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Emergence of Comprehension of Spanish Second Language Requests

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Dissertation

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas at Austin

August 2013

Acknowledgements

First and foremost, I would like to acknowledge the immense support and guidance of my advisor, Dale Koike. I have had the great fortune of being able to study and work with Dale for six and half years in my training as a researcher of second language acquisition. Dale fostered an environment that allowed me to cultivate a non-dogmatic, yet critical, approach that will serve me well in my career.

During this same time, I was introduced to two more faculty members that would become influential in my development as a scholar and a teacher. David Birdsong taught me how to synthesize and critique published studies that resonates to this day in how I approach new research. In addition, David facilitated the development of my teaching experience beyond the language classroom with his graduate seminar on research design and statistics. Also shaping the two components of an academic career, Rafael Salaberry helped me to explore various theoretical approaches to second language acquisition and the relevant pedagogical implications.

Outside of second language studies, Zenzi Griffin offered me an opportunity to understand more about language and cognition, as well as how to contextualize my work within the bigger picture. Similarly, Jacqueline Toribio encouraged me to consider the larger implications of my interests in second language acquisition in terms of the field of bilingualism.

I also must recognize the formative influence of two professors that bridged by undergraduate and graduate studies. My first introduction to the study of Hispanic linguistics came from an undergraduate course given by Marta Luján. This experience, along with a subsequent course on Spanish syntax and morphology with Marta,

motivated an early interest in a previously inconceivable academic career oriented toward the Spanish language. In addition, Chiyo Nishida exposed me to a symbolic approach to language through a course on advanced Spanish grammar. This course was undoubtedly one of the most critical influences in my inspiration to pursue a career of research and to share this perspective through teaching. The effect of these experiences cannot be overstated.

On a more personal level, the friends that I have made throughout my graduate studies have helped me to survive the often uncertain and stressful nature of academia. For fear of omission, I cannot name them all here. Finally, I cannot imagine arriving at the achievements represented by this dissertation without the support and love of my wife, Emma.

Thank you all.

Emergence of Comprehension of Spanish Second Language Requests

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The University of Texas at Austin, 2013

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This dissertation examines the developmental trajectory of online processing toward second language (L2) pragmatic comprehension. This goal stems from two shortcomings of previous research: (1) approaching L2 pragmatics as the acquisition of discrete phenomena through progressive stages (see Kasper, 2009), and (2) focusing narrowly on production. Building upon previous L2 pragmatic comprehension work (Carrell, 1981; P. García, 2004; Taguchi, 2005, 2007, 2008a, 2008b, 2011a, 2011b; Takahashi & Roitblat, 1994), the current study investigates the development of L2 Spanish request speech act comprehension by native English-speaking adult learners. The analysis involves accuracy, comprehension speed and the relationship between the two dimensions across three levels of directness over a 13-week period.

Previous research was informed by skill acquisition theories (Anderson & Lebiere, 1998) to account for increased accuracy and decreased speed over time. Here, further analysis is based on Complexity Theory / Dynamic Systems Theory (CT/DST) (Larsen-Freeman, 1997; Larsen-Freeman & Cameron, 2008a; de Bot, Lowie, & Verspoor, 2007; Ellis, et al., 2009; Verspoor, de Bot, & Lowie, 2011) to account for the seemingly chaotic results often found in L2 research.

The findings of the current study show significant overall improvement in accuracy and speed of Spanish request identification, and a moderate relationship between the two measures. However, the association between slower responses and higher accuracy in the current data contradicts skill acquisition theories. Rather, the theoretical framework of CT/DST provides a more authentic account of development. As such, the results indicate that the levels of request directness develop along distinct trajectories and timescales. Direct requests reflect higher accuracy and faster interpretation. While the most indirect level of requests shows the largest improvement in accuracy, the responses for these items are no faster at the end of the study than at the beginning. The development of conventionally indirect requests occupies a middle ground in terms of accuracy similar to direct requests and comprehension speed like implied items. Further findings reflect L2 pragmatic comprehension as a complex, dynamic system that emerges through the differential effects of predictor variables across measures and within sub-groups of participants based on proficiency improvement, motivation and response strategy.

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Chapter 1: Introduction

Learning a second language (L2) entails many challenges. Learners must extend first language knowledge to supplement new lexical forms, semantic features, phonetic and phonological realizations and syntactic structures. These features alone may often enable a second language learner to express basic meaning coherently. However, in order to interact and function effectively in the target language, the pragmatic norms of language use are necessary tools in addition to basic linguistic features. The acquisitional task is then to associate convergent features of linguistic categories and contextual cues to functional units of the second language. A particularly difficult undertaking in second language acquisition (SLA) is developing the ability to participate in the co-construction of meaning with other speakers. After all, how can one respond when one is unsure as to what the other person is *really* trying to say?

This issue is at the heart of L2 pragmatics, which is “the study of the development and use of strategies for linguistic action by nonnative speakers” (Kasper & Schmidt, 1996, p. 150). However, one deficiency in L2 pragmatics study is a notable research emphasis on production over comprehension. Indeed, this trend has led to explicit calls for more comprehension studies in real time, in both naturalistic and experimental settings (Kasper, 2009, p. 264). This lack of comprehension research is more than a simple gap in L2 pragmatics research; production and comprehension are two differentially developed skills (Anderson, 2010). DeKeyser and Sokalski (1996) found a L2 language practice effect for comprehension versus production skills, indicating that new skill development cannot be assumed to be equal across the dimensions. Thus, in order to get a more complete understanding of L2 pragmatic development, it is important to pursue studies of comprehension in order to investigate both dimensions.

1.1 L2 PRAGMATIC DEVELOPMENT THEORY

Another issue underlying this bias in L2 pragmatic research is that studies often focus on developmental stages of forms or usage and pay little attention to cognitive *development*; that is, how learners progress through such stages. L2 pragmatics research frequently consigns cognitive-theoretical concerns to Bialystok's two-dimensional model of pragmatic competence (Bialystok, 1993). Bialystok theorizes two levels of cognitive representation and processing of pragmatic phenomena. The first dimension is the analysis of knowledge, which "is the process of making explicit, or analyzing, a learner's implicit knowledge of a domain" (Bialystok, 1993, p. 48). Bialystok further outlines three stages of knowledge representation: conceptual (meaning), formal (linguistic categories) and symbolic (form-usage connection). The second, "control of processing is the process of controlling attention to relevant and appropriate information and integrating those forms in real time" (Bialystok, 1993, p. 48). As such, a separation of accuracy of analysis and speed of processing development finds some support by Bialystok (1993, p. 47): "... each processing component develops with experience and maturity on its own course. The development of these two processing components is normally correlated ...".

In terms of pragmatic indirectness, the ability to choose between potential interpretations reflects analysis of knowledge. However, the ability to "process information selectively" interacts with the ability to analyze knowledge. The *inability* to select additional contextual information restricts the possible interpretations available for analysis. Bialystok (1993, p. 55) adds: "analyzed representations carry with them the prospect of selective attention to aspects of a representation or deciding between competing representations ... thus for adults the problem of correct interpretation is the responsibility of control of processing".

Much of the production-based research in L2 pragmatics refers to Bialystok's theory as a basis to explain the development of forms and usages as symbolic representations, and more fluent production as evidence of greater attentional control. However, the study of comprehension necessitates a more cognitive-based methodology in order to observe subtle behavior and processing differences and change in time. The solution lies in the subfield of 'experimental pragmatics' (Noveck & Reboul, 2008; Noveck & Sperber, 2004), a psycholinguistic approach to the study of pragmatics. This type of research seeks to examine a cognitive basis for pragmatic phenomena. While this approach traditionally minimizes the variable of context given a laboratory setting, it facilitates the study of *cognitive processing underlying pragmatic knowledge, use and development*.

Using this approach, the goal of this dissertation is to investigate the developmental trajectory of online processing underlying Spanish L2 pragmatic comprehension. Specifically, the current interest lies in the process of development rather than observable products common to much L2 research. Also, it is important to expand beyond theories of skill acquisition that are often invoked in order to account for the development of L2 pragmatic comprehension. An assumption of the current study is that rather than simple linear learning, development can appear chaotic, variably influenced by personal, experiential and macro-contextual factors. Popular cognitive theories such as Adaptive Control of Thought-Rational (ACT-R) (Anderson, 1993, 1996; Anderson & Lebiere, 1998), which are general and imprecise accounts that attempt to reduce phenomena to their minimal components, contradict this proposal. Therefore, a primary focus of the current study is to apply additional theoretical support that is drawn from the evolution of exemplar, or item usage-based, theories in the form of Complexity Theory / Dynamic Systems Theories (CT/DST) (N. Ellis et al., 2009; Larsen-Freeman, 1997;

Larsen-Freeman & Cameron, 2008a) and the related Continuity Psychology (Spivey, 2007). This framework of multi-faceted influences and nested levels of analysis offers a richer model of development than those used in previous skill acquisition work, to be discussed further in Section 2.4. The current goal is to account for more types of variables that affect the dynamic process of L2 pragmatic comprehension development.

1.2 L2 PRAGMATIC COMPREHENSION RESEARCH

Due to a bias towards the study of production, comprehension studies represent an understudied area within L2 pragmatics research. Some production studies analyze appropriate responses as evidence of pragmatic comprehension; for example, refusing or accepting a request as opposed to issuing a greeting (Ervin-Tripp, Strage, Lampert & Bell, 1987). However, this approach does not consider *how* learners interpret L2 pragmatics or the development of comprehension of L2 utterances.

Early studies of L2 pragmatic comprehension were guided by Grice's Theory of Implicature (Grice, 1975). This theory differentiates the surface meaning of an utterance such as 'he isn't my best friend' versus the intended meaning referring to a dislike of said person. This research includes findings of: variation in ESL implicature interpretation (Carrell, 1979), syntactically indexed ESL request comprehension (Carrell, 1981) and differential acquisition of various types of implicature (Bouton, 1994). In reviewing the field of L2 pragmatics, Kasper (2009, p. 263) discusses this early work and arrives at the criticism that "the methodologies of these studies did not shed light on the processes by which the L2 speakers arrived at their interpretations to indirectly conveyed speech acts". It is this criticism of a narrow focus on L2 knowledge that serves as the point of departure for the following series of studies that culminate in the current project.

Subsequent L2 pragmatics studies began to de-emphasize a focus on L2 knowledge and instead turned to the *processing* dimension of L2 pragmatic comprehension. For example, Takahashi and Roitblat (1994) used a reaction time (RT) task with written scenarios related to conventional requests by native Japanese learners of L2 English. The authors found no difference in reading time between conventional and literal interpretations. By introducing the RT measure, Takahashi and Roitblat measured differences in pragmatic interpretation in addition to a purely accuracy-focused analysis. However, the written modality experimental design enabled learners the opportunity for extra exposure to each prompt by re-reading, thus confounding reading time and pragmatic processing.

Taking the next step in the evolution of studying L2 pragmatic comprehension, some research shifted to the auditory modality. Taguchi (2002) developed a pragmatic listening comprehension task to probe English speech act interpretation by native Japanese speakers. The basic procedure is for participants to listen to a brief conversation and respond to an on-screen prompt that assesses the participant's interpretation of the target speech act that occurs at the end of a brief conversation. The pragmatics listening task developed by Taguchi (2002) inherently taps into "analysis of knowledge" according to Bialystok's (1993) model. In this study, participants interpreted indirect English question responses and reported the strategies they used to arrive at the decision on an introspective verbal report immediately after each item. Figure 1.1 shows an example from the study:

Figure 1.1: Sample Item from Taguchi (2002)

Sally: Hi Dennis, long time no see.

Dennis: Yeah, it's been a long time, hasn't it? What's new?

Sally: Oh, just the usual stuff. By the way, is it true you got divorced?

Dennis: You know . . . I think we got married too young.

Question: Is Dennis single?

This study revealed an effect for English L2 proficiency not only in terms of accuracy, but also strategy. The goal of this research was not only to study L2 pragmatic comprehension, but also to assess the applicability of Relevance Theory. The findings reflect that participants are able to make relevant meaning implied through context for conversational turns that appeared to violate Grice's (1975) relevance maxim. Taguchi later adapted this experimental design to investigate different populations and to introduce different constructs to the study of L2 pragmatic comprehension.

Taguchi (2005) tested listening comprehension of implied meanings to study more and less conventional indirect refusals and indirect opinions along with the reaction time to the decision. In this experiment of Japanese learners of English, L2 proficiency was shown to have a significant effect on accuracy but not comprehension time, and no significant relationship was found between the two measures. The results also indicate that the more indirect and implied items registered significantly more slowly. Though not referenced by Taguchi, this finding confirms a study by Röver (2005), which found that conventionality aids in accurate and quick responses. While SLA studies often differentiate participants based on an independent variable for proficiency, Taguchi's (2005) experimental design maintains proficiency as a continuous variable based on *Test*

of English as a Foreign Language (TOEFL) scores. This study also dealt with a speed-accuracy trade-off in that “results suggest that accuracy and speed are independent dimensions in L2 pragmatic comprehension and follow separate developmental paths” (Taguchi, 2005, p. 558). These results lend further support to a two-dimensional model of L2 development that comprises a knowledge dimension and a processing control dimension (Bialystok, 1993). However, such ‘paths’ are unavailable in Taguchi’s (2005) data, given that the data represent only one L2 learner group at a single point in time.

In order to investigate development in the context of the above findings, Taguchi (2007) reported on a longitudinal study, testing participants at the beginning and end of a seven-week intensive L2 English course for native Japanese speakers. The results showed a significant increase in implied interpretation accuracy and a significant decrease in reaction time on the pragmatics comprehension task. The effect over time was greater for accuracy than reaction time and the two measures were not related to a significant degree, similarly to Taguchi (2005). However, because the data involve only a pre-test and post-test, nothing about the actual developmental *path* is reflected in the findings.

Subsequently, Taguchi (2008a) again employed the pragmatic comprehension task over the course of four months in a study abroad context, with three data collection waves. This iteration investigated the effect of the amount of L2 exposure outside of class on accuracy and speed gains in interpreting implied refusals and opinions. This study found a significant change in comprehension speed but not in accuracy from wave to wave, which contradicts the findings in the previous seven-week longitudinal study (Taguchi, 2007). Accuracy showed significant improvement only between the first and last waves. However, the amount of time between waves was not constant; data collection occurred at weeks 3, 8 and 19. This study also found extra L2 exposure and lexical access speed to be significant factors for comprehension time but not accuracy

gains. Overall, implied refusals exhibit more accurate responses and faster RTs at each wave than implied opinions. Still to be examined is the difference in comprehension between two or more levels of directness for a single speech act.

Taguchi (2008b) investigated the potential effect of conventionality on interpretation and comprehension speed in the reverse language pairing of a native English speaker learning L2 Japanese. In this cross-sectional study of elementary and intermediate level classroom learners, Taguchi tested the comprehension of conventional and implied opinions. In this study, the intermediate group interpreted all items significantly more accurately, but not faster than the elementary group. Similarly, conventionality showed a significant effect for accuracy but not comprehension time, which means that despite the higher degree of indirectness for implied opinions, responses to these items were no slower or faster than for conventional opinion items. Contrary to the expected results, conventional opinions incurred lower accuracy than the implied opinions. However, due to the cross-sectional design of this study, the developmental path of comprehension along different levels of directness explored in the previous study (Taguchi, 2008a) remain unexamined.

