested to play a facilitative role in L2 development since they seem to provide the learner with positive evidence of the target-like structure (e.g., Leeman, 2003). More importantly to this study, previous research with task complexity has shown that participants seem to benefit from recasts as a form of feedback while completing a task (e.g., Révész, 2007, 2009; Baralt, 2010, forthcoming). Even though the prediction made by Robinson is based on oral recasts, he does predict that “written input” should also help more a complex group, and in the treatment task of the current study, the recasts provided by the computer program were in a written format and since recasts provide target-like input, the task granted the participants with written input to help them meet the goal of the task. So, as far as the Cognition Hypothesis is concerned, the complex group should have still outperformed the noncomplex group since the participants in this condition should have had more uptake of the feedback. However, the delivery of recasts in the current study was very controlled, and not a result of negotiation of meaning that would lead to more uptake as Robinson suggests.

Therefore, in this study, it seems that prompting learners to place more effort at conceptualizing their output, may have detracted them from noticing the target form and/or testing their hypotheses of the use of the subjunctive in adjectival clauses. Interestingly, however, one would expect the simple condition to display a greater performance than its complex counterpart, and this was not case. The qualitative data of the stimulated recall episodes is useful in showing that it may be that some learners in the complex condition opted to focus on formulating their response and not so much on worrying about the reasons for the student’s behavior. This is a possible consequence of the delivery mode through a monologic CALL task.
The current study employed a computer-assisted language-learning (CALL) task to deliver the treatment for the participants (i.e., the treatment was delivered completely and only by the computer including the feedback). One of the advantages of using computerized treatments like the one in this study is that it may improve the internal validity of studies since it presents uniformly the information of the target form along with any focus on form technique (e.g., Sanz, 2000b). SLA studies have used computerized treatments to explore the role of pedagogical interventions on L2 development (e.g., Rosa & Leow, 2004; Sanz & Morgan-Short, 2004; Stafford, Bowden & Sanz, 2012). A few studies operationalizing task complexity have also implemented some type of computerized treatment to examine lexical development and reading comprehension based on the complexity of instructions (Peters, 2007), morphosyntactic development with CMC or computer mediated communication interaction (Baralt, forthcoming) and as a medium to present the treatment task (Révész, Sachs & Hama, 2012). The participants in this study only engaged with the CALL task and had no interaction with an interlocutor as in other studies employing computerized tasks (e.g., Baralt, forthcoming; Révész, Sachs & Hama, 2012). Another feature of the treatment task is that there was no time limit placed on the participants to complete the task so they were able to take as much time. Consequently, the participants were more autonomous in completing the CALL task.

Chapelle (2009) alludes to this idea of autonomy since she describes a CALL design as one that seems to grant learners with more opportunities for interaction, as they are able to “control the input and its various modified forms.” (p. 631). Researchers have examined the role of computerized tasks in promoting learner autonomy in their learning an L2 (e.g., Blin, 2004). Likewise, in this task, the participants may have been able to allocate their attentional resources as they wished – whether they exhibited more preoccupation with conceptualizing the response or the actual encoding of the message, that is, the morphosyntax, lexis and phonology to the
message. In fact a couple of recall comments from a participant SR_01 during the stimulated recall session under the complex condition, said the following: “I looked at the pictures but then I was more concerned with the grammatical aspect if it was subjunctive or not.” and “I noticed that the two discrepancy answers were not the masculine or feminine group nor singular or plural, just the subjunctive so I focused on that.” A second participant, SR_03, reported, “At this point I was trying to decide what was more important choosing the picture or the verb.” These comments suggest that the participants seem to be unable to allocate their overt attentional resources to both components of the task and may have chosen to prioritize formulating their response and not so much conceptualizing. The participants in the simple condition expressed being overwhelmingly more concerned with formulating their response. For example, SR_04 said, “Here I was trying to figure out if it was an –ar verb or what kind of verb it was;” and SR_08 commented, “I couldn’t think what to say when I looked at the picture. I didn’t know how to complete the sentence. I knew what the sentence was saying but it was hard to think how to say something afterwards.” Therefore, it may be due to participants’ own decision to focus on formulating a response instead of figuring out the intent reasons for disconcerting behavior during the task that may explicate attenuated findings between both experimental conditions. Qualitative data suggests that learners in both groups were perhaps investing their attentional resources similarly, with some participants in the complex condition paying as much attention to the linguistic encoding of the message as participants in the noncomplex condition. This suggests that increasing cognitive demands on a CALL task and having learners encode a more complex preverbal message, as a product of conceptualizing, does not lead them necessarily to paying more attention to linguistic resources for encoding as the Cognition Hypothesis predicts, but rather that attentional resources are competing between conceptualizing and encoding. These findings align themselves with Skehan’s (2009) claims that due to learners’ limits on working
memory capacity as well as smaller and unorganized lexicon, they are unable to invest necessary attentional and memory resources to both conceptualizing and formulating L2 output.
5.2 Effects of Task Complexity on Written Production

Research Question #2 also asked if changing the cognitive demands of a task through intentional reasoning may have an effect on the accurate output of Spanish present subjunctive in adjectival relative clauses, but instead, on a written production assessment task. The data suggest that the noncomplex group was better during the written production task as evidenced by its superior performance on the delayed posttest and larger net gains. So, it seems that modality of the assessment task may have played a role on the performance for each group. This finding is surprising as previous studies suggest that L2 learners usually do better on written production tasks (e.g., Sanz, 1994). Sanz’s (1994) dissertation study tested the effects of processing instruction on multiple assessment measures by taking into account modality and task type. She found that participants were more accurate in producing direct object clitics on the written version of the tasks. The discrepancy between Sanz’s results and the ones in this study may be that Sanz’s treatment task that did not match the production assessment tasks in her study.

Therefore, the comparable performance of both groups on the oral production task but not on the written task is due to the matching between experimental condition and assessment. Both the treatment and the oral production tasks were bimodal in that participants both read and listened to the situations, and then had to produce their response orally based on a picture. However, for the written production task, the participants only were able to read the situations and had to write their response. Lightbown (2008) discusses Transfer Appropriate Processing (TAP) that proposes that learners activate their memory resources much better if the activation process mirrors that of the learning process, that is, the context of the retrieval process matches the encoding process of information. This idea has repercussions for language teaching, for example, since instructors should create learning environments that simulate communicative contexts that learners will confront when using their L2. This framework also assumes that
attention is limiting and that people are unable to encode every event that they are exposed to in a particular environment, but when retrieval conditions are similar to learning conditions, this seems to optimize retrieval processes. So, Lightbown claims, “…what matters most is not how we learned something in the first place, but whether the learning processes are easily transferred to the retrieval process and conditions.” (p. 31). Therefore, the results may differ since only the oral production assessment task mirrored the treatment condition, and not surprisingly, this was the assessment task in which both conditions rendered similar results. Interestingly, on the other hand, the participants in the noncomplex condition demonstrated superior performance on the written production task that required retrieving the use of the target form under a different condition. If learners under the noncomplex condition spent more time allocating their overt attention, as suggested by the stimulated recall data, to formulating their response and spending more effort on figuring out the use of the target form, this may have lead the learners to encode more instances of the target form in memory; and consequently, they were more able to transfer the knowledge to a different testing condition, especially from the pretest to delayed posttest since only the noncomplex condition performed better than the control group.
5.3 Effects of Task Complexity and Bilingual Experience

Prior language experience is viewed as an individual difference (Bowden, Sanz & Stafford, 2005) that mostly has related to how learners’ bilingual experience may play a role on the development of an additional language or L3. For example, some studies on L3 development have shown that biliteracy has a positive effect on L3 English (Sanz, 2000a), level of bilingualism correlates with proficiency levels of L3 Latin (Lado, 2008) and late bilinguals retain information more than early bilinguals (Stafford, Sanz & Bowden, 2010). However, the current study differs in that it examines the prior language experience of heritage bilinguals who are not learning an L3 but (re) learning their L1 that has not been completely acquired, has undergone attrition and/or has been affected by transfer of their dominant language --- in this case, English. Since no study has looked at the effects of task complexity on a HL population, a null hypothesis is assumed in the current study. However, the triple interaction and associated analysis suggest that in this study language experience plays a role in explaining the effects of the conditions as they are observed in participants’ enhanced ability to use the subjunctive.

Research has shown that even though the grammars of L2 and HL learners may show similarities, particularly in the area of morphosyntax, their experience and exposure to input differs (Montrul, 2008) and the explicitness of knowledge of the language also varies (Bowles, 2011). One of the differences in the results is that while HL and L2 learners showed comparable improvement in the oral production task, the HL learners lagged behind in the written production task by only improving from pretest to delayed posttest and showing smaller net gains than the L2 learners. The small effect size on the written assessment task corroborates with the results of Potowski, Jergeski and Morgan-Short (2009) who also found greater effect sizes for L2 learners in their interpretation and production tasks. However, the findings also show comparable effect sizes for the oral production task between both bilingual groups. The production task in the
Potowski and colleagues’ study was also in the written mode and they did not have an oral production task. Therefore, the results of the oral task can be attributed either to differences in modality or how the conditions for the oral assessment and treatment were matched, as argued earlier. HL learners’ experience with the language is mostly aural; and consequently, they tend to lack literacy skills in the HL, especially if their schooling is completed done in the L2 or dominant language (Montrul, 2008). This may explain why they did as well as the L2 learners on the oral production task. Additionally, the treatment task was bimodal, so the fact that the HL participants also listened to the prompts in the treatment may have provided them perhaps with an advantage. But, interestingly, the L2 learners’ performance on the oral task was not less superior even though they have less experience using the language in the oral mode. Again, this may due to the predictions of the Transfer Appropriate Processing (Lightbown, 2008), so it is not completely clear if the HL group’s performance is because of modality of assessment task or TAP or both.

Differences in type of knowledge developed as a result of interacting with +/- complex tasks were reported at the end of the study through the Exit Questionnaire. The findings are in line with Bowles’ (2011) study that found that HL participants performed better in less explicit tasks than their L2 counterpart; and thus, showing that HL learners have more implicit knowledge of their heritage language. One of the HL participants in the current study reported the following, “I learned that I can speak Spanish in my own domain but when asked a question either I know it or I don't. I can't explain why I just know it” while another participant said, “I learned that I need a lot of improving to do in my Spanish. I am currently learning the grammar rule in Spanish class; therefore, I cannot provide a rule yet.” The comments provided by the L2 learners were more explicit in nature; for example, one participant wrote, “I learned that when discussing something with certainty, or else referring to something in particular, to use the
indicative mood, but when unsure of something to express that uncertainty with the subjunctive.”