García (2004) examined the interpretation of indirect requests, suggestions, corrections and offers by English learners from a variety of L1s. Participants listened to recorded dialogues and recorded responses on multiple choice questionnaires to identify “what the speaker was trying to do” (P. García, 2004, p. 100) However, the study design allowed participants to operationalize speech acts for themselves, potentially confounding some speech acts for different participants. Results include an effect of L2 proficiency and an interaction between type of speech act and the linguistic elements (specified agent, lexical markers, false starts and modals). In addition, García does not record reaction time

or reasons for the selected answer, giving no insight as to the categorization decision process.

While Taguchi's line of pragmatic listening comprehension studies is pivotal to expanding L2 pragmatics comprehension research in terms of the listening modality and processing dimension work, the cumulative results are problematic when it comes to generalizable research. First, Taguchi mixes modality within the experimental setting, as does García (P. García, 2004). In each study (Taguchi, 2002, 2005, 2007, 2008a, 2008b), a written response stimulus follows an auditory context. Though the stated objective is to study listening comprehension, the inclusion of a reading task confounds the processing measure for Taguchi. While this problem would not necessarily be an issue in terms of accuracy of speech act interpretation results, the mixing of modalities directly prolongs reaction time due to switching cognitive tasks associated with each modality (Connell & Lynott, 2010; Lynott & Connell, 2009). In addition, participants receive procedural instructions in each study in the native language, invariably producing an effect of L1/bilingual/L2 language mode (Grosjean, 1999; Meuter & Allport, 1999) on comprehension speed. Therefore, the reaction time results involve unnecessary variation given that the typical experimental procedure involves participants switching between first and second languages as well as listening and reading modalities. This mixing may well account for some of the inconsistent results of significance of the reaction time data.

Taguchi's studies further confound results through the design of the recorded contexts. For example, the pragmatic listening task examines participants' pragmatic comprehension in response to different prompting speech acts: suggestion, request, invitation and offer. Therefore the ability to understand the preceding speech act can confound participants' interpretation of the conversation-final target utterance. This factor may affect not only the accuracy of interpretation due to a misunderstanding of the

context, but also the reaction time as participants take more or less time to process the previous speech act. In all, this line of research yields specific expectations for future research on the development of L2 pragmatic comprehension.

Another issue in the interpretation of Taguchi's results concerning the relationship between accuracy and comprehension speed lies in the data analysis procedure. The accuracy data consist of the sum of correctly identified critical items per participant. This method is compatible with other types of research in which there is no bias toward an element of the experimental procedure and only targets the intended phenomenon. However, in the pragmatics listening task, responses are binary 'yes'/'no', which are highly sensitive to individually variable biases of either agreement or disagreement. Therefore, the validity of this accuracy measure of pragmatic comprehension is questionable. Take for example the following two hypothetical distributions of responses to a binary decision task in Figure 1.2:

Figure 1.2: Insensitivity of Aggregate Binary Responses

Participant A				Participant B			
		Item Design				Item Design	
Participant Response		YES	NO	Participant Response		YES	NO
	'yes'	40	8		'yes'	40	2
	'no'	8	2		'no'	8	8

In this scenario, both participants register the same accuracy score in the data set because they both responded in accordance with the experimental item designation. However, Participant A identified the filler (NO) items in a similar distribution while Participant B more appropriately rejected the same items. It then appears that Participant

A has a general bias towards responding ‘yes’, which gives a high accuracy score, but does not correspond validly to accuracy on the task as a whole.

In addition, the comprehension speed data in each of Taguchi’s studies is the average of the reaction times for each category (i.e. indirect refusals, conventional opinions) for each participant. The partial correlation analysis selected by Taguchi then compares this average response time to the sum of correct binary responses. The issue with this statistical approach is that this method collapses the observed variation of comprehension speed and looks for a significant relationship to an insensitive accuracy measure. The problem with averaging reaction times is illustrated in the following example data in Figure 1.3:

Figure 1.3: Confounds of Averaging Reaction Times

ID	ACC SUM	RT AVG			
A	40	5.1			
B	40	5.3			
C	25	7.1			

ITEM	Alternate RT Distributions	
1	5.2	4.3
2	5.3	5.3
3	5.4	6.3

In Figure 1.3 above, the table on the right represents two plausible distributions of reaction times that could contribute to the average value for Participant B (5.3 seconds). Despite having the same mean, the middle column has a standard deviation of 0.1 seconds while the last column has a standard deviation of 1.0 second. Collapsing this variation facilitates the oversimplification of the data and greatly increases the risk of falsely finding significant effects in the statistical analysis. Given the procedure of

correlating two problematic variables, it is unsurprising that no significant relationship is found between accuracy and comprehension speed.

In spite of these methodological confounds, some consistent findings hold over Taguchi's studies. Higher L2 proficiency corresponds to more gains in accuracy of L2 pragmatic comprehension while cognitive variables related to lexical and semantic access as well as listening practice relate to speeded comprehension. Subsequent research is needed to assess the reliability of these findings in the context of more controlled experiments and conservative analyses.

A more recent study by Taguchi (2011b) builds on her previous work in an attempt to extend the study of L2 pragmatic development under the theoretical guidance of dynamics and complex systems. This longitudinal study examines the development of L2 English production of opinions and requests by L2 Japanese learners, each differentiated by level of imposition. Results show significant increases in accuracy of appropriateness for both speech acts at the low imposition level. However, high imposition opinions and requests show slower development, reflecting disparate scales of development along the two levels. In terms of fluency, participants quickly increased in speech rate from the beginning to the middle of the study, but showed stabilization from middle to end. This formative work encourages the continued exploration of L2 pragmatics as a complex adaptive system.

1.3 COMPLEXITY THEORY / DYNAMIC SYSTEMS THEORY

The innovative turn in the theoretical approach to L2 pragmatic research signaled by Taguchi's (2011b) study demands a more in-depth discussion of the framework provided by Dynamic Systems Theory (DST) (de Bot, Lowie & Verspoor, 2007) and Complexity Theory (CT) (Larsen-Freeman, 1997; Larsen-Freeman & Cameron, 2008a).

These theories represent the culmination of conceptual and methodological developments across disciplines as diverse as biology (Waddington, 1940), mathematics (Wiener, 1948), developmental psychology (Thelen & Smith, 1994), synergistics (Kelso, 1995) and linguistic universals (Cooper, 1999). The theories are analogous, based on the same concepts and methodologies. However, the lack of terminological convergence and the current use of both appellations reflect the recency of development within different pools of researchers. In the current study, CT/DST refers to the shared framework described by each. As such, CT/DST is not a direct threat to existing SLA-relevant theories, but rather it may prove a valuable, over-arching, “supra-disciplinary level” framework (Larsen-Freeman & Cameron, 2008a, p. 15). The data analysis centers on the constant dynamics of change and the processes that encourage change. Where many traditional approaches hold factors constant, CT/DST acknowledges the inherent fluidity in anything. Rather, apparent stasis corresponds to either relative stability or change so slow as to appear static. CT/DST operationalizes these conditions as ‘attractor states’. An attractor state is a figurative collection of distinct features, the strength or depth of which correlates to the probability of selection. In language, attractors reflect the association of semantic meaning to word form or morphology to syntactic function, such as the association between the English morpheme ‘-ly’ and an adverbial role. The strength of these associations varies by item and is susceptible to change. For example, the canonical word order in any language at any point in history represents an attractor state. Languages that observe less stringent restrictions on word order involve a weaker, or shallower, word order attractor state. The reality that such states are not fixed is reflected by the shift from Latin, subject + object + verb, to modern Romance varieties, subject + verb + object.

According to Larsen-Freeman and Cameron (2008a, p. 2), “a defining characteristic of a complex system is that its behavior emerges from the interactions of its

components”. While not included in the main text, a significant footnote follows this statement: “notice that this is different from saying that the whole is greater than the sum of its parts”, which is commonly the operationalization of ‘emergence’. Therefore, this defining characteristic of dynamic systems marks a fundamental conceptual divergence from the general conceptualization of emergentism. Although Complexity Theory uses the terms ‘emergent’ and ‘emergentism’ (N. Ellis, 1998), it is important to note that emergent behavior in CT/DST is non-linear and disproportionate to its causal factors. A common example is the behavior of sand. As granules of sand are added to a pile, at a certain point the pile shifts abruptly, spreading the accumulated sand through a wider area. The causal factor, the addition of more sand, disproportionately affects the behavior of the collection of sand at this point. Furthermore, to emphasize that such systems are dynamic, in that they are perpetually changing and adapting, they are also referred to as ‘complex adaptive systems’ (de Bot et al., 2007; N. Ellis et al., 2009; Larsen-Freeman, 1997).

Generally speaking, a system emerges through the interaction of its constituent components to produce a state or form at particular points in time. However, Larsen-Freeman and Cameron (2008a) are clear that systems are not isolated since inclusion in a system inevitably affects the properties of the components. It may be useful here to give an example using the chemical bonds of water. The independent features of oxygen and hydrogen do not account for the observed characteristics of water, in its different forms. Rather, the synthesis of oxygen and hydrogen into a molecule of water produces properties not particular to the component elements. In this way, the system is not a sum total or amalgamation of its components; rather, it becomes something different in its unification.

However, complex systems have differing degrees of complexity. Systems variably consist of simple components as well as other systems. Consider for example the nested components of planets, solar systems and galaxies, all within the universe, which may be one of an infinite number of alternate universes. This nested intergalactic system then illustrates a more organic picture of massive, entangled complex systems that themselves may belong entirely or partially to another potentially larger complex system. Implied within this previous statement is the concept that the various components of a complex system can become involved in multiple, though somewhat separate, complex systems. However, two separate complex systems are not truly separate if any of their components are also shared by another complex system.

In light of the interconnectedness of systems, CT/DST favors a ‘sociocognitive’ approach to language (Larsen-Freeman & Cameron, 2008a, p. 7). This term seeks to simply the theoretical basis from Thelen and Smith (1994):

A dynamics systems approach to cognition and action provides a biological ground for cultural and contextual accounts of human cognition ... mental life as emergent from the activities of everyday life. (p. 329)

As such, CT/DST is not purely a cognitive or socio-cultural framework, reminiscent of the work on developmental psychology by Vygotsky (1978). Rather, it encourages the consideration of how dynamic systems in each domain interact to contribute to development and use. Even this ‘division’ is inseparable in that language use can spur change in the language system (N. Ellis & Larsen-Freeman, 2009). For example, technological innovations spur linguistic expansion in order to fill communicative gaps. One specific example is the grammaticalization of the word ‘email’ from a noun used in phrases such as ‘send an email’ or ‘receive an email’ to the conventionalized use of the

word as a verb, ‘to email something to somebody’. Similarly, CT/DST rejects the orthodox distinction between competence and performance (Chomsky, 1975). As such, linguistic patterns are emergent properties of language use rather than performance representing a degenerate manifestation of competence.

In terms of cognitive representation, CT/DST applies the ‘continuity psychology’ developed by Michael Spivey (2007). For Spivey, cognition consists of probabilistic and *fuzzy* representations that are in constant flux. Cognition seeks attractor basins; the selection of which results from probabilities based on previous experiences. Continuous processing replaces traditional discrete representations as new stimuli activate neurons, further cascading activation through interconnected subsystems. Early support for the lack of discrete categories follows from ‘speed-accuracy trade-off’ findings (Lambert, 1995, 1998, 2000; Spivey, 2007); that is, accuracy decreases as quicker responses are elicited. Because speeded responses require faster selection of an attractor state, partial activation of multiple competitors occurs in the absence of sufficient time to move into the most probabilistic state. Rather, the most appropriate, or probabilistic, state shares a similar amount of activation with less-optimal states and therefore receives a similar chance of selection. Conversely, given extra time, the state selected is most likely to match the conditions of the stimulus. Consequently, Spivey’s continuity psychology disallows symbolic representation and rule-based computation, such as ACT-R (Anderson & Lebiere, 1998). As such, the newer theoretical framework of CT/DST (Larsen-Freeman & Cameron, 2008a) precludes the type of abstraction and cognitive architecture of this previous approach to skill acquisition.

1.3.2 Methodological Considerations of Dynamic Systems

The specific concepts in a dynamic systems framework naturally align with methodological guidelines. Larsen-Freeman and Cameron (2008a, p. 230) discuss three general phenomena particularly relevant to CT/DST. ‘Co-adaptation between linked systems’ reflects the potential for change in one system to affect another. For example, as the representations of the L2 lexicon strengthen, more processing resources become available to attend to contextual features relevant to language use, expanding pragmatic and contextual sensitivity. Next, ‘emerging patterns of stability and variability around stability’ offer an alternative view of traditional constructs such as acquisition or even fossilization. Rather than rely on Cartesian dualities such as ‘acquired’ versus ‘not acquired’, development in complexity theory resembles a continuum ranging from erratic or chaotic variation to almost complete stability. For example, the acquisition of noun-article gender agreement in L2 Spanish is highly variable earlier in development and stabilizes with consistent agreement at high levels of L2 proficiency. Development, then, reflects the growing strength of the related attractor state(s). Last is the examination of ‘points of change or transition when a system shifts from one behavior to another’. In the example of noun-article gender agreement, a point of change or transition would be when a L2 Spanish learner, who previously shows variable and irregular usage, shifts over a relatively short period of time to using mostly correct agreement. It is at such points that investigation may be able to uncover the factor(s) involved in such change, which are not always anticipated by the experimental design. In the context of the current study, patterns of stability and points of change are of central concern in the development of L2 pragmatic comprehension. Furthermore, these states and shifts occur across levels of directness, pointing to another methodological issue.

In relation to understanding and describing the constant dynamism of complex systems are the concepts of ‘nested levels’ and ‘multiple scales’. ‘Levels’ refers to the sub-layers of larger constructs such as fluency, complexity and accuracy within general L2 proficiency (Robinson, Cadierno & Shirai, 2009; Skehan, 2009). ‘Scale’ refers to the time scale(s) of change at a given ‘level’, measured by any relevant unit such as nanoseconds, years, centuries, semesters or even seasons. Additionally, within any level, changes within subsystems may relate to distinct levels on yet different scales (Larsen-Freeman & Cameron, 2008a). Rather than collapse a phenomenon into a generalized or idealized set, the non-discrete nature of categories gives rise to the acknowledgement of levels or continua within such fuzzy categories (Spivey, 2007). While the power functions could be the same, the units of time on the x-axis may be vastly different across levels.

Within the various nested levels and linked systems, it is necessary to focus logistically on particular factors or systems at a time. For example, while examining the role of typological differences in L1-L2 on the development of L2 syntax in written production, it is senseless to assess additionally the shifts in vocabulary learning strategies. However, it cannot be assumed that the environment is static. Rather, the ‘foregrounded’ focal phenomenon develops in the context of the dynamic ‘background’ (Larsen-Freeman & Cameron, 2008a, p. 231). Therefore, exploration of additional effects in the background follows when the pre-selected features do not account for observed change. This tenet of complexity theory flies in the face of conventional science, which bases predictive testable hypotheses on previous explanations. A dynamic systems approach separates ‘prediction’ and ‘explanation’, favoring the latter (Larsen-Freeman & Cameron, 2008a, p. 231). CT/DST asserts that it is not necessarily possible to explain or predict outcomes in a traditional reductive approach that isolates specific components.