This study differs from Bowles (2011) however, in that she measured participants’ pre-existing knowledge of Spanish whereas the current study attempted to examine participant’s knowledge after being exposed to a treatment task with the target form; and interestingly, while the HL learners under the experimental conditions did better than the control groups after the one treatment session, the HL learners seem to have arrived to less explicit knowledge of the target form in comparison to the L2 group.

The results show that only the HL noncomplex condition outperformed the control, and for the written production task, the complex condition as well. As previously discussed, the stimulated recall data suggest that some L2 learners under the complex condition may have chosen to invest more attention to formulating their response and were more preoccupied with producing the correct grammatical form due to their explicit knowledge of the L2. If HL learners, as indicated by responses in the exit questionnaire, were not able to formulate a rule for the grammar they were learning, the participants in the complex condition may have not been able to deviate their attention from conceptualizing responses to formulating their responses and reflect on the verb choice in the same manner as some of the L2 learners appeared to do. In fact, this may not be surprising as stimulated recall comments from HL participants in Gass and Lewis’ (2007) study on perception of corrective feedback revealed that the HL group perceived more semantic feedback episodes. Although stimulated recall data was not collected from HL learners, a couple of the subjects reported learning the following as a result of the treatment task: (a) “I learned that even though we perceive a photo to mean something, we might not always give it the correct meaning;” (b) “How to find out what the problem was;” and (c) “to come up with answers that would best describe the pictures I was shown.” These comments represent how the HL participants may have focused more on the content component of the task and this ties to
their experience with the heritage language, that is, they use the language in communicative contexts to derive meaning and solve problems whereas L2 learners generally are exposed to metalinguistic information of the target language even if they learn Spanish following a communicative approach.

But, regardless of how the HL learners approached the task, the HL learners under the noncomplex condition were able to improve and use the target form in the study even when metalinguistic information was not part of the treatment task. As it was discussed in the literature review in chapter 2, the Cognition Hypothesis and Trade-Off Hypothesis are based on an information-processing model, particularly accepting the notion that attention is necessary for SLA to occur. Robinson’s proposal is based on directing attentional and memory resources during the completion of the task to promote “noticing” (Schmidt, 2000). However, Long’s (forthcoming) cognitive-interactionist proposal for Instructed Second Language Acquisition sets forth that attention is paramount for two different levels --- for noticing or awareness (e.g., Schmidt, 2000) and apperception as based on Gass (1997), for example. Apperception refers to the act of registering a stimulus in the environment without necessarily entering into an individual’s awareness, but nonetheless, requires some level of attention. N. Ellis (2005) claims that not noticing but attention is necessary for tallying a stimulus in the environment that may be processed into long-term memory while the individual is focused on the meaning of the input. Furthermore, according to N. Ellis, the strength of the associations in long-term memory of a particular stimulus is contingent on the number of tallies that the individual implicitly makes. Therefore, even though more qualitative data are needed to support this assumption, this may explain the HL learners’ performance on the assessment tasks. It may be that the HL learners under the noncomplex condition were better at tallying the number of instances of utilizing the target form as result of directing their attention more to formulating their response. So, the
noncomplex or simple condition could have promoted both HL and L2 learners’ attentional resources to the Formulator (i.e., encoding their response with linguistic information), but due to their different prior language experiences with Spanish, they differed on how they may have allocated their covert attention during task completion in the treatment.
5.4 Inhibitory Control and Bilingual Experience

Research Question #4 attempted to address if heritage early bilingual experience conferred superior inhibitory control abilities vis-à-vis L2 late bilinguals. The results from the Attentional Network Task (ANT) for conflict and cost as measures for inhibitory control reveal superior inhibitory control for the HL learners during the first block of the experiment, but only for conflict effects. The biodata demonstrates that they were quite comparable as far as computer and videogame use and none of the participants reported being diagnosed with Attention Deficit (Hyperactivity) Disorder --- all of these variables may potentially influence inhibitory control abilities. The analysis also controlled for socioeconomic status and only submitted the reaction times for participants who reported coming from a working class family, so that differences in SES was not a contributing factor. Both groups did differ, nevertheless, on age of onset for learning Spanish, proficiency level and use of Spanish, with the HL participants showing greater proficiency than the L2 learners, even though their proficiency levels fell short from Spanish native speakers or advanced heritage bilingual speakers.

The results marginally corroborate with the ones in Costa et al. (2008) since the current study utilized the same task (i.e., Attentional Network Task) they used, unlike the more frequent use of the Simon Task in Bialystok’s studies. As previously stated, the rationale for utilizing the ANT instead of the Simon Task is that the ANT may be a more robust measure of inhibitory control since the Simon task requires the participants to hold information in working memory unlike the ANT. The results are similar to Costa and colleagues’ in that the overpractice in the experiment may have attenuated the effects of the bilingual advantage by the last event block, and as Costa and colleagues argue, “… the advantage of bilinguals over monolinguals is more likely to be observed in conditions requiring high attentional control demands. That is, presumably, when the task is overpracticed, it recruits fewer attentional demands, and as a
consequence the effects of bilingualism are reduced.” (Costa et al., 2008, p. 79). However, the findings in the present study differ with the Costa et al., study in that the bilingual advantage seems to disappear a block sooner, that is, by block 2 unlike block 3 in their study; and also, no significant results were found for cost effects in the present study even though the descriptive data overall show an advantage for the HL participants in managing faster the switch cost effects.

Most studies on bilingualism and inhibitory control show a more pronounced advantage for both younger and older bilingual populations, and only a slight advantage for bilingual young adults who attend college (Bialystok, 2006). This “slight benefit” for young bilingual adults may be attributed, as some have suggested, to monolinguals’ sophisticated cognitive abilities as a result of peak brain development. This may explain how the non-early bilingual groups in both studies were able to perform equally as well by the end of the experiment. Therefore, the HL participants in this study were faster at suppressing the distracting information during the first block of the experiment when the task was new and the participants had not gotten a chance to practice and get better during the subsequent blocks. In the current study, the bilingual advantage was not as prominent as it was in the Costa and colleagues’ study given that the bilingual advantage seemed to fade away after the first block and no advantages for the HL participants were found for switching cost.

A potential explanation that may account for the differences between the early bilingual participants in both studies is the context in which their bilingual development occurred. First, Cataloina is a region in Spain where both Catalan and Spanish enjoy an important status making the region a true bilingual community in which its citizens utilize both languages in informal and formal contexts (Montrul, 2013). Sanz (2000a) reports how a linguistic policy of the 1980s instituted Catalan as a language of instruction with the goal of promoting students’ proficiency in both Spanish and Catalan upon completion of secondary education. It is no surprise that Costa et
al. (2008) report that their Catalan-Spanish speakers were educated in both languages and consistently exposed to both languages during an early age, and had native speaker proficiency in both languages, although the researchers do not say their instruments for measuring proficiency. In this study, the HL participants have a different bilingual profile since they all reported not studying in a bilingual education program, they use English much more than Spanish, and their proficiency levels did not reach a bilingual native or highly proficient level as evidenced by the self-proficiency ratings and the DELE test.

According to Cummin’s Threshold Hypothesis, only highly proficient bilinguals may reap from the cognitive benefits that are associated with being bilingual; and thus, promoting competence in both languages becomes paramount to reach this goal (Cummins, 1979). Along these lines, for example, Sanz (2007) argues that biliteracy, which would be considered a high threshold in Cummin’s hypothesis, is conducive to greater learning gains when acquiring a third language. This may also explain the results from the exploratory studies such as Stafford (2011) and Finger et al. (2011) that did not find any bilingual advantages for their early bilingual participants. However, the current study did find a glimpse of the bilingual advantage during that first block of the ANT, but this advantage was not sustained or seen in cost effects and it may be due to the proficiency level of the HL participants as a result of their reported use of Spanish that did not equate their greater English use and early schooling experience that did not support the maintenance and development of literacy skills in the heritage language. This may have consequences for superior inhibitory control skills for heritage language bilinguals who do not get substantive opportunities to exercise switching between both languages which seems to be the cause for promoting advantages in applying inhibitory control skills to non-linguistic cognitive tasks like the ANT. This being said, however, it seems also that the heritage language
bilingual experience of the current participants does not have detrimental effects on their cognitive outcomes either.
5.5 Inhibitory Control and Task Complexity

Research question #5 posits if individual differences in inhibitory control mediate the learning outcomes of participants in each task condition. The results from a correlation and linear regression analysis reveal that inhibitory control did not mediate learning outcomes in none of the task conditions; and therefore, the results do not support the predictions of the Cognition Hypothesis. The findings do not corroborate with studies as Niwa (2000), for example, that found that cognitive individual differences play a role in learning outcomes during a complex task. It did correspond partially with Kormos and Trebits (2011) who did not find benefits of higher working memory for the complex condition, although they did find that higher working memory capacity did correlate with greater production of complex clauses. Likewise, Baralt (2010) did not find support for working memory with the complex conditions in face-to-face or computer-mediated-communication conditions; in fact, working memory only influenced the simple face-to-face condition for the receptive assessment tasks. However, one potential explanation to account for the discrepancy of results for both studies is the different working memory capacity assessment instruments they implemented.

The findings of this study do go along with Linck and Weiss (2011) who also did not find inhibitory control to be a predictor of L2 development in a longitudinal study. It may be that inhibitory control just does not play a role in L2 development. To best of my knowledge, this was the second SLA study to examine specifically inhibitory control during learning outcomes. Unlike Linck and Weiss (2011), this study employed the ANT instead of the Simon task, and the participants have studied Spanish longer than the ones in Linck and Weiss study. Despite these two major differences between both studies, a role for inhibitory control was still not found. A reason for not finding a role for inhibitory control may be due to the task conditions for both studies. As previously stated, inhibitory control may be more pertinent when participants are
completing a difficult task as suggested by the results of both this study and Costa et al. (2008) when the non-early bilingual groups performed as well by the end of the experiment due to practice. In the Linck and Weiss study, the researchers gave the participants a version of the DELE test with only 20 test items for grammar and vocabulary and with no time pressure. Similarly, the participants in this study, who completed the treatment tasks, did not have any time pressure to complete the tasks and took as much time as needed. Although the independent measures of task complexity do indicate that the complex condition was more difficult than the noncomplex one, the stimulated recall data suggest that some of the participants in the complex condition may have opted to pay attention to aspects of formulating the response and not reasoning, if they deemed it more important.