Rather, behavior is interpretable through the interaction of factors and that behavior or change can only be described with hindsight because of the variable influence of subcomponents and their interactions. Complexity theory then prefers ‘retrodiction’ to prediction, “understanding the next state by the preceding one” (Larsen-Freeman & Cameron, 2008a, p. 231). While subsequent predictions are possible based on expectations, they are not the direct result. However, this methodology gives rise to simply inventing *stories* for data *post hoc* and the scientific validity of the findings can then be suspect. Therefore, caution and objectivity are paramount in CT/DST analysis. The goal is to not ignore or dismiss legitimate observations of change and to address them directly. As such, CT/DST research itself is as dynamic as the theory, spawning additional investigation targeted at findings based on retrodiction in the interest of confirmation.

Furthermore, complexity theory underscores the importance of sensitivity to initial conditions. That is, even slight differences at the outset of observation may have drastic effects through interaction with other factors. The common example of this is the ‘Butterfly Effect’: “does the flap of a butterfly’s wings in Brazil set off a tornado in Texas” (Lorenz, 1972). Conversely, noticeable initial differences may have no long-term effects. It then follows from a retrodiction point of view that the effect of relative differences in initial state is interpretable in light of observed change or differences.

Complexity theory offers a supra-disciplinary model of development to track changes in diverse phenomena. The goal here is to explore aspects of dynamic systems in the development of L2 pragmatic comprehension in order to escape the common trappings of traditional, reductionistic research. The following section describes recent research in SLA from a CT/DST perspective. Subsequently, findings in L2 pragmatic

comprehension are further explored in relation to the principles of complexity and dynamics discussed above.

1.3.3 Theoretical Application to SLA

Because CT/DST is a relatively young development in relation to linguistics, only a handful of research addresses dynamic systems in SLA (de Bot et al., 2007; N. Ellis et al., 2009; N. Ellis & Larsen-Freeman, 2006; Larsen-Freeman, 1997; Larsen-Freeman & Cameron, 2008a; Verspoor, de Bot & Lowie, 2011). The earliest extrapolation of dynamics and complexity from the physical sciences to SLA is seen in Larsen-Freeman (1997). After drawing correlations between SLA and Chaos/Complexity theory, Larsen-Freeman addresses specific issues in SLA in terms of complexity and dynamics including the definition of learning, mechanisms of acquisition, (in)stability of interlanguage, effect of instruction and individual differences. Based on this discussion, SLA researchers are then implored to avoid dichotomies, reductionism and aggregation with univariate cause-effect links and to adopt new imagery/metaphors and emphasize details.

Though several years passed before this initial introduction of chaos infiltrated SLA literature explicitly, some references did appear to influence at least the bibliography of Nick Ellis (1998, 2002a, 2002b, 2005). In 2007, a workgroup meeting of the Santa Fe Institute involving diverse language researchers formed the ‘5 graces group’, named for the participants’ opulent lodging. This group circulated a position paper that initiated the development of a subsequent conference and eventually a special issue of the peer-reviewed journal *Language Learning* (N. Ellis et al., 2009). Studies in this special issue examined constituent structure (Beckner & Bybee, 2009), speech communities (Blythe & Croft, 2009), novel form-meaning associations (Boyd, Gottschalk & Goldberg, 2009), modeling of emergent verb-argument constructions (N. Ellis & Larsen-Freeman,

2009), recursive sentence processing (Christiansen & MacDonald, 2009), evolution of language and brain (Schoenemann, 2009), emergence of compositionality (Cornish, Tamariz & Kirby, 2009), emergence of meaning (Matthiessen, 2009), individual differences (Dörnyei, 2009) and language assessment (Mislevy & Yin, 2009).

Working in parallel, de Bot, Lowie and Verspoor (de Bot et al., 2007, p. 7) published an introduction to DST for SLA “as a candidate for an overall theory of language development”. Subsequently, the authors produced a special issue of the journal of the *Modern Language Association* (de Bot, 2008). This collection featured the application of DST to L1 as well as L2 (Van Geert, 2008), SLA research methodologies (Larsen-Freeman & Cameron, 2008b), intra-individual L2 variation (Verspoor, Lowie & Van Dijk, 2008), cycles of language use, change and acquisition (N. Ellis, 2008), Universal Grammar (Plaza-Pust, 2008) and multilingualism (Jessner, 2008). In 2011, the same group published an edited book dedicated to ‘methods and techniques’ of a dynamic systems approach to SLA (Verspoor et al., 2011), including visualizations and simulations. Taken together, this research offers a modern and appropriate model of SLA research across commonly addressed areas of investigation. In the interest of extending this work, a goal of this dissertation is to explore the application of CT/DST to L2 pragmatics.

1.4 CONTRIBUTION OF THE CURRENT RESEARCH

While the development of L2 pragmatic comprehension is certainly a social tool in the sociocultural tradition, the current study seeks to examine emergent representation and processing over a period of L2 development. Instead of denying the role of social context in understanding communicative function, the scope is to study learners’ cognition underlying this phenomenon. Specifically, this thesis focuses on cognitive

development in the highly variable context of late, or post-adolescent, L2 pragmatic acquisition.

Considering the research on L2 pragmatic comprehension (Section 1.2), little information is available about the *relative* developmental trajectories of L2 comprehension along different levels of speech act directness. Only two studies (Taguchi, 2007, 2008a) attended to the construct of conventionality in the comparison of conventionally (e.g. Can you pass me the salt?) versus non-conventionally (e.g. Are you putting salt on my meat?) indirect realizations of the same speech acts (Taguchi, 2007, p. 315). Conventionality was a significant predictor in that conventionally indirect forms were identified more accurately and faster than the implied versions. However, these studies did not deal with the temporally dynamic relationship between levels of directness since neither one was longitudinal. Conversely, the only longitudinal studies (Taguchi, 2005, 2008b) examined the development of just one level of directness for refusals and opinions and risked a confounding familiarity effect as participants were exposed to the same stimuli during multiple data collection waves. Questions remain as to whether the relative development of different levels of directness is similar or divergent. A more thoroughly controlled, longitudinal study is needed in order to track reliable developmental trajectories of multiple pragmatic realizations. Moreover, the data that result from this study offer a better understanding of the relationship between the development of accuracy and processing, given the skill and language modality methodological issues in the previous research.

In addition, Taguchi (2005, 2007, 2008a, 2008b) laments that most pragmatic comprehension-relevant studies are about English as a foreign/second language, with the exception of a portion of the Koike (1989a) study of L2 Spanish learners. As such, this

study offers an examination of typologically more similar languages, English / Spanish, in order to allow for generalization of findings through more cross-linguistic research.

An additional and complementary call for further research comes from the conclusion to a section on ‘Pragmatic Comprehension’ in the *New Handbook of SLA*, in the chapter on L2 Pragmatics (Kasper, 2009, p. 264):

Compared to the earlier studies, which centered on reading comprehension by design, more recent work has turned to examining pragmatic comprehension in listening. In this effort, the theoretical framework has been enriched by theories addressing key topics in L2 processing and more generally, notably conceptualizations of accuracy and speed, and their interrelation. By combining pragmatic theories with general processing theories, studies of L2 pragmatic comprehension can readily be aligned with proposals to conceptualize and study L2 listening and processing more generally. While these advancements bode well for future research, studies on L2 pragmatic listening comprehension in real time have not yet much to say about the developmental paths through which L2 listeners progress in the comprehension of indirectly conveyed speech acts. A fruitful research program would therefore incorporate longitudinal studies of L2 pragmatic listening with multiple data collection points in naturalistic and experimental settings, using technologies that enable researchers to infer – or even better, observe – processing characteristics at the microlevel and their changes over time.

Answering this call, the current study seeks to elaborate a longitudinal study in an experimental setting in order to observe subtle changes in L2 pragmatic comprehension processing. In terms of the theoretical aims mentioned by Kasper, cognitive accounts for L2 pragmatic development stem from general cognitive theories of skill acquisition. However, is it possible that the acquisition of comprehension of a single level of speech act directness is a specific skill that develops more or less independently of the other levels of the same speech act? CT/DST offers an over-arching model of development,

within which the mechanisms of theories of skill acquisition can be observed to operate. It is one goal of the current study to explore this application.

1.5 OUTLINE OF THE DISSERTATION

Chapter 1 introduced the current study of the development of L2 pragmatic comprehension in the context of a common theoretical approach to L2 pragmatic development and relevant studies of L2 pragmatic comprehension. In addition, Section 1.3 described the theoretical framework of CT/DST and related methodological implications. Last, the contributions of the current study were elaborated in Section 1.4 based on shortcomings as well as overlooked and underserved areas of the previous research.

Chapter 2 explores the theoretical background to the current study, including the overarching context of SLA and pragmatics. Within this section, the focal phenomenon of the current study, Spanish requests, is described and exemplified in detail according to Speech Act Theory and mitigation strategies. Also, specific issues are discussed that concern research focusing on *products* versus *process* as well as developmental trajectories. Next, theories of skill acquisition are explained in terms of non-linguistic and linguistic phenomena. Finally, research questions stemming from previous L2 pragmatic comprehension studies (Section 1.2) are posed in light of the theories of development.

Chapter 3 details the experimental methodology used to test the research questions presented at the end of Chapter 2. This study employs a computerized listening comprehension task to probe pragmatic interpretation, adapted from Taguchi (Taguchi, 2002, 2005, 2007, 2008a, 2008b). The background research on Spanish requests (Section 1.2.4) informs the articulation of the experimental stimuli. Data collection occurs in five waves over the course of one semester of Spanish language study by native English

speakers. The data reflect accuracy and reaction times and explore experiential variables such as proficiency, previous Spanish coursework, as well as wave-varying amounts of time spent studying, producing and receiving Spanish. In addition, participants report strategies used to decide on speech act categorization, which are shown to impact accuracy, reaction time and development directly. Finally, participant selection, data manipulation and analysis procedures are described.

Chapter 4 reports comprehensive results for accuracy, reaction time and individual variables for all participants across waves. First, aggregate data across all participants are described. Next, experiential variables offer sub-group analyses in order to examine L2 pragmatic development trends and factors further. Last, macro-contextual influences related to the institutional setting provide additional insight into the results.

Finally, Chapter 5 discusses the results reported in Chapter 4 in terms of the original research questions in Chapter 2, framed by the theories of skill acquisition and CT/DST. Within this discussion, the results are compared to the previous L2 pragmatic comprehension research reviewed in Chapter 1. Next, implications of the current research for L2 pragmatics, SLA more generally and foreign language pedagogy, are explored. Finally, the limitations of the current study as well as future research questions generated are considered.

Chapter 2: Background

The conceptual framework for the current study is *change over time*. Development is a natural and ubiquitous phenomenon relevant to any academic discipline. Fields as diverse as astronomy, geology, economics and sociology endeavor to explain not only the observable world, but also the developmental processes underlying change and apparent differences. This chapter discusses the field of SLA, the field of pragmatics and how they intersect in order to contextualize the study of Spanish L2 pragmatic comprehension. Subsequently, fundamental issues are addressed that involve developmental perspectives and trajectories as well as approaches to empirical prediction and explanation. Next is an exploration of theories of skill acquisition that are traditionally offered as models of representation and acquisition across cognitive domains, including SLA and L2 pragmatics. Lastly, the previous studies of L2 pragmatic comprehension and the theoretical framework of CT/DST that are framed by the discussion of L2 development in the current chapter culminate in an overview of the current study and the guiding research questions.

2.1 SECOND LANGUAGE ACQUISITION

The field of second language acquisition offers varied approaches to understanding the linguistic, social and cognitive factors in the learning of an additional language. The basic terminology is even dependent on the context of such learning. Many researchers strictly differentiate ‘second language acquisition’ as immersion in a community of practice of the target language, versus ‘foreign language acquisition’ as target language education embedded in the first language (L1) environment. For the purposes of the current study, ‘second language acquisition’ generalizes both contexts as *the process of learning of a second language after infancy, beyond the native language*.

Though the educational context is relevant, it is important to delineate SLA from applied linguistics. The work of SLA seeks to study and describe empirically and to account theoretically for the development of second language knowledge and the underlying cognitive processes. Consequently, applied linguistics seeks to utilize the findings and theoretical accounts of SLA to develop pedagogical materials and practices in order to enhance and maximize learning outcomes. A second language educational orientation underlies the current study, but there are no attempts to intervene in the L2 developmental process through teaching or material treatments. Rather, the present goal is to investigate L2 pragmatic development, specifically, comprehension of the request speech act.

Within the processes of L2 learning are three irrefutable phenomena that consistently result in non-targetlike competence and production across linguistic domains. ‘Transfer’ occurs as language learners apply L1 knowledge and/or rules to the L2, such as the use of English possessive structure in Spanish, **Antonio’s coche* ‘Antonio’s car’. ‘Overgeneralization’ arises as learners apply L2 rules across contexts and items. For example, a Spanish language learner may try to use the verb form *tení*, overgeneralizing the default conjugation by using the root of the verb and the first person singular perfective past tense suffix, in place of the irregular form, *tuve* ‘I had’. Similarly, ‘simplification’ manifests in the consistent selection of only one form or rule when the L2 exhibits multiple alternatives. For example, Spanish language learners may use only *saber* ‘to know’ rather than selecting from the semantically related pair *saber/conocer* in the appropriate contexts. The confluence of these effects results in a state of second language often referred to as ‘interlanguage’ (Selinker, 1972), an idiosyncratic linguistic system that does not approximate the target language. However, such comparison to the native speaker norm is often criticized as a ‘comparative fallacy’ (Bley-Vroman, 1983).

Rather, the terminology ‘multi-competence’ (Cook, 1991) offers a more objective operationalization of the cognitive reality of multiple linguistic systems.

2.1.1 Fundamental Approaches to SLA

Within the field of SLA, three principal theoretical approaches dominate: linguistic, cognitive and sociocultural. The linguistic approach derives largely from the early work of Chomsky (1955, 1976). A cognitive, domain-specific account of linguistic knowledge treats SLA as the availability—or unavailability—of innate implicit linguistic competence and the interaction of L2 input with the native language (Bley-Vroman, 1988; Long, 1985; Montrul, 2002). Additional cognitive approaches (DeKeyser, 1997, 2000, 2009; N. Ellis, 1998, 2001, 2002a, 2002b) ascribe to general cognitive mechanisms of acquisition, representation and processing to account for SLA in much the same way as the acquisition of other skills. Principal concerns are the process of input => intake => uptake => output, implicit versus explicit learning and knowledge, automaticity of processing, representation of memory and the role of frequency. In addition, different processing strategies interact with these phenomena to influence success in SLA. ‘Top-down’ processing involves a more general or holistic approach to meaning, while ‘bottom-up’ processing focuses on constituent subcomponents such as words or isolated sounds. For example, the two approaches are applicable to a L2 reading activity using the same text. A top-down processing exercise can involve skimming the text for general themes while the identification of cognates represents a bottom-up approach. In contrast to the two previously mentioned frameworks, sociocultural approaches to SLA start outside the mind of the learner, working inward to explain how social and cultural experiences affect learning (Firth & Wagner, 1997; Lantolf, 2000). This perspective originates from the earlier work of psychologist Lev Vygostky (1978). Rather than

focusing on the competence of the individual, sociocultural theory seeks to understand development through the surrounding context and communicative activity. SLA is then the process of acquiring new social and cultural *tools* through interaction.