Due to the autonomy of the learner in completing the complex task, this may have reduced pressure; and consequently, the participants did not need to access inhibitory control abilities when producing their responses. These results of these two studies differ from Linck, Hoshino and Kroll (2008) who found that individual differences in inhibitory control did play a role during an on-line picture-naming task in which the participants had to name as quickly as possible the picture they saw in their L2. Therefore, the picture-naming task required cognitive effort from the participants to suppress their L1 while completing the task, and this is more closely related to inhibitory control abilities as measured by the Simon and ANT, especially since they were instructed to do it quickly. Future research needs to examine different task learning conditions that may place more pressure on the learners to inhibit their L1 with the goal to determine if inhibitory control is an executive function that may play a role in L2 learning like working memory capacity, for example. Within the area of task studies, task complexity researchers should examine how inhibitory control plays a role during interactive complex tasks in which participants may feel more pressure to produce their responses; and, as a result, may
need to spend more cognitive resources at suppressing their L1 from interfering as a consequence of experiencing potential linguistic breakdown.
5.6 Inhibitory Control and HL/L2 Development

Research Question #6 sought to investigate if inhibitory control skills mediated learning outcomes differently for HL and L2 learners. Correlation and regression analyses were conducted and no significant findings were found for each group. One obvious reason for no findings is that the two groups of participants did not differ greatly on inhibitory control abilities except for the first block event of the ANT. Moreover, perhaps the task did not lend itself for learners to tap into their inhibitory control abilities. A more careful design of task conditions that would require participants to rely more on inhibitory control as well as a population of heritage language bilinguals who have superior inhibitory control abilities may be necessary to examine if the bilingual advantage would be beneficial for acquiring a HL or L3 for that matter. Also of theoretical importance for the field of heritage language acquisition is how other cognitive variables (e.g., working memory capacity) play a role in the re-learning of a heritage language.
5.7 Theoretical Implications

The findings of this study do not lend support for the predictions of the Cognition Hypothesis that increasing cognitive demands on tasks would lead to more grammatical accuracy given that the participants in the noncomplex or simple condition seemed to outperform and retain more information on the use of the target form than participants in the complex condition, especially when gains had to be transferred to a different task mode. This study lines itself more with studies that have not found empirical support for the Cognition Hypothesis on L2 development (e.g., Nuevo, 2006). Most of the studies that have found support for the Cognition Hypothesis have been related to testing L2 performance (e.g., Gilabert et al., 2009; Révész, 2011) during interaction, which may lead to L2 development as in the face-to-face group in Baralt (2010; forthcoming). However, interestingly, in the interactive computer-mediated-communication (CMC) version of the task, Baralt’s participants that were assigned to simple condition demonstrated superior performance than the complex group. The findings of Révész, Mika and Hama’s (in prep) study that implemented a monologic computerized task also do not support the predictions of the Cognition Hypothesis. In fact, the results do seem to support Skehan’s Trade-Off Hypothesis’ theoretical claims, that is, more attention resources need to be directed to the Formulator that is responsible for encoding linguistic data that entails the areas of complexity, accuracy and fluency during L2 speech production. More empirical research needs to pay more attention to examining delivery modes of tasks along with high and low levels of complexity to promote L2 performance and development. That is, future research may need to design parallel tasks that not only differ along complexity factors but also by condition (i.e., interactive versus monologic) to investigate more carefully interactions between task complexity and task conditions. The Cognition Hypothesis would need to address why increasing task
demands would lead to more L2 opportunities and potential development during interaction but not during computerized tasks, for instance.

Another issue raised in this study that needs further exploration, mostly due to the HL participants, and that may need theoretical consideration is the levels of attention. The Cognition Hypothesis makes claims for attention at the level of noticing (Schmidt, 2000), but does not mention attention at the level of apperception, for example, as Long (forthcoming) and N. Ellis (2005) claim. The HL participants in this study do not report any explicit knowledge of the target form, but do however show some learning gains, quantitative and qualitative differences did emerge as a result of the treatment tasks when compared to the L2 group. Furthermore, this would align the Cognition Hypothesis with the theoretical predictions of Long’s (forthcoming) cognitive-interactionist theory of Instructed SLA that highlights the role of the two levels of attention.

Although no theory or model of Heritage Language Acquisition is yet in place, this study supports the argument that SLA theoretical underpinnings and methodological considerations may provide insight into how HL learners may re-learn their HL as a result of their learning conditions and experience that leads their grammars to mirror closely that of L2 learners (Montrul, 2012). This is a good point of departure in order to amalgamate findings that will provide a window into the learning processes of this bilingual population with the aim to prescribe optimal learning and teaching conditions when possible. A theory of Heritage Language Acquisition would need to be two fold --- first, it would need to describe and explicate the early linguistic outcomes of HL speakers as already much research has begun to accomplish (Benmamoun, Montrul & Polinsky, 2010) and tie it to environmental factors and internal processes. Then, secondly, how that experience leads to (re)-learning the HL, particularly when the HL speakers have reached postpubertal age and the learning environment is manipulated. For
example, one of the predictions of Montrul (2008) is that HL learners will respond faster to re-exposure to the HL than L2 learners exposed for the first time.

The empirical evidence of this study does not support this prediction, as the HL learners in this study did not outperform the L2 learners. In fact, the L2 learners seem to have benefitted more from the treatment tasks. This may be due to the target form of the current study. If Spanish L1 acquisition studies suggest that the subjunctive mood is not stable in a monolingual Spanish speakers’ grammar until the age of schooling, it may be the case that the target form of the experiment may have never been acquired by the participants in this experiment leading to an example of incomplete acquisition. This would mean that no memory trace is available to the HL learner of the target structure, and hence, why they did not respond as quickly to the treatment. However, it is worthwhile to consider a target form that has undergone attrition and whether a memory trace is in the learner’s mind that would be triggered, and if it would result in faster learning. To address this issue, though, researchers in Heritage Language Acquisition have expressed a need to conduct longitudinal studies to document heritage language children’s learning patterns for different linguistic structures. This information can be useful and applicable in understanding the complexities of how various HL speakers’ linguistic profiles may play a role when examining re-learning dynamics. This is an example of how the learning experience of HL learners is important to consider and its potential influence when interacting with some type of pedagogical intervention.

Additionally, this study adds to the bilingual advantage literature, and how researchers need to examine a diverse profile of bilinguals to ascertain what aspects of the bilingual experience contribute to cognitive advantages in inhibitory control. In this study, only a mere advantage surfaced for this population of heritage bilinguals. The empirical evidence lends partial support to Cummin’s (1979) Threshold Hypothesis in that bilingual speakers must attain a
certain level of competence in both languages to enjoy the cognitive benefits of being bilingual. Also, it seems that the benefits of being bilingual are compounded by age effects. That is, the effects of bilingualism are attenuated when comparing college-aged early bilinguals to late L2 speakers as in the current study and Costa et al., (2008) since these young people are at their cognitive peak. It is worthwhile to conduct future studies with HL bilingual children and older adults in the United States to determine whether the cognitive benefits become more salient as some studies already suggest for bilinguals in other contexts (e.g., Martin-Rhee & Bialystok, 2008; Bialystok et al., 2008). In addition to age, more studies should examine carefully if the linguistic competence needed for advantages in inhibitory control is contingent on proficiency level and/or language use, and also of importance, why context of bilingualism matters. That being said, however, in the current study, the HL bilinguals were not at a cognitive disadvantage in comparison to the L2 learners despite their unbalanced proficiency between their dominant and heritage language. Thus, the HL experience in the United States does not have detrimental effects on cognitive capacity.
5.8 Methodological Implications

Within task-based language research, researchers have expressed the need to provide empirical evidence for testing constructs that are part of a research design, and in the case of the current study --- task complexity (e.g., Norris & Ortega, 2003; Révézsz, 2011). This study employed a quantitative and qualitative measure to provide evidence that the tasks under both conditions differed according to cognitive demands. Although questionnaires have been utilized in previous studies (e.g., Robinson, 2001b), in the current study, the questionnaire was designed to ask participants to rate specific components of the tasks. The Task Perception Questionnaire contained questions that were related to complexity issues, but some questions were general and pertained to non-complexity components that the complex and noncomplex task shared. Statistical analyses were run for both types of questions, and the results suggest that the participants in both conditions differed in their answers for the complexity questions, but not the general questions. This analysis provides evidence that the complex condition was indeed placing higher cognitive demands on its participants. Therefore, a recommendation for future design of questionnaires to measure task complexity should involve questions that deal with the differences in complexity between the task conditions as well as questions on components that the tasks share, and upon statistical analyses, researchers should only expect significant differences between the groups on questions related to complexity issues. As already recommended by Révézsz (2011), this study implemented the use of stimulated recall as an introspective method to provide qualitative independent evidence for task complexity. The stimulated recall comments did suggest that the participants in the complex group were involving the Conceptualizer as they were trying to figure out the intentions for the behavior of others. So, stimulated recall in this study was quite useful for investigating the thinking processes of the participants as well as how they were directing their overt attention during task completion. Due
to the nature of the task, it also revealed that some participants might have chosen to focus on aspects of the task that they wished instead of following the goals of the task. Furthermore, if one of the tenets of the Cognition Hypothesis and the Trade-Off Hypothesis is based on the demands that tasks place on attentional resources, it may be recommendable that researchers attempt to look into how learners are allocating their attention while completing a task.
5.9 Pedagogical Implications

The findings of this study suggest that careful design of communicative tasks with the intervention of a focus on form technique such as recasts may lead to learning gains which is one of the underpinnings of Task-Based Language Teaching framework (Long, forthcoming). It also supports one of Long’s methodological principles of utilizing task as an instructional unit of analysis (Long, 2009). Another characteristic of the current study is that no metalinguistic information of the target form was presented to the learners, and yet, the participants outperformed the control group, and these findings go along with Sanz and Morgan-Short (2004), for example, that also found that metalinguistic information was not necessary when learners are engaged in meaningful tasks. Although this is not to suggest that teachers should not teach metalinguistic information to their students, teachers should be cognizant of how much class time and the weight placed to teaching metalinguistic information of linguistic structures.

Another finding to consider is choosing appropriate teaching methods for HL learners in our classrooms. This study suggests that they are capable of learning, but it seems that they differ slightly to our L2 learners on the type of knowledge they arrive to as well as how the modality of assessments may play a role in the manner they respond to pedagogical interventions. Of course, this is limited to the conditions of this study, so the field of HL teaching needs more research that will shape how instructors can provide an optimal learning environment for HL learners. Most importantly, however, the understanding of HL learners’ linguistic profiles and experiences are paramount to design effective curriculum and instruction given the heterogeneity of the population. Finally, due to HL learners’ linguistic and cognitive outcomes that seem to fall short from bilinguals in other contexts, early bilingual education may be essential in helping these learners maintain and reach higher proficiency levels in their heritage language as well as benefit from the cognitive advantages associated with bilingualism. Finally, this study contributes to the
literature on the use of computerized language learning tasks (CALL) as another pedagogical tool for students to learn a foreign/second language.
5.10 Limitations and Future Research

As with any empirical study, this one also has its limitations and the results need to be taken with caution, as more studies are needed to replicate its findings. First, the number of participants was low, especially with the HL group. Although more HL participants were tested, many were disqualified since they had previous knowledge of the target form. Second, the HL and L2 groups were not comparable as far as proficiency levels. One of the goals of this study was to compare HL learners vis-à-vis L2 learners to ascertain differences and similarities in their learning, so future studies may want to match both populations as closely as possible on proficiency levels since this may be a contributing confound to the results. Third, a potential caveat is that although the treatment tasks were bimodal, the delivery of recasts was only in a written form and the participants had to read them out loud. This may have put the HL learners at a disadvantage since their learning experience of the HL is more aural. Fourth, the researcher was unable to recruit HL participants to complete the stimulated recall session, and this may have provided stronger evidence for how the HL learners were thinking and allocating attention during the completion of the tasks.

Future research on the Cognition Hypothesis needs to address more carefully the issue of task conditions and maybe investigate parallel tasks that differ not only on task complexity, but also on monologic versus interactive. Studies also need to make an effort to include qualitative measures of task complexity through online and offline introspective methods, for instance, to gather more insight into how participants are allocating their attention and their thinking processes when completing the tasks and responding to feedback that also serves as input. Based on the types of knowledge of the HL learners at the end of this research project, future studies should investigate the learning processes of these learners --- whether or not they prefer to process target forms implicitly versus explicitly taking into account their learning profiles. That is,
if HL learners are paying more attention to content and less to form while completing a task. Also of importance is to test heritage language bilinguals at different proficiency levels, including those who may have studied in a dual language immersion program to see what cognitive effects are found due to having more opportunities to use and acquire literacy skills in the heritage language.
5.11 Conclusions

This study sought to investigate how task-based approaches that differ in complexity design may have a different impact on the Spanish development of HL and L2 learners of Spanish. The study also looked at how their bilingual experiences may shape their inhibitory control abilities and how these may play a role in mediating their learning processes. Overall, the results suggest that task-based approaches are effective for both populations. It appears that monologic computerized tasks manipulated for simpler cognitive demands promote development and retention of accurate use of the Spanish subjunctive in adjectival clauses contra to the predictions of the Cognition Hypothesis. The evidence suggests that the effects vary based on the learners’ prior language experience, as learning outcomes related to type of knowledge and performance on different task modes differ between HL and L2 learners. It was expected that these differences in outcomes would be explained by individual differences, specifically, in inhibitory control as measured by the ANT. However, inhibitory control abilities did not play a role in learning outcomes, as HL and L2 learners showed comparable ability to suppress distracting information as a consequence of HL specific bilingual experience and the privileged cognitive benefit of a college-aged population.
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APPENDIX A

Georgetown University Institutional Review Board

Date: February 23, 2012

To: Julie Torres, PhD Candidate
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From: David Blanco
   Institutional Review Board

Title: Heritage and Second Language Learners of Spanish: The Roles of Task Complexity and Inhibitory Control

IRB#: 2012-076

Annual Approval Date: February 10, 2012

Expiration Date: February 9, 2013

Action: Approved as submitted
   Expedited Initial Review
   C-1 form signed 1/10/12
   C-3 form signed 2/17/12 (category 7a)
   Study ICF
   Oral and Written Production Tasks
   Aural Grammaticality Judgment Task
   Bilingualism, Tasks & Inhibitory Control
   DELE Proficiency Test
   Computerized study task printout
   Task perception questionnaire
   Language Background questionnaire
   HVS questionnaire
   Torre: SSD, CV, Human subjects protection training

Your above-referenced protocol and consent form were approved through expedited review by Dr. Robert J. Bics, the IRB Chair or a designee, on February 17, 2012.

This is to inform you that you may commence your project. Approval for this study is through February 9, 2013.

When consenting participants, please be sure to use only the most recent version of the informed consent form that is stamped by the IRB with the current approval and expiration dates.

This study will automatically become inactive when its approval expires on February 9, 2013 unless a continuing review submission for the study is received and approved by the IRB before that date. The IRB requires that you submit an application for annual renewal at the end of each approval period and/or at study completion. It is the PI's responsibility to submit the application for annual renewal and the appropriate IRB forms at least one month before the expiration date.

Medical-Dental Building, SW 104, 2500 Reservoir Road NW, Washington DC 20057
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APPENDIX B

Task Perception Questionnaire +C

1. Participant number

Read the following questions that will ask you to rate the difficulty of the different components of the task, 6 being the “most difficult,” and 1 “not difficult at all.” For some of the questions, an image from the task will be provided to remind you of the task.

2. Rate your overall impression of the task.

☐ 6 most difficult
☐ 5
☐ 4
☐ 3
☐ 2
☐ 1 not difficult at all

Use this image to answer question 3.

Unas estudiantes tocan música demasiado alta.

Las estudiantes **desean** escuchar música alta que...

A. [Image]

B. [Image]

C. [Image]

D. [Image]

Respuestas correctas:
Foto: C
verbo: **las anima a**

☐ las anima a...

☐ las anime a...

Submit

3. Rate specifically the part when you had to produce the Spanish sentence.

☐ 6 most difficult
☐ 5
☐ 4
☐ 3
☐ 2
☐ 1 not difficult at all
Use this image for question 4.

La Dra. López te dice......

Unas estudiantes tocan música demasiado alta.

4. Rate the sections of reading and listening to the scenarios.
   - 6 most difficult
   - 5
   - 4
   - 3
   - 2
   - 1 not difficult at all

Image for Question 5
5. Rate the part of looking at the photo section when producing your cause in Spanish.
   ○ 6 most difficult
   ○ 5
   ○ 4
   ○ 3
   ○ 2
   ○ 1 not difficult at all

6. Rate your coming up with Spanish words when producing your sentence.
   ○ 6 most difficult
   ○ 5
   ○ 4
   ○ 3
   ○ 2
   ○ 1 not difficult at all

**Image for question 7**

**Instructions - Part 1**

1. You will see a picture and hear a Spanish sentence from Dra. López. The sentence and picture describe the behavior in the dorm.

2. You will see a second slide with the resident director icon (to your right) and a thought bubble.

   The thought bubble presents your immediate reaction (in Spanish) to the behavior presented on the previous slide.

   Your immediate reaction is based on whether you know the reason or not for the behavior. For some you will be certain while for others you will not be certain.

3. You will come to a third slide in which you will see and hear a written Spanish clause that begins to describe the reason for the behavior.

   Continue............

7. Rate your reading and understanding of the instructions for the task.
   ○ 6 most difficult
   ○ 5
   ○ 4
   ○ 3
   ○ 2
   ○ 1 not difficult at all
8. Rate your understanding of the first part of the clause provided to you to produce your Spanish sentence.

- 6 most difficult
- 5
- 4
- 3
- 2
- 1 not difficult at all

9. Rate your understanding of the feedback on the photo and verb selection.

- 6 most difficult
- 5
- 4
- 3
- 2
- 1 not difficult at all

10. Rate your ability to simultaneously figure out the reason for the behavior and produce your Spanish sentence.

- 6 most difficult
- 5
- 4
- 3
- 2
- 1 not difficult at all

11. Rate your understanding of the vocabulary words used in the scenarios.

- 6 most difficult
- 5
- 4
- 3
- 2
- 1 not difficult at all
APPENDIX C

Task Perception Questionnaire -C

1. Participant Number

Read the following questions that will ask you to rate the difficulty of the different components of the task, 6 being the "most difficult" and 1 "not difficult at all." For some of the questions, an image from the task will be provided to remind you of the task.

2. Rate your overall impression of the task.
   - 6 most difficult
   - 5
   - 4
   - 3
   - 2
   - 1 not difficult at all

Use this image for question 4.

La Dra. López te dice......

Unas estudiantes tocan música demasiado alta.

4. Rate the sections of reading and listening to the scenarios.
   - 6 most difficult
   - 5
   - 4
   - 3
   - 2
   - 1 not difficult at all
5. Rate the part of looking at the photo section when producing your reason in Spanish.

- 6 most difficult
- 5
- 4
- 3
- 2
- 1 not difficult at all

6. Rate your coming up with Spanish vocabulary words when producing your sentences.

- 6 most difficult
- 5
- 4
- 3
- 2
- 1 not difficult at all

Image for question 7

Instructions - Part 1

1. You will see a picture and hear a Spanish sentence from Dra. López. The sentence and picture describe the behavior in the dorm.

2. You will see a second slide with the resident director icon (to your right) and a thought bubble.

   The thought bubble presents your immediate reaction (in Spanish) to the behavior presented on the previous slide.

   Your immediate reaction is based on whether you know the reason or not for the behavior. For some you will be certain while for others you will not be certain.

3. You will come to a third slide in which you will see and hear a written Spanish clause that begins to describe the reason for the behavior.