2.1.2 Ultimate Attainment and Maturational Constraints in SLA

The issue of maturational constraints is important to consider for the current study, which focuses on L2 pragmatic development in late learners of L2 Spanish. Within this scope, a contentious topic for any approach to SLA is the great variability of ultimate attainment of second language learners. Ultimate attainment describes the upper limits of acquisition of target-like language, often compared to native speaker norms. The noted variability at the end-state of L2 learning stems from a significant empirical and theoretical distinction between L1 and L2 acquisition, also known as the “logical problem of foreign language learning” (Bley-Vroman, 1988). While the cognitive context of L1 acquisition is more or less equal across individuals, SLA occurs in the context of the L1 and proceeds through different mechanisms of acquisition. Bley-Vroman further illustrates this problem in the Fundamental Difference Hypothesis (Bley-Vroman, 1988), represented below in Figure 2.1:

Figure 2.1: The Fundamental Difference Hypothesis (Bley-Vroman, 1988)

Child Language Development	Adult Foreign Language Learning
A. Universal Grammar	A. Native language knowledge
B. Domain-specific learning procedures	B. General problem-solving systems

Bley-Vroman’s hypothesis distinguishes the basis of knowledge with (A) and the process of development with (B). He concludes that the differences in both domains

across L1 and L2 learning are responsible for the lack of complete target-like acquisition in a L2. Following this early theoretical work, subsequent research on ultimate L2 attainment largely focuses on ‘maturational constraints’ on SLA (Birdsong, 1992, 1999, 2005; Birdsong & Molis, 2001; Coppieters, 1987; DeKeyser, 2000; DeKeyser & Larson-Hall, 2005; Johnson & Newport, 1989; Long, 2005). The argument is that temporal variables such as age of first L2 exposure and length of L2 exposure constrain the outcome of SLA as innate linguistic knowledge and linguistic domain-specific learning mechanisms become less available. General problem-solving skills are assumed to be inefficient or at least less effective in the process of SLA. Therefore, a basic distinction in SLA research design is between *early* versus *late* acquisition, the first occurring before adolescence and the latter, after. This acquisitional context distinction forms the crux of the debate over the ‘Critical Period Hypothesis’, which states that there is an optimal window of opportunity to acquire a L2 before the onset of adolescence (Birdsong, 1999; DeKeyser, 2000; DeKeyser & Larson-Hall, 2005; Johnson & Newport, 1989; Long, 2005). This difference in cognitive context for SLA results in a wide range of variation for late learners from what some researchers refer to as ‘fossilization’ of a non-targetlike interlanguage (Selinker, 1972) to evidence of ‘nativelikeness’ (Birdsong, 2005). Such high L2 achievement approximates that of native speakers across a limited number of linguistic domains of language such as voice onset time, grammatical agreement or grammaticality judgment. However, others argue that these findings are so abnormal as not to be centrally relevant to the field of SLA (Long, 2005). The implication for L2 pragmatics in the current study is in the relative contribution of the many L2 sub-skills. If the acquisition of certain linguistic domains is constrained, any such deficiencies inherently limit comprehension of L2 pragmatic phenomena.

2.1.3 Individual Differences in SLA

Another sub-discipline of SLA research examines the relative effects of individual differences on the acquisitional processes and outcome (Dörnyei, 2005). The effects and interactions of such individual characteristics later inform the present study of L2 pragmatic comprehension. ‘Language aptitude’ was one of the earliest individual difference variables to garner attention due to a relatively strong correlation to L2 proficiency (DeKeyser, 2000; Ehrman & Oxford, 1995), with psychometric instruments dating back to 1959 in the Modern Language Aptitude Test (MLAT) (Carroll & Sapon, 1959). However, later work moved away from viewing language aptitude as a singular concept, opting instead to examine its components. Specifically, results indicate that the subsystem of working memory responsible for the temporary storage of auditory information, the ‘phonological loop’ (Baddeley, 2003; Baddeley & Hitch, 1974), may be the best indicator of what has previously been considered language aptitude (N. Ellis, 2001; Gathercole & Thorn, 1989).

Individual learner difference variables relate more so to learner psychology as opposed to learner cognition. The relationship between ‘personality’ and SLA is as of yet inconclusive (Dörnyei, 2005; Furnham, 1990). The complex features of personality interact differentially with the various components of language, producing mixed findings when taken together. For example, extroverts tend to become more verbose and fluent in a second language while introverts often develop relatively more accurate use. Conversely, ‘motivation’, like aptitude, consistently predicts successful foreign language learning due to its influence in beginning and sustaining the process (Dörnyei & Skehan, 2003; Gardner & Lambert, 1972). Specific concerns for SLA relate to an internal versus external locus of motivation as well as accomplishment versus process orientation, where internally motivated learners oriented toward the process have an advantage. While

motivation positively correlates to L2 attainment, high ‘foreign language anxiety’ diminishes the learning process and outcomes (Horwitz, Horwitz & Cope, 1986) through a diversion of attentional resources. However, a mild level of anxiety actually improves learning because the natural response is an increase in attention and effort (MacIntyre, 2002).

The last group of individual difference variables relate to metacognitive aspects of learner psychology. One variable interrelated with personality is ‘learning styles’; individuals’ preferred or habitual approaches to learning (Ehrman, 1996). Complications in SLA arise when a mismatch occurs between a learner’s style and that of the instructor, activity, program, learner’s beliefs or learning strategies. While learning styles are overarching in terms of application to a broad variety of contexts, skills and tasks, ‘learning strategies’ are more localized techniques for undertaking a given task (Snow, Corno & Jackson, 1996). Oxford’s Strategy Inventory for Language Learning (SILL) involves six categories of strategies, exemplified in Table 1.1 below (Oxford, 1990):

Table 2.1: Strategy Inventory for Language Learning (Oxford, 1990)

Memory Strategies	"I use a combination of sounds and images to remember the new word."
Cognitive Strategies	"I look for patterns in the new language."
Compensation Strategies	"I make up new words if I do not know the right one."
Metacognitive Strategies	"I arrange my schedule to study and practice the new language consistently, not just when there is the pressure of a test."
Affective Strategies	"I try to relax whenever I feel anxious about using the new language."
Social Strategies	I work with other language learners to practice, review or share information."

Variation in the use of strategies and congruence to the task at hand directly affect learning outcomes. Later in this study, the SILL serves to describe and discuss strategies reported in the current data.

This section outlines the principal approaches and concerns across the field of SLA in order to frame the current cognitive study of L2 development that also considers some individual differences. Given diversity of approaches to SLA research, it is necessary to identify and explore a specific sub-area of linguistic interest. In the context of the current study, pragmatic comprehension serves as the sub-domain of interest through which to study the processes of L2 development.

2.2 PRAGMATICS

‘Pragmatics’ is “the study of language from the point of view of the users, especially of the choices they make, the constraints they encounter in using language in social interaction, and the effects their use of language has on the other participants in an act of communication” (Crystal, 1997, p. 301). The study of language in use and the role of context inherently delineate pragmatics from other fields of theoretical linguistics such as syntax or semantics in that it is concerned with language as a medium of communication between speakers rather than purely abstract theoretical competence (Chomsky, 1975; Levinson, 1983). Rather, pragmatics represents the intersection of meaning and context of the interlocutors, physical environment, cultural norms, discourse, shared knowledge and expectations. Subsequently, the central argument for pragmatics is ‘linguistic underdeterminacy’ (Huang, 2006). That is, that the interpretation of the communicative message of language use is ‘underdetermined’ solely through the analytic contributions of syntax and semantics.

Furthermore, the unit of analysis for pragmatics is the ‘utterance’, supplanting the traditional focus of other linguistic disciplines, which is the ‘sentence’. As such, an utterance may not conform to the theoretical rules of syntactic structure or semantic truth conditions, yet it can form a *felicitous*, or appropriate, communicative act through the inclusion of contextual information into analysis. Consequently, pragmatic analysis is also able to account for the simplification of syntax and semantics (Huang, 2006). One Spanish example is the use of *de acuerdo* ‘agreed / I agree’ to respond to an opinion or assertion given in the preceding utterance by an interlocutor. The utterance *de acuerdo* simplifies the sentence-level representation by omitting the matrix verb *estoy* ‘I am’ as understood in the interaction as a conventionalized form of agreement. It is also the socially conventionalized use and interaction with interrogative intonation that shifts the communicative function to one of seeking agreement from the interlocutor.

General theoretical approaches to pragmatics resulted from a reaction to the classical ‘Conduit Metaphor’ of communication (Reddy, 1979). This model begins with speaker intentions, which the speaker encodes and transmits for the listener to decode and comprehend. An early and highly influential reaction to this simplification of communication resulted in Grice’s Cooperative Principle: “make your contribution such as it is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged” (Grice, 1975, p. 26). Grice elaborated this principal through his Maxims of Conversation, involving Quantity (to be as informative as possible), Quality (to be truthful), Relation (to be relevant) and Manner (to be concise and avoid ambiguity). The fulfillment of these maxims can overlap in that the Quality of a response entails a Relevant one as well as produces a contradiction as one tries to be concise in Manner without sacrificing Quantity. That is, conversation may require additional quantity of information in order to avoid ambiguity. The theoretical

contribution of Grice's work is to acknowledge *anticipation* of expected participation, rather than to view communication as purely *reactionary*. Building upon this idea, Relevance Theory (Sperber & Wilson, 1986, 1995) sought to simplify Grice's framework in which Relevancy, embodied in the Maxim of Manner, subsumes all else. Comprehension is then the recognition by the listener of the speaker's intention. In this approach, interlocutors stop processing meaning at the most expected and relevant interpretation. Kasper (2009, p. 262) elaborates on the application of Relevance Theory to non-conventionally indirect uses, saying: "an inferred meaning is optimally relevant when it has the greatest contextual effect and requires the least processing effort". Relevancy is then interpretable according to the contextual foci of pragmatic research, as discussed below.

While pragmatics concerns contextualized language use in general, the major areas of interest are implicature, presupposition, politeness, deixis, pragmatic markers and speech acts (Huang, 2006). All of these areas coalesce in the manifestation of communication and permeate the design of experimental stimuli in the current study. 'Presupposition' is a truth condition implicit in an utterance. In pragmatics, it is often related to some assumption in the shared background or context of the speakers (Beavers, 1997; Stalnaker, 1974). For example, *¿Se ha graduado Antonio?* 'Has Antonio graduated?' presupposes that the listener is familiar with Antonio, who is some sort of student. Common ground shared by speakers allows mutual presupposition in interaction, making communication more efficient and less confusion-prone. 'Deixis', or indexicality, involves personal, spatial and temporal reference (Levinson, 2008). Essentially, some word meanings require contextual information for interpretation. Conventional deictic lexemes are possessive pronouns, demonstrative pronouns, spatial or temporal adverbs, personal adjectives, possessive adjectives and demonstrative adjectives. Morphological

deixis in the form of conditional morphology offers a spatial and temporal reference beyond the *in situ* context (Koike, 1989b). ‘Pragmatic markers’ are reflexive elements of utterances that serve to index contextual features (Aijmer & Simon-Vandenberg, 2011). Aijmer and Simon-Vandenberg (2011) summarize the four primary categories that mark relationships between speech acts, conversational turn structure, speaker-hearer relationships, propositions and information status. ‘Politeness’ is a construct that modifies language use for social considerations. One approach to politeness is Brown and Levinson’s Politeness Theory (Brown & Levinson, 1987), which describes tactics to minimize or avoid threats to the listener’s ‘face’ – one’s public self image. To similar ends, ‘implicature’ represents multiple available meanings or interpretations for a given utterance. Like presupposition, implicature represents intended meaning without explicit linguistic realization. The first interpretation is the most literal and direct meaning while the second is a meaning implied through either omission or shared expectations. For example:

- | | |
|---|-------------------------------|
| (1) A: <i>¿Llegará a tiempo Miguel?</i> | ‘Will Miguel arrive on time?’ |
| B: <i>Su coche se rompió.</i> | ‘His car broke down.’ |

In (1), the response by B represents an implicature that signifies that Miguel will not arrive on time by providing a justification only, without addressing directly the content of A’s question. It is this distinction of levels of meaning and interpretive processing that is of central concern to the current study of L2 pragmatic comprehension. While implicature, presupposition, deixis and pragmatic markers constitute areas of pragmatic research, all manifest in the realization of speech acts.

2.2.1 Speech Act Theory

Speech acts are communicative and functional categories and represent “how to do things with words” (Austin, 1962). Later, John Searle (1969, 1975a, 1975b) would formalize this concept as Speech Act Theory. The distinction of this analytic approach to language was a response to previous work in the philosophy of language and logic that sought to interpret sentences solely based on truth-value (Davidson, 1967; Tarski, 1944). Rather, utterances are used *to do* a great deal more than just make true or false statements. Thus, Speech Act Theory bridges linguistics and philosophy of language. Figure 2.2 outlines the principal categories according to Speech Act Theory (Searle, 1975a) below:

Figure 2.2: Speech Act Theory Categories (Searle, 1975b)

Assertives: commit the speaker to the truth of the utterance

El cielo es azul.

‘The sky is blue.’

Directives: require the listener to take action

¡*Saca la basura!*

‘Take out the trash.’

Commissives: require the speaker to take action

Voy a conducir a Canadá.

‘I will drive to Canada.’

Expressives: convey the attitudes or emotions of the speaker

Me alegro.

‘I’m happy.’

Declarations: alter reality to match the proposition

Dejo este trabajo.

‘I quit this job.’

However, an important distinction in the study of speech acts is perspective. Austin differentiates locutionary, illocutionary and perlocutionary acts. While locutionary acts represent the actual form of an utterance, the illocutionary act represents the intended meaning or function of the utterance on the part of the speaker. Perlocutionary acts are the perceived meaning or function according to the listener. Thus, any given utterance can plausibly be interpretable as three different acts according to each perspective. For example, *possible* interpretations for:

(2) *La cena no está muy rica.*

‘Dinner isn’t very tasty.’

- are:
- (a) locutionary act = assertive – that the food is simply bland
 - (b) illocutionary act = directive – request for salt or other condiment
 - (c) perlocutionary act = offensive – that the listener is not a good cook

The principal difference between the three acts of example (2) lies in the potential for implicature. The speaker’s intended act (b) diverges from the direct, locutionary act of an assertive (a) by performing an implied directive. Conversely, the listener can interpret the same utterance as a personally directed, offensive insult (c). In this way, implicature can intersect with the construct of degrees of directness in speech act realization.

2.2.2 Degrees of directness

At first, it may seem as though there is no difference between locutionary and illocutionary acts; surely listeners interpret utterances as intended. However, upon using implicature, the speaker risks a situation in which the hearer can misinterpret the

utterance. In order to moderate this risk, there are three main degrees of (in)directness in speech acts. This differentiation of directness, along with a myriad of politeness strategies, represents a continuum of illocutionary force (Austin, 1962). The shift to a less direct illocutionary force represents an attempt to ‘mitigate’, which is “the modification of a speech act: the reduction of certain unwelcome effects which a speech act has on the hearer” (Fraser, 1980, p. 341). Below are examples of a Directive across the three levels of directness from a speaker that the listener performs the action of helping to move the table:

- | | | |
|-----|---|-----------------------------|
| (3) | <i>Ayúdame a mover la mesa.</i> | Direct |
| | ‘Help me move the table.’ | |
| (4) | <i>¿Podrías ayudarme con la mesa?</i> | Conventionally Indirect |
| | ‘Could you help me with the table?’ | |
| (5) | <i>No puedo mover la mesa yo mismo.</i> | Non-Conventionally Indirect |
| | ‘I can’t move the table by myself.’ | |

The direct, or literal, interpretation of (3) is as a directive. The surface realization of the speech act aligns locutionary, illocutionary and perlocutionary acts through a lack of alternative interpretation. Subsequently, (4) represents the concept of ‘conventional indirectness’. The direct interpretation of this example with its interrogative structure and the modal *poder* ‘can’ is a question as to the conditional or hypothetical *ability* of the listener to perform the action. This indirect structure is conventional in that the default interpretation in the target language by implicature is a directive. A common facetious response is “I can, but I won’t”. In this case, the listener selects the direct interpretation of the utterance in order to reject the intended request. Implicature, or ‘non-conventional

indirectness', is required to obtain the third realization of the directive in (5) through the need to parse multiple interpretations in order to arrive at the intended request for help. Rather, a face value interpretation of (5) is as an assertive; simply communicating the speaker's inability, or as an expressive (complaint) of the speaker's frustration. In order to refer to these levels of speech act directness efficiently and reflect the terminology of Félix-Brasdefer (2007), the remainder of this dissertation utilizes the following abbreviations for direct (DR), conventionally indirect (CI) and non-conventionally indirect (NCI) speech acts.

It is this distinction of degrees of directness and the need to process multiple interpretations during comprehension that addresses a central theme in the current study of L2 pragmatic comprehension, described in Chapter 3. Similarly, the examples above provide a preview of the target speech act of the present study, which are requests. Because the study focuses on the development of L2 request comprehension, the following section contextualizes the analytical framework addressing the factors that lead to utterance realization.

2.2.3 The Study of Requests

For the purposes of the current study, a 'request' is defined as a sub-type of directives that indicates 'an action that a speaker wants the listener to do for the benefit of the speaker' (adapted from P. García, 2004). Early work by Shoshana Blum-Kulka and colleagues in the 'Cross-cultural Study of Speech Act Realization Patterns' (CCSARP) project laid the groundwork for a systematic approach to the study of speech acts, including requests (Blum-Kulka, 1983, 1984; Blum-Kulka, House & Kasper, 1989; Trosborg, 1995). The cumulative result of this work demonstrates several commonalities to pragmatic realization across languages and cultures including speech acts, indirectness,

politeness and the concept of face. The CCSARP project resulted in the following framework to describe requests:

Table 2.2: CCSARP Framework for Requests (Blum-Kulka, 1984; Blum-Kulka et al., 1989)

Level of directness:	Direct
	Conventionally indirect
	Non-conventionally indirect
Mitigation strategy	Lexical
	Syntactic
Formal complexity	± Verb
	Internal/external modification
Perspective	Hearer/listener
Context	Addressee
	Goal
	Positive/negative
Mood	Positive/negative
Purpose	Goods/service/attention/action

While the analysis of requests according to the strategies employed is one approach to this speech act, another is to look at sequential organization (Blum-Kulka, 1984; Blum-Kulka et al., 1989). Three principal sequential elements comprise requests: a pre-head act, a head act and a post-head act. Each speech act necessarily comprises a head act, the element that communicates the illocutionary force, while the use of pre- and

post-head acts is realized when they are culturally and contextually relevant. Pre-head acts give an indication of an upcoming speech act while post-head acts tend to support it.

(5)	Oye,	no conduzcas tan de prisa.	¡Vas a matarnos!
	<i>Hey,</i>	<i>don't drive so fast.</i>	<i>You are going to kill us!</i>
	PRE-HEAD	HEAD	POST-HEAD

Ultimately, the realization of a request results from the combination of usage of different strategies and organization according to the perceived social demands within the given context. The specific strategies and distribution of realizations are, of course, relevant to each situation, the speakers and the language.

Beyond degrees of directness, another element in request strategies is that of ‘external’ versus ‘internal’ modification (Faerch & Kasper, 1989). Essentially, external modifiers are pre- and/or post-head acts that work to modulate politeness, such as tagging the politeness marker *por favor* ‘please’ after *saca la basura* ‘take out the trash’. Conversely, internal modifiers are transformations to the request head act, such as conditional morphology (e.g. *podría* ‘could you’). Modification variably manifests in requests across the three degrees of directness and can affect comprehension if listeners are sensitive to the relationship between these strategies and the realization of requests. Nevertheless, the realization of specific modifiers, distributed across types of requests, results in relatively infrequent examples that are difficult to track consistently and reliably over time. As such, these features of requests are not focal in the current study. A detailed list of modifier categories from Schauer (2004) along with descriptions and English examples is available in Appendix A.

2.2.4 Spanish Requests

Within the general CCSARP framework for requests above, Spanish requests exhibit common features associated with levels of directness and with mitigation strategies. It is important to acknowledge sociolinguistic variation in the realization of requests, particularly involving levels of directness (Félix-Brasdefer, 2005, 2009, 2010; Márquez Reiter, 2002) given that sociological groups such as dialects and genders tend to use requests of varying degrees of directness in certain situations. Nevertheless, the current study focuses on the ability of Spanish L2 learners to *identify* requests, not produce them in the appropriate distribution of a given dialect. Therefore, this section seeks to describe the common structures and mitigating modifiers of Spanish requests across levels of directness in order to contextualize the experimental stimuli of the current study. Figure 2.3 below gives examples of Spanish requests representative of the three degrees of directness from Félix-Brasdefer (2005).

Figure 2.3: Classification of Spanish Request Head Acts (Félix-Brasdefer, 2005, p. 77)

1. Direct strategies (DR)

a. Mood derivable

Préstame tus apuntes y les saco copia ahorita rápido, ¿no?

‘Lend me your class notes and I’ll copy them right away, okay?’

b. Performative

Te pido que me ayudes a limpiar el baño

‘I am asking you to help me clean the bathroom’

c. Need/Want statement

Necesito/quiero que me prestes tus apuntes

‘I need/want you to lend me your class notes’

Figure 2.3 continued

2. Conventional indirectness (CI)

d. Suggestory formulae

¿Qué te parece si te intercambio esta semana y tú limpias el baño ahora?

‘How about if I trade weeks with you and you clean the bathroom now?’

e. Query preparatory

¿Podría darme un aventón a la gasolinera?

‘Could you give me ride to the gas station?’

Quería ver la posibilidad si podía ausentarme la noche de mañana

‘I wanted to see about the possibility of taking tomorrow night off’

3. Non-conventional indirectness (NCI)

f. Hints

Necesito los apuntes de la clase y tú eres el único estudiante que conozco

‘I need the class notes and you are the only student I know’

The first, and usually only, interpretation of DR realizations is a request due to the overt markers shown above such as the imperative verb form, the use of the performative expression *te pido* ‘I ask/request’ and need/want statements such as *quiero* ‘I want’ and *necesito* ‘I need’. Subsequently, CI Spanish requests use structures directly interpretable as inquiries about the ability or opinion of the listener, rather than as elicitations of action. One example in Figure 2.3 employs the common modal structure *poder* ‘to be able’ followed by an infinitive. Nonetheless, these expressions are reliably understood as requests through social norms. Lastly, NCI Spanish requests, as in other languages, employ no particular set of structures because they are interpretable through context. The

last example in Figure 2.3 is interpreted as a request for the listener to share their class notes with the speaker without an overt reference to this action.

Upon review of the types of Spanish request structures above, it is evident that English requests share many similarities such as the overt politeness marker *por favor* ‘please’ (Blum-Kulka et al., 1989). One would then assume that native English speakers learning Spanish would reveal positive L1 transfer in terms of identifying requests. However, the reality of SLA is such that the development of L2 pragmatics is not a simple process due to the interaction of the variety of L2 forms and uses that can also vary from L1 options. The following section discusses research related to the L2 acquisition of pragmatics in order to frame L2 Spanish request comprehension within the larger context of pragmatics and SLA.

2.2.5 L2 Pragmatics

In the context of the field of SLA at large, the study of L2 pragmatics is a relatively young object of inquiry (Bardovi-Harlig, 2001; Kasper, 2009). Early interest in cross-cultural communication (Hall, 1959; Kluckhohn & Strodtbeck, 1961), due in large part to languages in contact through politics and commerce, led to investigation of the acquisition of non-native language use (Canale & Swain, 1980). Parallel to pragmatics at large, L2 pragmatics involves a significant bias towards using methods of production-based data collection. Subsequently, foundational research is mostly descriptive, leaving the learning process lacking theoretical account (de Paiva, 2010; Kasper, 2009).

L2 pragmatics departs from general monolingual pragmatic research due to the interaction of L1 pragmatic knowledge with the development of L2 language use. Just as syntax and phonetics differ between languages, so do speech act realization and politeness expectations and strategies. Therefore, the general scope of L2 pragmatics is to

investigate the realization of pragmatic phenomena over the course of L2 development, as well as the developmental processes involved.

Approaches to L2 pragmatics stem from two of the three principal SLA frameworks to development discussed in Section 2.1.1 above: cognitive and sociocultural. A linguistic approach is not compatible with L2 pragmatics in that traditional theoretical linguistics strictly distinguishes ‘competence’ from ‘performance’ (Chomsky, 1965) and all pragmatics research inherently relates to performance. While the socially embedded context of language use appears most congruent with a sociocultural approach to SLA, L2 pragmatics garners much attention from a cognitive perspective.

In terms of speech acts, L2 pragmatic production research reflects staged development moving from formulaic chunks toward conventional expressions and, finally, into the use of an increased range of strategies and illocutionary force. This process however, is variably affected by pragmatic transfer (Kasper, 1992; Takahashi, 1996). The following section discusses L2 research of the current target speech act in more detail.

2.2.6 L2 Requests

The L2 development of the request speech act enjoys a noteworthy amount of attention in the SLA research, due in part to frequency of use in a wide range of interactions. This work dates back to some of the earliest work in the CCSARP (Blum-Kulka, 1984), which found L2 pragmatic production divergent from both L1 and L2 norms. Studies focusing on the development of L2 requests also address: grammatical and lexical constraints on pragmatic expression (Koike, 1989a); an approximation of sequential organization to native norms (Félix-Brasdefer, 2004); increasingly indirect

requests using an increasing variety of strategies (Félix-Brasdefer, 2007); and constraints of learning environment (Achiba, 2003). In a review of L2 request studies, Kasper and Rose (2002) outlined a five-stage process for pragmatic development in the production of L2 requests, shown in Figure 2.4 below:

Figure 2.4: Development of L2 Requests (Kasper & Rose, 2002, p. 140)

1. Prebasic (dependent on context, without syntax or relational goals)
2. Formulaic (unanalyzed formulas and imperatives)
3. Unpacking (formulas in productive language use and shift to conventional indirectness)
4. Pragmatic expansion (addition of new forms to pragmalinguistic repertoire, increased mitigation and more complex syntax)
5. Fine-tuning (regulation of requestive force to reflect participants, goals and contexts)

However, the preceding work on requests, except for a small portion of the study by Koike (1989a), focused on the *production* of requests. While production studies are certainly important in L2 pragmatics to investigate the actual language use of learners, much of the processing involved in L2 learning is not studied. Just because a learner does not produce a particular form or construct, it does mean not that the learner lacks at least some formative representation of that phenomenon; an issue anticipated by Koike (1989a, p. 286) but not thoroughly addressed. While production abilities are particularly interesting from an interactional perspective, a more cognitive approach to L2 development begs the question of what pragmatic competence is accessible before use.

Therefore, comprehension studies can fill the need to illuminate the fine-grained trajectory of L2 pragmatic emergence. However, across production and comprehension studies, not all L2 research necessarily agrees on a shared conceptualization of development.

2.3 PERSPECTIVES ON DEVELOPMENT

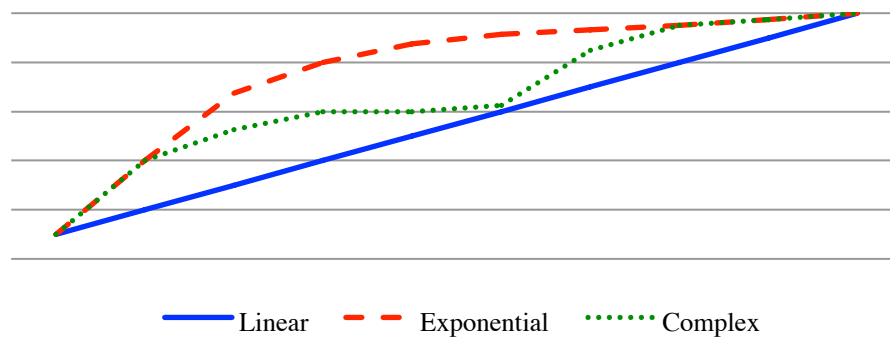
While definitions of SLA commonly involve the term ‘process’, research most often examines the ‘products’ of acquisition at different points along development, in terms of non-target-like ‘interlanguage’ or the upper limits of attainment of specific linguistic features such as word order or aspect (Coppieters, 1987). This focus on products of learning may well be an influence of the concern of ‘learning outcomes’ in second language pedagogy related to assessment. Subsequently, researchers attribute observed differences to theories of development, tacitly saying that a given theoretical framework accounts for change between proficiency levels or treatment groups (Gass, 2009). For example, there are many studies of L2 pragmatic production that describe pragmatic products of acquisition in the form of developmental stages (see Kasper & Rose, 2002). However, subsequent studies involving L2 pragmatic developmental paths have investigated child L2 request production (Achiba, 2003), effect of study abroad context (Barron, 2003), organization of turns during disagreement (Bardovi-Harlig & Salsbury, 2004) and child L2 pragmatic comprehension (Lee, 2010). The main shortcoming of the study of products of learning lies in the massive void of information about the process of development from stage to stage and from one form/use/meaning to another form/use/meaning mapping (Leow, in press). This leads to the question regarding not only what language use occurs in the interim, but also how changes transpire. For example, are learners able to comprehend implied meanings before maintaining stable

uses of conventionalized forms? How do learners manage to become aware of contextual inferences in the interpretation of implied meanings? This is not to say that all research avoids the examination of the developmental processes of language learning.

There is a substantial amount of research on the learning process related to learner-external factors such as implicit versus explicit instruction and input/comprehension-based learning versus production-based learning (Shintani & Ellis, 2010). These approaches are problematic due to the unrealistic presupposition that such methodological constructs accurately or completely describe the learning processes taking place. That is, the complexity of learning confounds the institutional or experimental constraint on processing in that implicitly-taught learners can make explicit assumptions and that explicitly-taught learners can simultaneously process implicit features (N. Ellis, 2005). This approach imposes research-oriented constructs and disregards what learners actually do. Therefore, SLA research must examine developmental processes from an emic, learner-centered perspective in terms of learner behavior and learner-oriented factors.