Continue..........
7. Rate your reading and understanding of the instructions for the task.
   - 6 most difficult
   - 5
   - 4
   - 3
   - 2
   - 1 not difficult at all

Image for question 8

La estudiante siempre va a fiestas que...

8. Rate your understanding of the first part of the clause provided to you to produce your Spanish sentence.
   - 6 most difficult
   - 5
   - 4
   - 3
   - 2
   - 1 not difficult at all

Image for question 9

Respuestas Correctas:
Foto: A
Verbo: sirven

9. Rate your understanding of the feedback on the photo and verb selection.
   - 6 most difficult
   - 5
   - 4
   - 3
   - 2
   - 1 not difficult at all
10. Rate your ability to simultaneously figure out the reason for the behavior and produce your Spanish sentence.
   - 6 most difficult
   - 5
   - 4
   - 3
   - 2
   - 1 not difficult at all

11. Rate your understanding of the vocabulary words used in the scenarios.
   - 6 most difficult
   - 5
   - 4
   - 3
   - 2
   - 1 not difficult at all
APPENDIX D

PARTICIPANT #__________   Sex:    M   F   (Circle one)
AGE: ___________   Number of years living in the United States __________

Answer the following questions to the best of your ability.

1. At what age did you begin learning Spanish? (for example: from birth or age 5)
   
2. At what age did you begin learning English? (for example: from birth or age 5)
   
3. Did you start school in the United States?  Circle one:  YES     NO
   
4. Have you studied in a Spanish-speaking country? (e.g., Puerto Rico, Mexico)
   Circle one: YES   NO
   
   If you answer YES.... What country? _____________________ From age _________ to age _________

5. Have you studied in a bilingual education, immersion or dual language program (a school where you learned Spanish and English at the same time)?  Circle one:  YES   NO
   
   If you answered YES.... Which grades? ______________

6. Do you study Spanish in school now?  Circle one:  YES     NO
   
   Have you studied Spanish in the past?  Circle one: YES     NO
   
   If you answer YES, please write how many academic years you have been studying Spanish: _______

7. If you study Spanish, write briefly your main reason for studying Spanish.

8. Do you both of your parents or caregivers work?  Circle on:  YES NO
   or only one of them? Circle one: YES   NO
   
   If you answer YES, please write the profession of your parents/caretakers:
   
   Parent/Caretaker #1: ______________________________
   
   Parent/Caretaker #2: ______________________________

9. What generation are you in the United States (1st, 2nd, 3rd)? ________
10. Do you travel to your family’s home country? **YES**  **NO**  
*If YES*, how often: _____________________  For how long? ____________________

11. Mark an X for the language(s) you used most in the following periods of your life:

<table>
<thead>
<tr>
<th>AGE</th>
<th>SPANISH</th>
<th>ENGLISH</th>
<th>BOTH SPANISH &amp; ENGLISH</th>
<th>OTHER LANGUAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5 yrs. old</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-12 yrs. old</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-18 yrs. old</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18+ yrs. old</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. Rate your proficiency in Spanish and English (speaking, reading, writing, listening) according to the following scale (write the number next to each skill):

- **6 = NATIVE FLUENCY**
- **5 = NEAR (ALMOST) NATIVE FLUENCY**
- **4 = ADVANCED FLUENCY**
- **3 = INTERMEDIATE FLUENCY**
- **2 = BASIC FLUENCY**
- **1 = BEGINNING FLUENCY**

<table>
<thead>
<tr>
<th>SPANISH</th>
<th>ENGLISH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speaking</td>
<td>Speaking</td>
</tr>
<tr>
<td>Reading</td>
<td>Reading</td>
</tr>
<tr>
<td>Writing</td>
<td>Writing</td>
</tr>
<tr>
<td>Listening</td>
<td>Listening</td>
</tr>
</tbody>
</table>

13. Read the following statements and circle the response that appropriate for you.

a. Knowing Spanish is an important part of who I am.
   - STRONGLY AGREE  AGREE  DISAGREE  STRONGLY DISAGREE

b. Knowing Spanish is useful.
   - STRONGLY AGREE  AGREE  DISAGREE  STRONGLY DISAGREE

c. Knowing Spanish made school more enjoyable.
   - STRONGLY AGREE  AGREE  DISAGREE  STRONGLY DISAGREE

d. Knowing Spanish has helped me make friends.
   - STRONGLY AGREE  AGREE  DISAGREE  STRONGLY DISAGREE
e. Knowing Spanish is a valuable skill.

STRONGLY AGREE   AGREE   DISAGREE   STRONGLY DISAGREE

f. Knowing Spanish is a necessary skill.

STRONGLY AGREE   AGREE   DISAGREE   STRONGLY DISAGREE

g. Knowing Spanish at times is embarrassing.

STRONGLY AGREE   AGREE   DISAGREE   STRONGLY DISAGREE

h. Knowing Spanish has been a barrier to learning English.

STRONGLY AGREE   AGREE   DISAGREE   STRONGLY DISAGREE

i. Knowing Spanish has made school more challenging.

STRONGLY AGREE   AGREE   DISAGREE   STRONGLY DISAGREE

j. Knowing Spanish has made school less enjoyable.

STRONGLY AGREE   AGREE   DISAGREE   STRONGLY DISAGREE

k. Knowing Spanish had made it difficult to make friends.

STRONGLY AGREE   AGREE   DISAGREE   STRONGLY DISAGREE

II.

Please answer the following questions about your daily language use. Circle each answer.

For English:

1. I speak English with my parents or caretakers……

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

2. I speak English with my brothers and sisters……

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

3. I speak English with my relatives (cousins, uncles, grandparents)……

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

4. I speak English with my friends at school……

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY
5. I speak English with my friends in my neighborhood….

   ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

6. I speak English with my teachers….

   ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

7. I speak English to the school staff….

   ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

8. I speak in English in my community (grocery stores, mall, supermarket, church, community center)….

   ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

9. I write in English at school….

   ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

10. I write in English (notes, e-mails, text messages, chat) at home….

    ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

11. I write in English at work….

    ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

12. I read in English at school….

    ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

13. I read in English at home….

    ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

14. I read in English at work….

    ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

15. I listen to English at school….

    ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

16. I listen to English at home….

    ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY
17. I listen to English at work….

| ALWAYS | FREQUENTLY | SOMETIMES | RARELY | NEVER | DOESN’T APPLY |

18. I watch T.V. in English….

| ALWAYS | FREQUENTLY | SOMETIMES | RARELY | NEVER | DOESN’T APPLY |

19. I listen to music in English….

| ALWAYS | FREQUENTLY | SOMETIMES | RARELY | NEVER | DOESN’T APPLY |

20. I watch movies in English….

| ALWAYS | FREQUENTLY | SOMETIMES | RARELY | NEVER | DOESN’T APPLY |

*For Spanish:*

1. I speak Spanish with my parents or caretakers……

| ALWAYS | FREQUENTLY | SOMETIMES | RARELY | NEVER | DOESN’T APPLY |

2. I speak Spanish with my brothers and sisters……

| ALWAYS | FREQUENTLY | SOMETIMES | RARELY | NEVER | DOESN’T APPLY |

3. I speak Spanish with my relatives (cousins, uncles, grandparents)….

| ALWAYS | FREQUENTLY | SOMETIMES | RARELY | NEVER | DOESN’T APPLY |

4. I speak Spanish with my friends at school….

| ALWAYS | FREQUENTLY | SOMETIMES | RARELY | NEVER | DOESN’T APPLY |

5. I speak Spanish with my friends in my neighborhood….

| ALWAYS | FREQUENTLY | SOMETIMES | RARELY | NEVER | DOESN’T APPLY |

6. I speak Spanish with my teachers….

| ALWAYS | FREQUENTLY | SOMETIMES | RARELY | NEVER | DOESN’T APPLY |

7. I speak Spanish to the school staff….

| ALWAYS | FREQUENTLY | SOMETIMES | RARELY | NEVER | DOESN’T APPLY |
8. I speak in English in my community (grocery stores, mall, supermarket, church, community center)....

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

9. I write in Spanish at school....

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

10. I write in Spanish (notes, e-mails, text messages, chat) at home....

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

11. I write in Spanish at work....

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

12. I read in Spanish at school....

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

13. I read in Spanish at home....

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

14. I read in Spanish at work....

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

15. I listen to Spanish at school....

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

16. I listen to Spanish at home....

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

17. I listen to Spanish at work....

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

18. I watch T.V. in Spanish....

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

19. I listen to music in Spanish....

ALWAYS   FREQUENTLY   SOMETIMES   RARELY   NEVER   DOESN’T APPLY

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20. I watch movies in Spanish….

ALWAYS FREQUENTLY SOMETIMES RARELY NEVER DOESN’T APPLY

21. When I speak to my parents/caretakers, I switch between Spanish and English….

ALWAYS FREQUENTLY SOMETIMES RARELY NEVER DOESN’T APPLY

22. When I speak to my siblings, I switch between Spanish and English….

ALWAYS FREQUENTLY SOMETIMES RARELY NEVER DOESN’T APPLY

23. When I speak to my friends/peers, I switch between Spanish and English….

ALWAYS FREQUENTLY SOMETIMES RARELY NEVER DOESN’T APPLY

24. When I speak to my teachers, I switch between Spanish and English….

ALWAYS FREQUENTLY SOMETIMES RARELY NEVER DOESN’T APPLY

25. When I speak to members in the community (stores, supermarket, church), I switch between Spanish and English….

ALWAYS FREQUENTLY SOMETIMES RARELY NEVER DOESN’T APPLY

26. When I speak to the staff at school, I switch between Spanish and English….

ALWAYS FREQUENTLY SOMETIMES RARELY NEVER DOESN’T APPLY

27. I feel more comfortable speaking with people who can switch between Spanish and English….

ALWAYS FREQUENTLY SOMETIMES RARELY NEVER DOESN’T APPLY
APPENDIX E

Exit Questionnaire

I. Participant Number: __________

A. Computer Use. Please answer the following questions as accurately as possible.

1. How many hours per day do you spend on a computer? ________________

2. Can you type proficiently, without looking at the keyboard? YES  NO

3. Have you been diagnosed with ADD or ADHD??? YES  NO

B. Please rate the how often you do the following activities. Please circle your answer.

1. I use the computer for word processing (typing word documents)….  
   ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

2. I e-mail….  
   ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

3. I surf the web….  
   ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

4. I play with graphics in the computer….  
   ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

5. I use photoshop….  
   ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

6. I chat on the computer….  
   ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

7. I use skype or other phone internet applications….  
   ALWAYS  FREQUENTLY  SOMETIMES  RARELY  NEVER  DOESN’T APPLY

C. Videogames

Do you play videogames? Circle one: YES  NO

If you answer YES…. answer the following question:
8. I play videogames….

<table>
<thead>
<tr>
<th>ALWAYS</th>
<th>FREQUENTLY</th>
<th>SOMETIMES</th>
<th>RARELY</th>
<th>NEVER</th>
<th>DOESN’T APPLY</th>
</tr>
</thead>
</table>

II.

1. Can you explain what you learned while solving the task of the dorm? Can you provide some type of rule for the grammar?

2. Did you look up information between sessions on the grammatical construction that you thought you were learning?

3. What are your overall comments of the task? Was it motivating/engaging? Why or why not?
APPENDIX F

DELE Proficiency Test

Multiple Choice Test

Each of the following sentences contains a blank indicating that a word or phrase has been omitted. Select the choice that best completes the sentence.

1. Al oír del accidente de su buen amigo, Paco se puso _________.
   a. alegre  b. fatigado  c. hambriento  d. desconolado

2. No puedo comprarlo porque me___________.
   a. falta  b. dan  c. presta  d. regalan

3. Tuvo que guardar cama por estar _________.
   a. enfermo  b. vestido  c. ocupado  d. parado

4. Aquí está tu café, Juanito. No te quemes, que está muy _________.
   a. dulce  b. amargo  c. agrio  d. caliente

5. Al romper los anteojos, Juan se asustó porque no podía ________ sin ellos.
   a. discurrir  b. oír  c. ver  d. entender

6. ¡Pobrecita! Está resfriada y no puede _________.
   a. salir de casa  b. recibir cartas  c. respirar con pena  d. leer las noticias

7. Era una noche oscura sin _________.
   a. estrellas  b. camas  c. lágrimas  d. nubes

8. Cuando don Carlos salió de su casa, saludó a un amigo suyo: -Buenos días,_____.
   a. ¿Qué va?  b. ¿Cómo es?  c. ¿Quién es?  d. ¿Qué tal?

9. ¡Qué ruido había con los gritos de los niños y el _________. de los perros!
   a. olor  b. sueño  c. hambre  d. ladrar

10. Para saber la hora, don Juan miró el _________.
11. Yo, que comprendo poco de mecánica, sé que el auto no puede funcionar sin _.
   a. permiso   b. comer   c. aceite   d. bocina

12. Nos dijo mamá que era hora de comer y por eso _____________.
   a. fuimos a nadar   b. tomamos asiento   c. comenzamos a fumar   d. nos acostamos pronto

13. ¡Cuidado con ese cuchillo o vas a ____________ el dedo!
   a. cortarte   b. torcerte   c. comerte   d. quemarte

14. Tuvo tanto miedo de caerse que se negó a ____________ con nosotros.
   a. almorzar   b. charlar   c. cantar   d. patinar

15. Abrió la ventana y miró: en efecto, grandes lenguas de ______ salían llameando de las casas.
   a. zorros   b. serpientes   c. cuero   d. fuego

16. Compró ejemplares de todos los diarios pero en vano. No halló _____________.
   a. los diez centavos   b. el periódico perdido   c. la noticia que deseaba   d. los ejemplos

17. Por varias semanas acudieron colegas del difunto profesor a __________ el dolor de la viuda.
   a. aliviar   b. dulcificar   c. embromar   d. estorbar

18. Sus amigos pudieron haberlo salvado pero lo dejaron _____________.
   a. ganar   b. parecer   c. perecer   d. acabar

19. Al salir de la misa me sentía tan caritativo que no pude menos que __________ a un pobre mendigo que había allí sentado.
   a. pegarle   b. darle una limosna   c. echar una mirada   d. maldecir

20. Al lado de la Plaza de Armas había dos limosneros pidiendo _____________.
   a. pedazos   b. paz   c. monedas   d. escopetas

21. Siempre maltratado por los niños, el perro no podía acostumbrarse a ________ de sus nuevos amos.
a. las caricias  b. los engaños  c. las locuras  d. los golpes

22. ¿Dónde estará mi cartera? La dejé aquí mismo hace poco y parece que el necio de mi hermano ha vuelto a ________.
   a. dejármela  b. deshacérmela  c. escondérmela  d. acabármela

23. Permaneció un gran rato abstraído, los ojos clavados en el fogón y el pensamiento ________ ________.
   a. en el bolsillo  b. en el fuego  c. lleno de alboroto  d. Dios sabe dónde

24. En vez de dirigir el tráfico estabas charlando, así que tú mismo __________ del choque.
   a. sabes la gravedad  b. eres testigo  c. tuviste la culpa  d. conociste a las víctimas

25. Posee esta tierra un clima tan propio para la agricultura como para ________.
   a. la construcción de trampas  b. el fomento de motines  c. el costo de vida  d. la cría de reses

26. Aficionado leal de obras teatrales, Juan se entristeció al saber __________ del gran actor.
   a. del fallecimiento  b. del éxito  c. de la buena suerte  d. de la alabanza

27. Se reunieron a menudo para efectuar un tratado pero no pudieron ________.
   a. desavenirse  b. echarlo a un lado  c. rechazarlo  d. llevarlo a cabo

28. Se negaron a embarcarse porque tenían miedo de ________.
   a. los peces  b. los naufragios  c. los faros  d. las playas

29. La mujer no aprobó el cambio de domicilio pues no le gustaba ________.
   a. el callejeo  b. el puente  c. esa estación  d. aquel barrio

30. Era el único que tenía algo que comer pero se negó a __________.
   a. hojearlo  b. ponérselo  c. conservarlo  d. repartirlo

**Cloze Test**

In the following text, some of the words have been replaced by blanks numbered 1 through 20. First, read the complete text in order to understand it. Then reread it and choose the correct word to fill each blank.
El sueño de Joan Miró

Hoy se inaugura en Palma de Mallorca la Fundación y Museo Joan Miró, en el mismo lugar donde el artista vivió sus últimos treinta y cinco años. El sueño de Joan Miró se ha realizado con los fondos donados a la ciudad por el pintor y su esposa en 1981. En 1986, el Ayuntamiento de Palma de Mallorca decidió construir un edificio que albergue tanto la sede de la entidad como el museo moderno. El proyecto ha tenido que afrontar múltiples obstáculos de carácter administrativo. Miró, coincidiendo con los deseos de toda su familia, quiso que su obra no quedara expuesta en museos ampulosos ni en los panteones de arte o en manos de coleccionistas acaudalados; por ello, en 1981, creó la fundación mallorquina. Y cuando estaba a punto de morir, donó terrenos y edificios, así como las obras de arte que en ellos se encontraban.

El edificio que ha construido Rafael Moneo se denomina “Territorio Miró”, espacio en el que se han situado los distintos edificios que constituyen la herencia del pintor. El acceso a los mismos quedará protegido para evitar el deterioro de las obras. Por otra parte, se organizan talleres de grabado y litografía, cursos de las distintas técnicas de estampación. Estos talleres también se cederán periódicamente a distintos artistas contemporáneos, se busca que el “Territorio Miró” sea un centro vivo de creación y difusión del arte a todos los niveles.

La entrada costará 500 pesetas y las previsiones dadas a conocer ayer aspiran a que el centro acoja a unos 150.000 visitantes al año. Los responsables esperan que la institución funcione a rendimiento a principios de la próxima semana, si bien el catálogo completo de las obras de la Fundación Pilar y Joan Miró no estará listo hasta dentro de dos años.
APPENDIX H

Both Complex and Noncomplex Groups

SLIDE 1

La Dra. López te dice......

Una estudiante siempre llega borracha al dormitorio.

SLIDE 2

Ah sí... sé muy bien la razón.....
La estudiante siempre va a fiestas que...
APPENDIX I

STIMULATED RECALL PROTOCOL

Instructions for Participants:

Thank you for completing the task. Now we’re going to watch the video of you completing the task. I am interested in what you were thinking at the time you were producing your response. On the video, we can hear and see what you were saying but I cannot tell what you were thinking. So, I would like you to tell me what you were thinking, what was in your mind at that time while you were producing your sentence.

I’m particularly interested in the times you were having difficulty with producing your response. Therefore, I’m going to let you pause the video when you were having difficulty in producing your response and share what was going through your mind at that moment. If I have a question about what you were thinking as the video is playing, then I’ll pause the video to ask about what you were thinking. Do you have any questions?

Instructions for Researcher:

1. Read the instructions to the participant. Allow the participant to ask questions pertaining to completing the Stimulated Recall task.

2. Model what the participants should do. Allow the participant to ask questions again.

3. Allow the participant to stop the video and speak. Listen to what s/he is saying.

4. If the researcher stops the video, ask something general like the following:
   
   What was going through your mind at that moment?
   
   I see you’re confused/frustrated saying something there, what were you thinking then?

5. The researcher will pause the video, if the participants show any of the following signs of: pausing, difficulty in producing the answer, making corrections to their utterances, repeating/changing their answers, frustration…

5. If the participant says, “I don’t remember” to a prompt, the researcher does not ask any further questions and moves on.