Whether product-focused or process-focused, research on development concerns the progressive change of a given phenomenon over time. The depiction of this continuous progression is then a ‘developmental trajectory’ (or pattern or path). Developmental trajectories illustrate the nature of development over time in terms of relative rate(s) of change between observations. Figure 2.5 depicts different plausible developmental trajectories that begin and end at the same relative points in time:

Figure 2.5: Hypothetical Developmental Trajectories



The linear function in Figure 2.5 displays a constant rate of development over time whereas the exponential function depicts faster initial development followed by a longer period of more gradual change, in line with the power function or power law of learning (Newell & Rosenbloom, 1981). The complex function offers a unique and less predictable model of development. Similar to the exponential function, there is faster initial development that slows, yet dramatically increases again over a relatively short period of time. An advantage to the study of developmental trajectories is preciseness of data, which demonstrates perturbations, or discontinuities, in otherwise presumed linear development. While discontinuities often result from an experimental or pedagogical intervention, unanticipated fluctuations are still important in the pursuit of an empirical understanding of development. Section 2.3 below explores more deeply the issue of ‘prediction’ versus ‘explanation’ in the context of CT/DST. Nevertheless, data on the continual development in time is unavailable in assessments of pre- and post testing or the upper limits of acquisition.

These methodological issues of cognitive development research are basic and often presumed features of theoretical approaches. Below, at least implicitly, these issues

frame the discussion of the two primary types of skill acquisition theories. These theories serve as the historical context from which, and in opposition to which, the CT/DST framework developed.

2.4 THEORIES OF SKILL ACQUISITION

Theories of skill acquisition stem from work in cognitive sciences that seeks to account for development and representation of new skills across cognitive modalities (Anderson, 2010). As such, the application to SLA relates to a domain-general approach to acquisition, as opposed to a language domain-specific approach like the purely linguistic framework such as Universal Grammar (Bley-Vroman, 1988; Long, 1985; Montrul, 2002), as discussed in Section 2.1. The current section elaborates on two types of skill acquisition theories that differ not only in how skill develops, providing a ‘transition’ theory, but also the cognitive representation of a skill, also referred to as a ‘property’ theory (Gregg, 2003, p. 55).

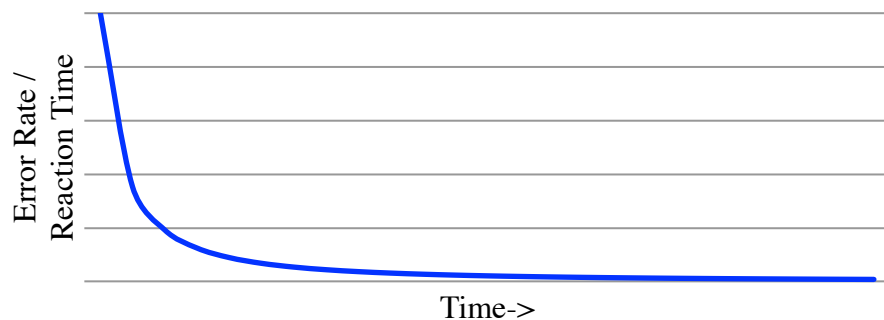
One important construct in skill research is the distinction of ‘declarative’ knowledge and ‘procedural’ knowledge (Anderson, 2010; Cohen & Squire, 1980). Declarative knowledge denotes storage and retrieval of information while procedural knowledge encodes *how to execute* a task. This distinction has been relevant not only to general cognition (Cohen & Squire, 1980; Squire, 1987, 1992), but also to SLA in particular (Ullman, 2001a, 2001b, 2004).

Another crucial concept in any theory of skill acquisition is the role of ‘practice’. Knowledge of a skill is inadequate to account for skill performance. Knowing the basic operations of driving a car does not make one a qualified racecar driver. Relating practice to expertise, Anderson (2010) discusses the three sequential stages of skill development: ‘cognitive’, ‘associative’ and ‘autonomous’. The cognitive stage consists of declarative

knowledge of the skill where performance is inconsistent and relatively slow. With practice, declarative knowledge becomes proceduralized in the associative stage. At this point, initial errors undergo revision and connections between associated knowledge strengthen, improving the accuracy and speed of processing. While both declarative and procedural memories are available for task demands, the procedural memory produces more accurate and quicker performance. The final autonomous stage reflects increasing automaticity, or restructuring (Cheng, 1985), in retrieval and performance. These qualitative changes in skill acquisition are also reflected in quantitative changes in decreased areas of neural activity (Qin, Sohn & Anderson, 2003).

In relation to the interface between the constructs of accuracy and speed, another particularly salient issue in skill acquisition theories is the ‘power law of learning’: error rate and reaction time decrease fast at first and decrease more slowly with additional practice (Anderson, 2010; Newell & Rosenbloom, 1981). The graphical representation of this construct creates what is referred to as a ‘power function’, shown in Figure 2.6.

Figure 2.6: Power Function (Newell & Rosenbloom, 1981)



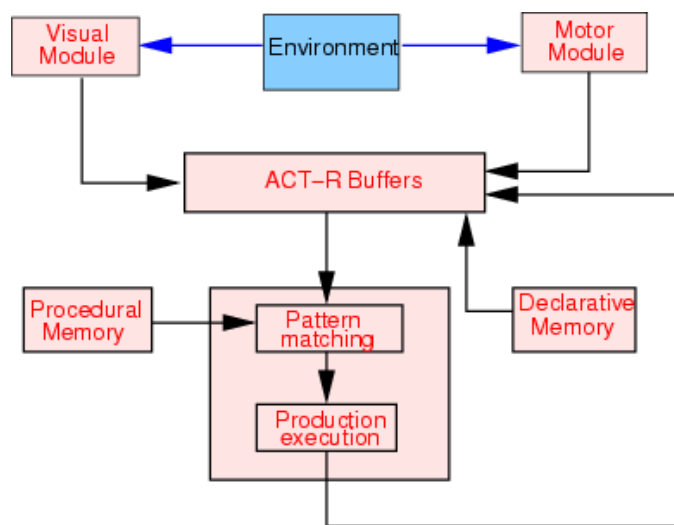
The reverse of this construct is the ‘forgetting curve’ (Anderson, 2010) in that in the absence of additional practice, error rate and reaction time increase.

2.4.1 Rule-Based Theories

One popular ‘rule-based’, or ‘symbolic’ theory of skill acquisition is Adaptive Control of Thought—Rational (ACT-R) (Anderson & Lebiere, 1998; Anderson & Schunn, 2000). ACT-R is the evolution of earlier skill acquisition work by Newell (1981) and previous cognitive models such as Human Associative Memory (HAM) (Anderson & Bower, 1973), which relied on declarative memory, and Adaptive Control of Thought (ACT) (Anderson, 1976, 1993, 1996), adding procedural memory. Later, the integration of a rational dimension gave a computational-statistical approach to cognition and resulted in the initial version of ACT-R (Anderson & Lebiere, 1998).

ACT-R is a symbolic cognitive architecture used to model learning, memory, problem solving, decision-making, perception and attention. Proposing to model cognition based on neural activity, the framework involves the interaction of distinct components responsible for different processes of skill learning and use. Figure 2.7 below depicts the architecture of ACT-R:

Figure 2.7: ACT-R Architecture (Anderson, 2013)



First, it is important to note that ACT-R uses highly technical, cognitive science and model-specific terminology, which is discussed below. The model consists of a symbolic level involving declarative and procedural memory ‘modules’ and a subsymbolic level with ‘buffers’ that process the interaction between modules and ‘pattern matchers’. The subsymbolic level consists of a large set of neural-like parallel utility equation processes that resolves redundancies and determines symbolic structure availability. While the declarative system represents facts, the procedural system provides rules for how to execute a given cognitive task. More specifically, procedural memory is a production system of condition-action pairs; that is, a particular action is triggered in response to the associated condition(s). For example, at a stoplight a trained car driver quickly engages the action of accelerating the vehicle when the condition of a green traffic light registers.

Such production rules are formed by analogy abstraction from examples (DeKeyser, 2001); however, each example is not necessarily stored in long-term memory. A language-related example is the use of the simple past tense morphology in English (‘-ed’). While children are exposed to many different verbs with the ‘-ed’ suffix, specific items such as ‘talked’ are not retrieved. Instead it is the production rule abstracted from all of the previous experiences that calls for the application of the morpheme to reflect past tense. That is not to say that specific examples have no further role in ACT-R. Even in the autonomous stage, very frequent examples can be stored and retrieved, often more quickly than the performance of the production rule system.

The subsymbolic system is also responsible for adapting the system based on experience in order to learn and change the modules accordingly. ‘Restructuring’ is one way to conceptualize these adaptations (McLaughlin, 1990). While automaticity most often refers simply to the speeding of processes and strengthening of representations,

restructuring more appropriately describes improved performance in terms of modified algorithms, which are complex calculations of the relative probabilities of the condition-action pairs (Cheng, 1985). Occurring at the subsymbolic level within the ACT-R architecture, restructuring then modifies buffers and modules of the symbolic system. The skill, or knowledge, is accessible when these activations and strengths reach adequate levels. This modification allows for the selection of more probabilistic knowledge and production rules that, over time, improve skill performance. A clear L2 example relates to proficiency. Over development, quicker and more accurate retrieval of the L2 reflects the stronger representation of L2 knowledge at the symbolic level and restructured processing at the subsymbolic level.

Nevertheless, skill performance and acquisition are not without the influence of top-down features such as ‘strategies’ (Anderson & Schunn, 2000; Lovett & Anderson, 1996). The selection of a certain strategy, or production in ACT-R, over an alternative strategy corresponds to the two subsymbolic constraints of minimizing effort and maximizing accuracy. Both features consist of probability weights associated with expected effort and success. In selecting between competing strategies, ACT-R computes the tradeoff between the two factors. With practice, accuracy increases and effort decreases for ultimately optimal strategies while less reliable or taxing strategies weaken.

However, research on ACT-R has a tendency to focus on the acquisition of fairly simple skills such as basic addition and binary decision-making, such as predicting coin flips (Altmann & Burns, 2005). In dealing with more complex skills, ACT-R remains staunchly reductionistic: the acquisition of more complex skills entails the acquisition of each of the component skills needed. Indeed, even the book that introduced ACT-R, *The Atomic Components of Thought* (Anderson & Lebiere, 1998), is overtly reductionistic. This characteristic comes from past models of the physical sciences that posited that

everything was reducible to atoms; ironically, now even atoms are not considered the smallest unit of measure, but rather as comprised of even smaller components.

2.4.2 Exemplar-Based Theories

An alternative approach to cognition is ‘connectionism’, a model of interconnected networks of simple items. This type of theory is also known as ‘exemplar’ or ‘item-based’ models (N. Ellis, 2002a, 2002b, 2005; Logan, 1988, 1992, 2002; Palmeri, 1997, 1999; Pierrehumbert, 2001). This framework grew from work on artificial neural network modeling called ‘parallel distributed processing’ (PDP) (Rumelhart, McClelland & Group, 1986). This approach was a departure from previous theories that posited serial activation and symbolic representation. For example, in a serial model (Levelt, Roelofs & Meye, 1999) the components of listening comprehension occur successively: audition, phonological decoding, lemma retrieval, etc. Rather, PDP posits that each process occurs in parallel, and that incremental input continuously activates relevant knowledge. Similarly, ‘spreading activation’ arises as parallel processes trigger subsequent activations. For example, Spivey, Grosjean and Knoblich (2005) demonstrated that hearing the initial phoneme /bi/ triggers all words beginning with that phoneme weighted by relative frequencies. Tracking the computer mouse movements of participants, the results show a significant divergence and attraction toward a visual competitor representing a ‘beaker’ when the spoken stimulus is ‘beetle’. Conversely, no divergence from a direct path to the ‘beetle’ occurs when the non-target item was an image of a ‘dolphin’. Such exemplar or item-based theories of skill acquisition rely on the accumulation of experiences with specific realizations of a given skill. Rather than considering skill performance as the result of production rules, item-based accounts focus on units of exemplars.

A strong form of an item-based theory is Logan's Instance Theory of Automaticity (Logan, 1988, 1992, 2002). Logan argues that early skill performance derives from algorithmic rules and later automaticity represents direct retrieval of specific memory units. Practice plays the role of strengthening the representation of an item, thus increasing the probability of activation and speedy retrieval of that item. For example, in vocabulary development, reading a new word only once in a text provides a weak representation of the novel item. Repeated exposure in different contexts and modalities strengthen the new representation, increasing the availability and retrieval speed of the new word. This appears to be very similar to the relationship between exemplars and production rules in ACT-R. However, the primacy of rules in the ACT-R is replaced in instance theory by an extreme favoring of specific items for Logan. Memory encodes and retrieves only items identical to those previously experienced. This scenario, however, greatly problematizes the theory's validity when considering linguistic variation and the recursivity, or creativity, of language given the constraints of syntax and semantics (Chomsky, 1976). As such, no novel utterances or behavior are possible due to a complete lack of available exemplars.

Palmeri (1997, 1999) expanded on the idea of item-based retrieval to involve item similarity and the formation of categories, abstracted from sets of related items. In addition, Palmeri eliminates first-item retrieval and favors a 'random walk' model in which response competition produces the best response, rather than simply the first. Returning again to the example of vocabulary, in speech production the first word activated to refer to a specific object may be 'chair'; though this is inexact and the processor subsequently selects the more appropriate item of 'couch'. Thus, Palmeri's adaptation allows for non-identical items. Later, the elaboration of categories enabled the modeling of linguistic phenomena as well. In highly influential work, Bybee (2001) and

Pierrehumbert (2001) applied exemplar-based theory to phonological development, activation and historical change. Pierrehumbert represented phonetic categories as ‘exemplar clouds’ of similar items. These clouds are metaphorical representations of exemplars from previous input, which are distanced by similarity and frequency. A specific example is the abstract phonetic category of /a/, comprised of the variety of the instances experienced by an individual, including idiosyncratic variation in formant values.

Ultimately, it may not be the case that cognitive psychology must choose between rule-based and item retrieval-based theories of skill acquisition. For example, Carr and Curren (1994) argue for a dual-mode approach in which both rule-based and exemplar-based systems are available and can operate in parallel. Later, the two systems may interact as products of the rule-based system become exemplars. Indeed, both Anderson’s ACT-R as well as some instance-based theories allow for both processes, though differentially important.

2.4.3 Application to SLA

Theories of skill acquisition account for general cognitive abilities that govern the development of a range of skills beyond the scope of just language, such as problem solving, perception and cognitive arithmetic. However, the question addressed in the current section is the applicability of different types of skill acquisition theories to SLA. While much work in SLA focuses on field-specific theoretical frameworks, two early studies that sought to address SLA specifically in terms of general cognitive theories of skill acquisition are those of DeKeyser (1997) and Robinson (1997).

DeKeyser (1997) investigated the development of written production and reading comprehension skills of morphosyntax in a miniature artificial language, *Autopractan*, in

the framework of ACT (Anderson, 1993, 1996) and ACT-R (Anderson & Lebiere, 1998). All participant groups, of approximately 20 each, had equal amounts of comprehension and production practice across the two skills. For comprehension, participants selected the appropriate image that matched a given sentence displayed on the computer screen. Similarly, production practice involved typing a sentence according to a given image. However, groups varied in the amount of practice in each skill for each of four morphosyntactic rules. These rules are the marking of number and case for nouns and gender instrumentality for verbs. Instrumentality indicates whether the action of verb requires some type of instrument or tool. Results showed that performance was distinctly skill-specific, corresponding to the skill that was practiced. That is, participants who practiced a certain rule in comprehension tended to do very well when tested on that rule in a comprehension format, but not when they had to produce by writing an answer with the same rule. In addition, over the course of 15 sessions, both accuracy and reaction time results followed a power function as error rate and reaction time each decreased, depicted in Figure 2.6 in Section 2.2 above. While one intention was to investigate the relative degree of automaticity with a dual-task condition, results were not significant, potentially due to an oversimplified distraction task. DeKeyser interprets these findings as support that L2 development proceeds in the same way as other cognitive skills, in accordance with ACT-R. However, DeKeyser does not discuss the findings in terms of the possibility of an item-based model of skill acquisition.

Conversely, Robinson (1997) specifically designed a study to test Logan's (1988) Instance Theory of Automaticity. This study investigated native Japanese-speaking late learners of L2 English in acquiring argument structure frames of novel verbs of English. The rule involved dative structure differences according to syllabic realization of English verbs. Monosyllabic verb stems allow for dative alternation ('John gave *Mary* the cake' /

‘John gave the cake *to Mary*’) where double object or the prepositional structure ‘to + *object*’ is optional. Conversely, disyllabic verb stems require the prepositional structure ‘to + *object*’ for the dative argument (‘John donated the piano to the church’ / *‘John donated the church the piano’). Training modality differentiated the groups. The ‘implicit’ training group participants read sentences and were instructed to try to remember the position of words in the sentences. Then, participants were asked whether two specific words appeared together and were given evaluative feedback. The ‘incidental’ training group read the same sentences and were asked meaning-oriented questions only. The ‘focus on form’ group read the same sentences with boxes surrounding the pertinent information concerning verb syllables and dative type. Results were non-significant on previously trained test items across groups. In addition, frequency of items negatively correlated with reaction times across groups in that a sentence previously presented one time elicited a reaction time longer than a sentence previously presented ten times, which was taken to support instance theory (Logan, 1988, 1992, 2002). However, the focus on form group responded significantly more accurately and quickly when judging novel ungrammatical sentences, supporting a rule-based approach to learning. However, while an equal number of participants from each group reported trying to figure out a rule, over twice as many participants who were instructed via focus on form successfully understood and could verbalize the rules. Echoing the above discussion of the concurrent involvement of both types of skill acquisition, Robinson concludes that “rule-based knowledge developed through conscious effort and implicit memory-based knowledge interacts in decision-making” (1997, p. 242). Thus, it appears that learning context is one factor in favoring one mode of learning over another.

One important consideration in application of theories of skill acquisition to SLA is that the previous L2 research focused on relatively simple skills. Narrow

morphosyntactic phenomena like noun-number agreement or dative alternation are hardly representative of the complex task of communication. The next step in aligning theories of skill acquisition to SLA is then to investigate much more complex phenomena, such as L2 pragmatic comprehension, the focus of the current study.

2.4.3 Application to L2 Pragmatic Comprehension

In comparison to the morphosyntactic phenomena investigated by DeKeyser (1997) and Robinson (1997), L2 pragmatic comprehension is a very complex skill, comprising several sub-skills associated with lexicon, syntax, morphology, phonetics, phonology, target-language sociolinguistic norms and universal pragmatic knowledge. Perhaps the development of sub-skills such as lexical retrieval and the interpretation of contextual cues approximates the power function shown in Figure 2.6, but the interaction between several components at different points of development could prevent a true power function for pragmatic comprehension. Conversely, L2 pragmatic comprehension, despite its complexity, may develop in the same way as other cognitive skills. Indeed, this question additionally speaks to the distinction between language functions versus forms. Certainly a variety of rules and exemplars exists in pragmatics as in morphosyntax. Therefore, exploring theories of skill acquisition in relation to L2 pragmatic competence facilitates discussion of not only development, but also L2 pragmatic representation.

As discussed in Section 1.2, the L2 pragmatic listening comprehension studies of Taguchi (2002, 2005, 2007, 2008a, 2008b) offer empirical research interpretable through theories of skill acquisition. In laboratory-based experimental pragmatics research, Taguchi examined L2 development and differences of both accuracy and reaction time on a listening comprehension task, consistent with skill acquisition research. A notable issue

in her collective results in relation to theories of skill acquisition is the inconsistent relationship between accuracy and reaction time. The claim is that it shows support for the separate development accuracy and comprehension speed along Bialystok's (1993) two-dimensional model, discussed in Section 1.1. Taguchi (2008b, p. 36) concludes:

Finally, the development of pragmatic comprehension should be analyzed separately for accuracy and processing speed because ... the degree of development differed between these two attributes. Speed showed distinct characteristics, independent of general L2 proficiency or accuracy of comprehension. It suggests that analysis of accuracy and speed combined could provide more meaningful developmental accounts of pragmatic comprehension.

However, this conclusion seems to conflict with theories of skill acquisition (Anderson, 1996; Anderson & Lebiere, 1998; N. Ellis, 1998; Logan, 2002; Newell & Rosenbloom, 1981; Palmeri, 1997). These approaches discuss the development of knowledge and processing as correlated processes. With practice, more accurate pragmatic comprehension should be the result of more reliable and increasingly automatic production rules interacting with competence in terms of ACT-R. Similarly, increased L2 experience should provide more exemplars and stronger representation, leading to decreases in both error rate and processing time in connectionist models (Logan, 1988, 1992, 2002; Palmeri, 1997, 1999). In an attempt to provide a theoretical validation for examining both accuracy and reaction time, Taguchi does in fact discuss Anderson's ACT-R very briefly in most of her studies (Taguchi, 2007, 2008a, 2008b, 2011a). However, she gives no account of what kind of rules, symbolic representation or subsymbolic restructuring are relevant in L2 pragmatic comprehension if the results are truly in line with ACT-R. Unfortunately, this tendency to refer to a theoretical approach without exploring the specific implications is common in L2 pragmatics research. Still

unexplained is how ACT-R accounts for L2 pragmatic comprehension or whether an item-based model offers a better fit.

While in each of Taguchi's studies the participants become more accurate and quick to respond on the pragmatics listening task, each study investigates different factors. In two studies (Taguchi, 2007, 2008a), the subcomponent of lexical access speed significantly correlates to gains, but not to other cognitive measures. Eventually, Taguchi (2008a, 2008b) turned to the effect of L2 exposure beyond the classroom. This measure of extracurricular L2 experience corresponds more directly to the role of practice in theories of skill acquisition. She found significant correlations only between gains in speed and time spent speaking and reading the L2, but not in listening. These results again are problematic for interpretation according to theories of skill acquisition. Given the relative lack of transfer of practice-based effects between production and comprehension skills found previously (DeKeyser, 1997; DeKeyser & Sokalski, 1996), time spent listening to the L2 should hypothetically be the most robust practice correlate of gains on a listening task.

Furthermore, cognitive theories must be able to account for the reality of development of speech act interpretation across degrees of (in)directness. Taguchi did find a difference in accuracy and reaction time for conventional versus implied refusals; however, unknown is whether comprehension of each level is a different, specific skill that develops independently. Again, would different theories of skill acquisition be better suited to explain the development of different levels of directness?

While each level of directness of a single speech act correlates to the same communicative function, specific linguistic realizations differ according to the theory of implicature and the norms of the target language, discussed specifically in regard to Spanish requests in Section 2.2.4. Nevertheless, increasing indirectness requires a larger

repertoire of appropriate forms as well as more control of processing in order to attend to contextual cues for interpretation. It is this disparate variety of realizations and directness categories that encourages further application of skill acquisition theories. One opportunity to assess the rival models of skill acquisition is found in two specific predictions for data in Palmeri's (1997) exemplar-based model relating to categories: (1) similarity of an item to other exemplars of the same category decreases RT and (2) similarity of an item to exemplars of other categories increases RT. In a discussion of Palmeri's predictions, DeKeyser (2001, p. 136) offers two questions for future research: (1) "how within-category and between-category similarity would interact in the automatization process" and (2) "how differing item similarity within a category would affect retrieval of individual items".

The study of L2 pragmatic comprehension provides one direct test of Palmeri's predictions and DeKeyser's questions. In the context of Spanish requests, there are inevitably more and less similar utterances within each degree of directness of a given speech act, as well as between categories of speech acts. Figure 2.8 shows one similar pair example:

Figure 2.8: Similar Items of Different Speech Act Categories

<i>¿Podrías comprarte un libro hoy?</i>	SUGGESTION/ADVICE
'Could you buy (yourself) a book today?'	
<i>¿Podrías comprarme uno también?</i>	REQUEST
'Could you buy me one also?'	

Both utterances involve the highly conventionalized features of the auxiliary verb *poder* ‘to be able’, syntactic mitigation through conditional morphology (*-ías*), listener-oriented deixis (*tú* ‘you’), interrogative intonation and the same conceptual verb *comprar* ‘to buy’. However similar, each utterance corresponds to distinct speech acts. According to Palmeri, the interpretation of such similar items should display increased latency in the form of relatively longer reaction times.

Such cross-category similarity introduces a potential complication in skill acquisition when learners apply explicit rules, whether accurately or not. Skehan (1996, p. 40) agrees: “There is natural and unavoidable use of strategies of *comprehension*, in that non-deterministic and non-exhaustive methods are used to recover intended meaning, with the success of this operation often being depended on only partial use of form as a clue to meaning”. Skehan (1996, p. 40) further argues that such strategies used to overcome communicative or cognitive pressure may become “*too effective*” and proceduralize, preventing further development past the well-represented and quickly retrieved L2 knowledge. Bialystok (1993, p. 54) echoes this concern in that adults L2 learners “need to continue to build up their repertoire of formal linguistic resources and to verify that their organization of the system has followed the correct categories”. The issue then is when symbolic representation does not connect forms to the appropriate categories of meaning and/or usage. As such, learners may develop L2 comprehension strategies that overgeneralize the categorization of surface forms shared across speech acts. For example, the use of interrogative intonation does not necessarily correspond to directives; rather, it can be used to mitigate other communicative functions such as commissives: *Yo podría hacerlo?* ‘I could do it?’, which is different from the question *¿Podría hacerlo (yo)?* ‘Could I do it?’. That is, learners may generate categories of similar items that are incongruent with the target language.

2.4.4 Theoretical Extension of Skill Acquisition Theories for L2 Pragmatic Comprehension

Additionally, within-category similarity has the added influence of transfer in the SLA context. That is, equivalent categories that share features in the L1 and L2 may exhibit decreased reaction times in accordance with Palmeri. Conversely, L2 items, which have no L1 equivalent, may register slower responses. For example, native English-speaking learners of Spanish will share request exemplars formed with imperative verbal morphology or the conventionalized modal verb structure *poder* ‘to be able’. Therefore, these items would be predicted to show more accuracy and faster reaction times than other DR and CI requests in Spanish.

Furthermore, the varying effects of different types of practice will influence L2 pragmatic comprehension. In the context of Spanish L2 instruction, there are multiple sources of practice. L2 practice occurs in the classroom and outside the classroom, such as in studying for the class, reading or listening to Spanish and interacting in Spanish. This practice differentially targets the componential skills of lexicon, syntax, phonetics, phonology and contextual inference needed to develop and use pragmatic competence. In the context of skill development specificity (i.e. production versus comprehension) (DeKeyser, 2007; DeKeyser & Sokalski, 1996; Shintani & Ellis, 2010), practice relating to listening and analysis of communicative function should correlate to higher gains in accuracy and reaction time reduction.

Analysis of communicative function can be found in the form of speech act categorization practice available in some foreign language textbooks (Murphy, Ogando-Lavin & Méndez-Montesinos, 2011). This functional organization of utterances introduces learners to the concept of the categorization of the communicative uses of language. In the curricular context, learners experience these activities at specific times in

the semester. Thus, perturbations in L2 pragmatic comprehension development could be predicted to appear at data collection points subsequent to speech act practice.

Finally, it is important to continue to develop research on L2 pragmatic comprehension grounded in cognitive theories of development. General theories of cognitive skill acquisition provide well-established models to start the discussion. However, these theories require deeper understanding and application to L2 pragmatic phenomena in order to offer reliable and generalizable research. A reasonable first step is to pursue *the development of the understanding of L2 speech acts that reflect different degrees of directness*, which is a specific area missing from L2 pragmatic comprehension research. Moreover, the traditional approaches to skill acquisition discussed earlier do not offer a framework that encompasses the myriad changing influences on development. As an alternative, the current study offers an opportunity to explore the application of CT/DST as a modern offspring of exemplar theories and Chaos Theory that has recently found favor in a small sector of SLA research.

2.5 CURRENT STUDY

In the current study, the complex system of interest is L2 pragmatic comprehension, which *emerges* over the course of general L2 development, a superstrate complex system. As such, the L2 pragmatics system represents interactions among other subsystems associated with lexicon, syntax, morphology, phonetics, phonology, target-language sociolinguistic norms and universal pragmatic knowledge, to name a few. It is the interdependence of such subsystems that underscores pragmatics as a complex system. Take, for example, the disproportionate role of the addition of linguistic items to a speech act. In certain instances, the inclusion of a single lexical unit such as *por favor* ‘please’ overtly determines the function of an utterance as a request while a lengthy

justification serves only for mitigation. This complexity as well as a rich history of CCSARP framework development showing varied degrees of realization and a variety of strategies makes the request speech act a particularly attractive feature to apply a dynamic systems approach to L2 development. The lack of cognitive studies of L2 pragmatic comprehension and the cursory findings of differential levels and rates of development demand more detailed research.

2.5.1 Research Questions

In consideration of the previous research discussed above, and Kasper's (2009) the call for further experimental pragmatic work, the purpose of this study is to examine the developmental trajectory of L2 comprehension of the request speech act. The data involve accuracy and speed measures over the course of one semester by native English-speaking university students learning L2 Spanish. This language pairing is particularly interesting due to overlapping and exclusive forms of requests. Additionally, this study seeks to illuminate the development of L2 pragmatics as a complex, dynamic system through the analysis of the relative yet concurrent development of nested levels of speech act directness in relation to experiential variables. The following research questions guide the current study:

- (1) What is the nature of the developmental trajectory of Spanish L2 request comprehension over the course of one semester of study, in terms of accuracy, comprehension time and the relationship between the two measures?*

While traditional research exposes differences between proficiency groups or even a single group's performance over time, this change remains hidden by limited data

collection. The purpose of this study is to offer a fine-grained analysis of the change that occurs over development. Importantly, the relationship between changes in accuracy and comprehension speed is key to considering differences between theories of skill acquisition. Without alternative models of developmental trajectory, the relationship between accuracy and reaction times is expected to follow the power function of learning (Figure 2.6) where accuracy increases while reaction time decreases quickly at first and slows later.

(2) How do the developmental trajectories of different levels of directness of requests vary relative to each other?

In light of previous findings by Taguchi (2005) and Röver (2005) discussed in Chapter 1, the three levels of requests – direct, CI and NCI – should show differential yet concurrent development. This hypothetical difference in development along levels of directness is conceptually different from models of L2 request development that depict learners passing from one stage to another, as if the more direct levels are wholly learned before a learner is able to progress through the next, more indirect level of expression. However, the scale of improvement may vary by level of directness.

(3) What experiential factors account for the variation in the development of accuracy and comprehension speed?