6. The researcher should not give any reaction nor engage in a conversation with the participant about what s/he is recalling. After the participant has given her/his response, the researcher should say, “Ok. Let’s move on.”
APPENDIX J

Oral Production Task --- VERSION A

Version A

Experimental Items

<table>
<thead>
<tr>
<th>Contextual Sentence</th>
<th>Sentence to Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No estoy seguro si hay en su zona</td>
<td>Mi tío quiere una esposa que...</td>
</tr>
<tr>
<td>2. Sí, sé que hay esos deportes</td>
<td>En el gimnasio hacemos deportes que...</td>
</tr>
<tr>
<td>3. No sé si tienen pandas en el zoológico</td>
<td>Mi sobrina aprecia pandas en el zoológico que...</td>
</tr>
<tr>
<td>4. Sí, conozco sus libros</td>
<td>Lucía vende sus libros que...</td>
</tr>
<tr>
<td>5. No sé si hay en la compañía</td>
<td>Necesitas un empleado que...</td>
</tr>
<tr>
<td>6. No sé si hay estas obras de arte</td>
<td>Preferimos ir a museos que...</td>
</tr>
<tr>
<td>7. Sí, conozco a esos meseros</td>
<td>Mis padres buscan los mismos meseros que...</td>
</tr>
<tr>
<td>8. No sé si tenemos en la ciudad</td>
<td>Mis amigas buscan una zapatería que...</td>
</tr>
<tr>
<td>9. Sí, conozco a su compañera de cuarto</td>
<td>Su amiga tiene una compañera de cuarto que...</td>
</tr>
<tr>
<td>10. Sí, sé muy bien sus preferencias de comida</td>
<td>Mi novio prefiere comidas que...</td>
</tr>
<tr>
<td>11. No sé cómo son sus cenas</td>
<td>Felipe hará cenas que no...</td>
</tr>
<tr>
<td>12. Sí, sé lo que compra para dormir</td>
<td>Mi mejor amigo compra camas que...</td>
</tr>
</tbody>
</table>

Distractor Items

<table>
<thead>
<tr>
<th>Contextual Sentence</th>
<th>Sentence to Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No sé si es la razón.</td>
<td>Joaquín es deportista. Pienso que...</td>
</tr>
<tr>
<td>2. Sí, esto ocurrió el mes pasado</td>
<td>Barbara y Juan...</td>
</tr>
<tr>
<td>3. No sé por qué</td>
<td>Es probable que los muchachos...</td>
</tr>
<tr>
<td>4. Sí, esto es para mañana</td>
<td>Mis amigos y yo</td>
</tr>
<tr>
<td>5. No estoy seguro</td>
<td>No creemos que los políticos que no...</td>
</tr>
<tr>
<td>6. Sí, sé la razón</td>
<td>Gustavo no fue a la fiesta porque...</td>
</tr>
<tr>
<td>7. Sí, para el próximo año</td>
<td>Mi novia y yo...</td>
</tr>
<tr>
<td>8. No sé muy bien</td>
<td>Estos estudiantes no...</td>
</tr>
<tr>
<td>9. Sí, sé muy bien</td>
<td>Todas las semanas las familias...</td>
</tr>
<tr>
<td>10. No sé la razón</td>
<td>Ella duda que la sala...</td>
</tr>
<tr>
<td>11. Sí, sé muy bien</td>
<td>La profesora fue a un congreso ayer y...</td>
</tr>
<tr>
<td>12. No estoy seguro</td>
<td>No viajó en el barco porque...</td>
</tr>
</tbody>
</table>
## Oral Production Task --- VERSION B

### Version B

#### Experimental Items

<table>
<thead>
<tr>
<th>Contextual Sentence</th>
<th>Sentence to Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No estoy seguro si tienen en el departamento de arte</td>
<td>El comité quiere un escultor que...</td>
</tr>
<tr>
<td>2. No sé si hay</td>
<td>El pueblo necesita museos que...</td>
</tr>
<tr>
<td>3. No conozco sus preferencias de deportes</td>
<td>Sus hijos aprecian deportes que...</td>
</tr>
<tr>
<td>4. Sí, conozco muy bien sus preferencias</td>
<td>Sus tíos prefieren montañas que...</td>
</tr>
<tr>
<td>5. Sí, conozco los jardines de Madrid</td>
<td>Los turistas buscan los jardines que...</td>
</tr>
<tr>
<td>6. No conozco los barcos</td>
<td>Juanito hará barcos que...</td>
</tr>
<tr>
<td>7. Sí, sé que hay este tipo de comida</td>
<td>En ese restaurante hacen una sopa que...</td>
</tr>
<tr>
<td>8. Sí, conozco al botones del hotel</td>
<td>El hotel tiene un botones que...</td>
</tr>
<tr>
<td>9. No sé si hay en esa tienda</td>
<td>Buscamos una mesa que...</td>
</tr>
<tr>
<td>10. Sí, sé muy bien donde hacen ejercicio</td>
<td>Los estudiantes corren en parque que...</td>
</tr>
<tr>
<td>11. No sé si hay empleadas en la agencia</td>
<td>Prefieren a una señora que...</td>
</tr>
<tr>
<td>12. Sí, conozco su suéter</td>
<td>A Pepe no le gusta el suéter que...</td>
</tr>
</tbody>
</table>

#### Distractor Items

<table>
<thead>
<tr>
<th>Contextual Sentence</th>
<th>Sentence to Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No sé si es la razón</td>
<td>Dolores es cantante. Pienso que...</td>
</tr>
<tr>
<td>2. Sí, esto es para la próxima semana</td>
<td>Mi familia y yo...</td>
</tr>
<tr>
<td>3. Sí, esto ocurrió el año pasado</td>
<td>Los niños de la escuela...</td>
</tr>
<tr>
<td>4. No estoy seguro</td>
<td>El cliente no se comió el bistec porque...</td>
</tr>
<tr>
<td>5. No conozco la situación económica</td>
<td>Dudan que la economía</td>
</tr>
<tr>
<td>6. No sé si es verdad</td>
<td>Es muy posible que nuestros estudiantes...</td>
</tr>
<tr>
<td>7. Sí, para la semana que viene</td>
<td>La profesora...</td>
</tr>
<tr>
<td>8. No sé la verdad</td>
<td>Uds. no creen que la película...</td>
</tr>
<tr>
<td>9. No sé muy bien</td>
<td>Durante la fiesta el grupo...</td>
</tr>
<tr>
<td>10. Sí, sé la razón</td>
<td>Marta no asistió a clase a porque...</td>
</tr>
<tr>
<td>11. Sí, sé muy bien</td>
<td>Todos los inviernos ella...</td>
</tr>
<tr>
<td>12. Sí, sé exactamente</td>
<td>La agente de viajes...</td>
</tr>
</tbody>
</table>
## Oral Production Task --- VERSION C

### Version C

**Experimental Items**

<table>
<thead>
<tr>
<th>Contextual Sentence</th>
<th>Sentence to Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No sé si tienen Ipads</td>
<td>La tienda Apple necesita Ipads que...</td>
</tr>
<tr>
<td>2. No estoy seguro si hay personas</td>
<td>El presidente quiere personas que...</td>
</tr>
<tr>
<td>3. No sé si existen en esos autobuses</td>
<td>Prefieren autobuses que...</td>
</tr>
<tr>
<td>4. Sí conozco esos discos compactos</td>
<td>Las muchachas buscan discos compactos que...</td>
</tr>
<tr>
<td>5. No conozco sus obras de teatro</td>
<td>Pedro hará obras de teatro que...</td>
</tr>
<tr>
<td>6. Sí, sé muy bien sus preferencias</td>
<td>Mi padre prefiere comprar teléfonos que...</td>
</tr>
<tr>
<td>7. No conozco sus preferencias de lugares</td>
<td>Elena aprecia ciudades que...</td>
</tr>
<tr>
<td>8. Sí, conozco sus viajes favoritos</td>
<td>Menem aprecia viajes que...</td>
</tr>
<tr>
<td>9. Sí, conozco bien los cines de esta ciudad</td>
<td>La ciudad tiene cines que...</td>
</tr>
<tr>
<td>10. Sí, sé que la tienda tiene esas blusas</td>
<td>Guillermina quiere blusas que...</td>
</tr>
<tr>
<td>11. Sí, sé muy bien el horario de ellas</td>
<td>Las alumnas siguen horarios que...</td>
</tr>
<tr>
<td>12. No sé si tienen en el café</td>
<td>Busco un café que...</td>
</tr>
</tbody>
</table>

**Distractor Items**

<table>
<thead>
<tr>
<th>Contextual Sentence</th>
<th>Sentence to Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sí, esto ocurrió la semana pasada</td>
<td>Mis primitos...</td>
</tr>
<tr>
<td>2. Sí para mañana</td>
<td>Mi amigo...</td>
</tr>
<tr>
<td>3. No sé si es cierto</td>
<td>Es muy dudoso que los parientes...</td>
</tr>
<tr>
<td>4. No conocen el partido político</td>
<td>Dudamos que el partido político...</td>
</tr>
<tr>
<td>5. Sí, sé exactamente</td>
<td>El arquitecto...</td>
</tr>
<tr>
<td>6. No sé muy bien</td>
<td>En la escuela la secretaria...</td>
</tr>
<tr>
<td>7. Sí, sé la razón</td>
<td>Mercedes tomó el examen porque...</td>
</tr>
<tr>
<td>8. No sé si es la razón</td>
<td>Lalo es hombre de negocios. Pienso que...</td>
</tr>
<tr>
<td>9. No estoy seguro</td>
<td>La policía no encontró al ladrón porque...</td>
</tr>
<tr>
<td>10. Sí, esto es para el próximo mes</td>
<td>Gustavo...</td>
</tr>
<tr>
<td>11. Sí, sé muy bien</td>
<td>En todas las reuniones el director</td>
</tr>
<tr>
<td>12. No sé la verdad</td>
<td>Nosotros no creemos que Pepe...</td>
</tr>
</tbody>
</table>
APPENDIX K

Written Production Task --- VERSION A

Version A

Experimental Items

<table>
<thead>
<tr>
<th>Contextual Sentence</th>
<th>Sentence to Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No sé si la cafetería tiene</td>
<td>Mis hijos prefieren beber jugos que...</td>
</tr>
<tr>
<td>2. Sí, sé que existe</td>
<td>Fabiana busca el dormitorio que...</td>
</tr>
<tr>
<td>3. Sí, estoy seguro de los gustos de las poblaciones</td>
<td>La gente prefiere un gobierno que...</td>
</tr>
<tr>
<td>4. No conozco sus lecciones</td>
<td>A mis estudiantes les gustan las lecciones que...</td>
</tr>
<tr>
<td>5. Sí, sé que hay</td>
<td>En el centro de salud, siempre hay unos estudiantes que...</td>
</tr>
<tr>
<td>6. No estoy si existen estos empleos</td>
<td>Los chicos quieren trabajos que...</td>
</tr>
<tr>
<td>7. No sé si tenemos lugares</td>
<td>Mis amigos psicólogos buscan una librería que...</td>
</tr>
<tr>
<td>8. Sí, conozco el laboratorio</td>
<td>Ellos tienen computadoras que...</td>
</tr>
<tr>
<td>9. Sí, estoy seguro de su gusto literario</td>
<td>Juan conoce la literatura que...</td>
</tr>
<tr>
<td>10. Sí, sé muy bien el tipo de mapa</td>
<td>Compro los mapas que...</td>
</tr>
<tr>
<td>11. No sé si hay en la compañía</td>
<td>Los empleados necesitan una jefa que...</td>
</tr>
<tr>
<td>12. No conozco sus tareas</td>
<td>Juan hace proyectos que...</td>
</tr>
</tbody>
</table>

Distractor Items

<table>
<thead>
<tr>
<th>Contextual Sentence</th>
<th>Sentence to Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sí, sé la razón</td>
<td>Ella salió a comer anoche porque...</td>
</tr>
<tr>
<td>2. No sé por qué</td>
<td>Es posible que mi amiga...</td>
</tr>
<tr>
<td>3. No estoy seguro</td>
<td>No fue a la fiesta porque...</td>
</tr>
<tr>
<td>4. Sí, sé muy bien</td>
<td>Los turistas fueron al monumento y...</td>
</tr>
<tr>
<td>5. Sí, esto es para mañana</td>
<td>Los profesores...</td>
</tr>
<tr>
<td>6. Sí, sé muy bien</td>
<td>Todas las semanas los niños...</td>
</tr>
<tr>
<td>7. Sí, esto ocurrió la semana pasada</td>
<td>Los muchachos...</td>
</tr>
<tr>
<td>8. No estoy seguro</td>
<td>No creo que él...</td>
</tr>
<tr>
<td>9. No sé si es la razón</td>
<td>Ignacio come muchos postres. Pienso que...</td>
</tr>
<tr>
<td>10. No sé la razón</td>
<td>Duda que...</td>
</tr>
<tr>
<td>11. No sé la razón</td>
<td>Mis amigos y yo...</td>
</tr>
<tr>
<td>12. Sí, para la próxima semana</td>
<td>Mis amigos y yo...</td>
</tr>
</tbody>
</table>
Written Production Task --- VERSION B

Version B

Experimental Items

<table>
<thead>
<tr>
<th>Contextual Sentence</th>
<th>Sentence to Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No sé si hay en la tienda</td>
<td>Susana prefiere pantalones que...</td>
</tr>
<tr>
<td>2. No estoy seguro si tienen para beber</td>
<td>Los niños quieren unos refrescos que...</td>
</tr>
<tr>
<td>3. No conozco sus deportes favoritos</td>
<td>Mis hijos aprecian deportes que...</td>
</tr>
<tr>
<td>4. No sé cómo son sus tareas</td>
<td>Juan hace tareas que...</td>
</tr>
<tr>
<td>5. Sí, conozco a esas amigas</td>
<td>Carolina busca a las mismas amigas suyas que...</td>
</tr>
<tr>
<td>6. Sí, sé muy bien sus preferencias</td>
<td>Mi novio prefiere películas que...</td>
</tr>
<tr>
<td>7. No sé si hay</td>
<td>Necesitamos una persona que...</td>
</tr>
<tr>
<td>8. Sí, conozco su ropa</td>
<td>Verónica y su hermana compran solamente la ropa que...</td>
</tr>
<tr>
<td>9. Sí, sé que hay estos estudiantes</td>
<td>En nuestra universidad, siempre hay unos estudiantes que...</td>
</tr>
<tr>
<td>10. Sí, sé cómo trabajan</td>
<td>Sus hermanos necesitan trabajos que...</td>
</tr>
<tr>
<td>11. Sí, conozco la adicción de ellos</td>
<td>Mi compañera de cuarto tiene una familia que...</td>
</tr>
<tr>
<td>12. No sé si hay lugares</td>
<td>Los estudiantes buscan un restaurante que...</td>
</tr>
</tbody>
</table>

Distractor Items

<table>
<thead>
<tr>
<th>Contextual Sentence</th>
<th>Sentence to Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sí, sé muy bien</td>
<td>Todos los días Juan Carlos...</td>
</tr>
<tr>
<td>2. No sé si es la razón</td>
<td>Rafael es muy irresponsable. Pienso que...</td>
</tr>
<tr>
<td>3. Sí, esto es para mañana</td>
<td>Los estudiantes...</td>
</tr>
<tr>
<td>4. No estoy seguro</td>
<td>No asistió a la clase porque...</td>
</tr>
<tr>
<td>5. Sí, sé muy bien</td>
<td>Carlitos fue a una fiesta anoche y...</td>
</tr>
<tr>
<td>6. Sí, esto ocurrió la semana pasada</td>
<td>Elena y yo...</td>
</tr>
<tr>
<td>7. No sé la razón</td>
<td>Dudo que mi familia...</td>
</tr>
<tr>
<td>8 No estoy seguro</td>
<td>No creo que su abuela...</td>
</tr>
<tr>
<td>9. No sé por qué</td>
<td>Es posible que Marisa...</td>
</tr>
<tr>
<td>10. Sí, para el próximo semestre</td>
<td>Mi compañero de cuarto y yo...</td>
</tr>
<tr>
<td>11. Sí, sé la razón</td>
<td>Su novio llegó tarde anoche porque...</td>
</tr>
<tr>
<td>12. No sé muy bien pero</td>
<td>Los muchachos no...</td>
</tr>
</tbody>
</table>
**Version C**

**Experimental Items**

<table>
<thead>
<tr>
<th>Contextual Sentence</th>
<th>Sentence to Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sí, él conoce a todos los meseros</td>
<td>Mi padre busca a la mesera que...</td>
</tr>
<tr>
<td>2. Sí, conocemos a su enfermera y doctores</td>
<td>La paciente necesita la enfermera que...</td>
</tr>
<tr>
<td>3. No conozco su casa</td>
<td>Marta tendrá un jardín que...</td>
</tr>
<tr>
<td>4. No conozco los viajes de este aeropuerto</td>
<td>Mi familia prefiere un vuelo directo que...</td>
</tr>
<tr>
<td>5. Sí, hay en nuestra familia</td>
<td>En mi familia siempre hay parientes que...</td>
</tr>
<tr>
<td>6. No sé si hay en el centro</td>
<td>Mis amigos y yo buscamos una tienda que...</td>
</tr>
<tr>
<td>7. Sí, conozco sus libros</td>
<td>Mi hermano menor tiene libros que...</td>
</tr>
<tr>
<td>8. Sí, sé cómo se toma el café</td>
<td>Mi abuelo prefiere el café que...</td>
</tr>
<tr>
<td>9. Sí, conozco su negocio de arte</td>
<td>Lola vende pinturas que...</td>
</tr>
<tr>
<td>10. No estoy seguro si tienen en la pastelería</td>
<td>Queremos un pastel que...</td>
</tr>
<tr>
<td>11. No estoy seguro si ese hotel tiene</td>
<td>Mi novia aprecia un hotel que...</td>
</tr>
<tr>
<td>12. No sé si existen</td>
<td>Ella necesita cursos que...</td>
</tr>
</tbody>
</table>

**Distractor Items**

<table>
<thead>
<tr>
<th>Contextual Sentence</th>
<th>Sentence to Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No sé mucho</td>
<td>Las niñas no...</td>
</tr>
<tr>
<td>2. No sé la razón</td>
<td>Dudan que...</td>
</tr>
<tr>
<td>3. No sé donde</td>
<td>Es posible que los muchachos...</td>
</tr>
<tr>
<td>4. No sé si es por qué.</td>
<td>Luisa es estricta. Pienso que...</td>
</tr>
<tr>
<td>5. Sí, es para este fin de semana</td>
<td>Mis amigas y yo...</td>
</tr>
<tr>
<td>6. Sí, esto siempre pasaba</td>
<td>Octavio y Susana...</td>
</tr>
<tr>
<td>7. No estamos seguros</td>
<td>No creemos que nuestro tío de 70 años...</td>
</tr>
<tr>
<td>8. Sí, para las próximas vacaciones de primavera</td>
<td>Nosotros...</td>
</tr>
<tr>
<td>9. Sí, me imagino por qué</td>
<td>Los estudiantes vieron la televisión porque...</td>
</tr>
<tr>
<td>10. Sí, sé muy bien</td>
<td>Gustavo se levantó esta mañana y...</td>
</tr>
<tr>
<td>11. Sí, sé muy bien</td>
<td>Todos los martes Elena...</td>
</tr>
<tr>
<td>12. No sabemos por qué exactamente</td>
<td>No fueron a la fiesta porque...</td>
</tr>
</tbody>
</table>
APPENDIX L

Georgetown University Institutional Review Board

Date: November 15, 2011

To: Julio Torres, PhD Candidate
    Spanish & Portuguese
    2500 Wisconsin Avenue NW, Apt 329
    Washington, DC 20007
    jrt36@hoymail.georgetown.edu

From: David Blanco
    Institutional Review Board

Title: Task-based Approaches to Second and Heritage Language Learning

IRB#: 2011-528

Annual Approval Date: October 14, 2011
Expiration Date: October 13, 2012

Action: Approved as submitted
    Expedited Initial Review
    C-1 form signed 10/11/11
    C-3 form signed 10/11/11 (category 7a)
    Study ICF
    Appendix A: Production Task
    Appendix B: Oral Grammaticality Judgement Task
    Appendix C: Recognition Multiple Choice Task
    Appendix D: Part 1 study questionnaire
    Appendix E: Task Perception Questionnaire
    Appendix F: Language Background Questionnaire
    Torres: CV, SSDF, Human subjects protection training

Your above-referenced protocol and consent form were approved through expedited review by Dr. Heidi Li Feldman, the IRB Chair or a designee, on November 11, 2011.

This is to inform you that you may commence your project. Approval for this study is through October 13, 2012.

When consenting participants, please be sure to use only the most recent version of the informed consent form that is stamped by the IRB with the current approval and expiration dates.

This study will automatically become inactive when its approval expires on October 13, 2012 unless a continuing review submission for the study is received and approved by the IRB before that date. The IRB requires that you submit an application for annual renewal at the end of each approval period and/or at study completion. It is the PI’s responsibility to submit the application for annual renewal and the appropriate IRB forms at least one month before the expiration date.

Please remember to:

Medical-Dental Building, SW 104, 3900 Reservoir Road NW, Washington, DC 20057
(202) 687-6553 telephone  (202) 687-4847 facsimile

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