The current study probes explicit strategy usage, time spent studying outside of class, time spent listening and reading, time spent interacting and accuracy versus speed focus at each data collection point. In addition, data analysis takes into account previous

experience with and timing of speech act categorization practice, curricular pressures, overall proficiency improvement and general L2 Spanish learning motivation. Relevant to the CT/DST framework, the current study assumes all factors to be potentially dynamic, as opposed to static. Given the findings by Taguchi (2005, 2007, 2008a, 2008b, 2011a, 2011b), proficiency is expected to factor positively into initial performance and development. In addition, time spent listening to and reading Spanish outside of coursework should correlate to more accurate interpretation and faster comprehension speed due to a skill specific practice effect, reflecting the findings by DeKeyser and Sokalski (1996). Finally, it is anticipated that higher accuracy will be associated with strategies that correspond to conceptualizing the meaning of utterances in the context provided. Conversely, strategies that overgeneralize specific linguistic features as indicators of requests should produce relatively inaccurate, but quick responses.

2.6 SUMMARY

This chapter provided the theoretical and historical context for the motivation for this dissertation described in Chapter 1. It began with the general concerns of SLA research that inevitably manifest in aspects of this study of L2 pragmatic comprehension development. Next, different perspectives of development were discussed in order to inform the current study of process over products. Subsequently, theories of skill acquisition frame the fundamental background for the development of CT/DST. Finally, this discussion culminated in a description of the current study of the developmental trajectory of L2 pragmatic comprehension of Spanish requests across degrees of directness over the course of one semester of study. Next, Chapter 3 describes the experimental methodology for addressing the research questions above.

Chapter 3: Methodology

In order to answer the research questions above, this longitudinal study employs a computerized pragmatics listening comprehension task based on work by Taguchi (2002, 2005, 2007, 2008a, 2008b, 2011a). This experiment measures accuracy of speech act interpretation and reaction time for each participant's interpretation decision to provide data related to the first two research questions. In addition, experiential variables for the third research question derive from post-experimental introspective written protocols probing strategies for response selection and time-varying variables of Spanish exposure and use. While qualitative differences in experience and strategy use structure the results reported in Chapter 4, the analysis is strictly quantitative.

3.1 PARTICIPANTS

Given that accuracy is a principal component of the data analysis for L2 learners, native speaker results serve as an inter-rater reliability measure of the experimental stimuli. Two groups of five native Spanish speakers participated in the experimental data collection in order to validate the study materials. These participants are graduate students in Spanish literature at a large southwestern United States university, recruited through an email targeting Spanish native speakers seen in Appendix B.

The final focal group for this study includes 25 university students enrolled in the same level of first semester of second-year Spanish language classes. An email announcement, available in Appendix C, was sent through instructors to all sections of the target Spanish course level, and served as the primary form of recruitment. The announcement contained a brief overview of the study, including time commitment, compensation, restrictions and principal investigator contact information. Out of approximately 100 volunteers, 44 participants initially participated in the study. During

the course of the study, four ceased involvement voluntarily. Another 15 were eliminated so as to exclude learners who grew up with Spanish-speaking family members or otherwise in a Spanish-speaking environment, based on responses to the background questionnaire seen in Appendix D that probed L1 and L2 language background, self-rated L2 proficiency level, previous travel and residence abroad in a Spanish-speaking country and Spanish coursework. The remaining 25 learners participated in a series of data collection sessions over the course of one long semester. In all, 19 participants completed all five sessions and six missed only one session. Any missed sessions occurred only during the third or fourth data collection sessions. Additional data for end proficiency and motivation to continue to study Spanish were collected after the final data collection session. For reference, Table 3.1 below shows the distribution of the characteristics of the 25 participants retained in the study.

Table 3.1: Participants Characteristics

Participant Number	Beginning Proficiency	End Proficiency	Net Proficiency Change	Previous Semesters of Spanish	Previous In-Residence Spanish	Motivation
1001	3	5	2	5		
1002	6	6	0	12	✓	✓
1003	3	4	1	1	✓	✓
1004	5	6	1	8		
1005	2	5	3	5	✓	
1006	3	5	2	7	✓	✓
1007	3	4	1	7	✓	
1008	4	3	-1	9	✓	
1009	4	5	1	5	✓	
1010	2	4	2	8		✓
1011	5	5	0	10		✓
1012	4	4	0	7	✓	✓

Table 3.1 continued

1013	4	3	-1	5	✓	✓
1014	4	4	0	7	✓	
1015	5	6	1	9	✓	
1016	4	4	0	1	✓	✓
1017	4	4	0	9	✓	✓
1018	5	4	-1	8		✓
1019	3	4	1	1	✓	
1020	3	5	2	5	✓	
1021	5	6	1	8		✓
1022	6	5	-1	7	✓	
1023	7	6	-1	7	✓	
1024	3	4	1	9	✓	✓
1025	3	3	0	7	✓	✓
Mean	4.0	4.6	0.6	6.7		
<i>sd</i>	(1.3)	(1.0)	(1.1)	(2.7)		
Minimum	2	3	-1	1		
Maximum	7	6	3	12		

In order to secure sufficient participation over the course of the study, participants received compensation, structured as follows: \$5 per session for each of five sessions, \$10 bonus for completing fewer than five sessions, but including the final session, and \$25 bonus for completing all five sessions. This incentive program enabled participant recruitment by offering up to \$50, provided that a participant attended all five sessions. The final session bonus sought to ensure end-point measurements, even if participants were unable to make one of the sessions.

3.2 INSTRUMENTATION

The data collection involved a computerized listening task, using the experimental stimuli presentation software SuperLab 4.0, Windows edition and Cedrus RB 830 button response pads. The experimental task required participants to categorize each individual utterance either as a request or not a request. As such, correct categorization reflects L2

pragmatic comprehension of the intended communicative function. In order to provide a basic contextual frame, the instructions indicated that all utterances are parts of conversations between two college-aged female roommates who also work together.

The design of the experiment avoids unwanted artifacts and biases. A counter-balanced randomized stimuli list design prevents a training effect that stems from exposing the same set of stimuli multiple times to participants. There are five lists, individually presented at each of five data collection waves. Each list was presented to participants in a random order to prevent any potential ordering effect and each participant completed each list, except in the case of missed sessions. The ordering of lists across participants was randomized as well. The study stimuli included a balanced design of 300 total items, of which 150 were requests and 150 were non-request distracter utterances divided evenly among the five lists. A complete inventory of items is available in Appendix E. The experimental request items differ by level of directness, following from Speech Act Theory (Austin, 1962; Searle, 1969): 50 DI, 50 CI and 50 NCI. The five lists are further balanced in that each list includes 10 direct requests, 10 CI requests, 10 NCI requests and 30 distracters. The distracters were distributed relative to the request items. Each group of 30 distracters included an equal number of direct, conventional and implied expressions, realized with similar structures and lexicon as the requests in the same stimuli list.

The analytical framework for Spanish requests discussed in Sections 2.2.3 and 2.2.4 serves as the basis for the design of stimuli of the current study (Achiba, 2003; Blum-Kulka, 1984; Blum-Kulka et al., 1989; R. Ellis, 1992; Koike, 1989b, 1994). Due to experimental constraints and direct effects on reaction time, request realization avoids pre-head acts, lengthy post-head acts and the overt marker *por favor* ‘please’. Also, the stimuli preclude performative (e.g. utterances that begin with *Te pido ...* ‘I ask you ...’).

As such, each request utterance is interpretable only as a request globally (considering the entire utterance) rather than being specified by a particular constituent.

In addition, request stimuli utilize a comparable distribution of modification strategies outlined by Schauer (2004) and seen in Appendix A across the five experimental lists in order to reflect a realistic range of possible realizations across varieties of Spanish. Figure 3.1 below shows example stimuli distributed across degrees of directness and mitigation strategy.

Figure 3.1: Example Request Stimuli

Level	Spanish Utterance	English Translation	Mitigation
DR	Llévame a la biblioteca central.	<i>Take me to the main library.</i>	None
	Tienes que pagarme este fin de semana.	<i>You have to pay me this weekend.</i>	Obligation Statement
	Ayúdame con las tareas, un ratito.	<i>Help me with the chores for a minute.</i>	Lexical Understater
	Quiero que pagues la cena hoy.	<i>I want you to pay for dinner today.</i>	Need/Want Statement
	¿Me sacas la basura de la cocina?	<i>(Will) you take out the kitchen trash for me?</i>	Interrogative Intonation
CI	¿Puedes llevar mi gato al veterinario?	<i>Can you take my cat to the vet?</i>	None
	¿Vas a recoger tu basura, quizás?	<i>Are you going to pick up your trash, perhaps?</i>	Lexical Understater
	¿Por qué no me esperas y luego vamos?	<i>Why don't you wait for me and later we go?</i>	Negation
	Creo que puedes traer el vino.	<i>I think you can bring the wine.</i>	Mental State Verb
	¿Podrías callarte ahora?	<i>Could you shut up now?</i>	Syntactic
NCI	Haces mucho ruido en la mañana.	<i>You make a lot of noise in the morning.</i>	None
	Necesito papel para imprimir el ensayo.	<i>I need paper to print my essay.</i>	Need/Want Statement
	Tienes mucha ropa en la sala, chica.	<i>You have a lot of clothes in the living room, girl.</i>	Lexical Understater
	No he conocido a tu novio acá.	<i>I haven't met your boyfriend here.</i>	Negation
	Tomaría café si alguien lo hiciera.	<i>I would have coffee if somebody made it.</i>	Syntactic

The example utterances above come from different lists of actual stimuli and offer a general overview of the type of vocabulary and grammatical variety distributed in the experimental materials. Accordingly, DR requests often use imperative verb forms such as *Ayúdame* ‘Help me’ and need/want statements like *Quiero que pagues ...* ‘I want you to pay ...’ that make explicit reference to the requested action by the part of the listener through a spoken verb phrase. The realization of CI requests employ the conventionalized

formulae observed in Spanish (Félix-Brasdefer, 2005) as listed in Figure 2.3. A prime example is the use of the modal *poder* ‘to be able to’, which is commonly accepted to indicate a request rather than an inquiry of ability. NCI requests avoid direct reference to the targeted action requested, as seen in *Haces mucho ruido en la mañana* ‘You make a lot of noise in the morning’. This utterance does not directly or conventionally indicate the speaker’s implied request that the listener make less noise. In addition, distracters are formulated from a variety of non-request speech act categories. Furthermore, within each of the five experimental lists, the 30 distracters are formulated with the same distribution of directness levels and mitigation strategies as the request items.

For the audio stimuli, a female native speaker of Costa Rican Spanish recorded the utterances for experimental presentation. The recording was performed using a Røde NT3 microphone and an Edirol by Roland R-09-HR high quality digital audio recorder. In the audio editing software Adobe Audition, the mono-channel audio track was then matched to two channels to deliver the same exact audio signal to both channels, left and right. Next, this audio signal was normalized to standardize the highest volume peaks and boost the mid-range of the signal to optimize audibility. Subsequently, each utterance-stimulus was extracted as individual audio files in the ‘.wav’ format so as to eliminate any silence before the onset of speech. This procedure was carried out in the software PRAAT in order to cut the audio according to the visual spectrograph, which in turn provides an objective measure of speech onset used to measure reaction time.

In order to validate the categorization of +/- request experimental stimuli, 10 native Spanish speakers participated in a single session, each involving all 300 items. The results from the first group of five native Spanish speakers yielded a Cronbach’s $\alpha=0.65$. However reliable, the native speakers did not consistently rate all items as designed. Therefore, every item for which 3 out of 5 native speakers responded with the opposite

category was replaced. Five of 150 distracters, one of 50 DI requests, two of 50 CI requests and 22 of 50 NCI requests were edited or replaced. The disproportionate number of NCI requests replaced is due to the implied nature of such utterances. Although each could be explained as an indirect request, it is important in the experimental context that the most probabilistic interpretation is controlled. The revised stimuli were again subjected to five native Spanish speakers who had not been tested previously. This group yielded a Cronbach's $\alpha = .86$, consistently in agreement with the designed item categorization as +/- request.

3.3 EXPERIENTIAL DATA

In order to collect additional data concerning practice and other experiential factors, participants completed three supplemental forms. Before beginning the study, participants filled out a brief background questionnaire (Appendix D). For each data collection session, participants completed an introspective written protocol, seen in Appendix F. The following questions formed the first part of this form:

- (1) What is your overall impression of the computerized comprehension task?
- (2) Please describe any strategies that you used to select your responses.
- (3) Do you feel that you tended to answer 'sí' or 'no' or even left or right generally or in response to specific types of prompts?
- (4) Did you ever wish you could go back and change a response after you had already clicked? Do you remember what the sentences were about when you wanted to change your mind?
- (5) Were you more concerned with answering quickly or correctly? How do you think that affected your responses?

Question (1) elicited holistic feedback about their experience during the study. Items (2), (3) and (5) probed whether participants applied any strategies in their decision as to how to interpret the experimental utterances. Last, (4) sought to uncover potential instances of additional utterance parses, resulting in an interpretation that conflicted with the one that triggered a response. In addition, question (4) was included in order to assess whether individual utterances were stored and represented well enough to be available a few minutes after the conclusion of the final experimental stimulus. Evidence for this type of item experience retention would favor exemplar-based theories of learning and therefore are relevant to the theoretical aims of the current study. However, no participant reported any specific utterance or approximation.

The remainder of the post-experimental written protocol is listed below:

- (6) Approximately how much time have you spent studying Spanish outside of class since the last session? (Remember, this is anonymous; you can be honest.)
- (7) Please briefly describe the type and amount of contact you have had with any Spanish *media* (i.e. movies, tv, radio, internet) since the last session – outside of class.
- (8) Please briefly describe the type and amount of contact you have had in Spanish with other *people* (e.g. workplace: customers/employees or relationships: roommate, friends, significant other) since the last session – outside of class.

These variables measured Spanish exposure and use that can vary by individual and time point including time spent (6) studying for their Spanish class since the last session, (7) being exposed to Spanish media and (8) interacting in Spanish.

After the final data collection session, participants filled out an exit survey (Appendix G) in order to ascertain holistic changes due to study involvement, end-of-study self-rated proficiency, as well as motivation to continue studying Spanish beyond basic requirements.

3.4 PROCEDURE

Data collection occurred during five periods over one long semester. The schedule was designed in order to maximize the duration of the study in one semester while leaving a two-week buffer at the beginning of the semester for recruitment and around holidays, the last week of class and before the final exam period. The study lasted 91 days from the first data collection to the last. The schedule was formulated based on the earliest and latest logistical times to have participants available, and the remaining waves are organized on having an equal time period of approximately 22.75 days between sessions.

During the first data collection session, participants first reviewed and signed an IRB approved consent form (Appendix H) and completed the background questionnaire. For every data collection session, they were then placed at a computer in a non-public accessed laboratory in a designated building on campus with a pre-determined identification number already entered into SuperLab in order to start the experiment. First, participants were shown Spanish text instructions, descriptions with examples of requests in Spanish and information as to the procedure of the experiment, accompanied by a voice-over recorded by the same Spanish native speaker who recorded the stimuli

(see Appendix I). Participants completed six practice trials in order to acclimate them to the study interface. After the practice trials, participants then began the 60 experimental trials of the study design for that session's list. Each item was presented once aurally and no feedback was given to the participant. Each utterance completed audio playback even if the participant responded before the end of the utterance. Once a response is registered, a brief pause preempts and signals the start of a new trial. Each data session includes the repetition of the instructions, examples and six practice trials in order not only to remind participants of the nature of the study, but also to familiarize them again to the voice of the native Spanish speaker. These two to three minutes also established the Spanish language mode before beginning the experimental trials. Immediately following the experimental portion of each session, participants filled out the introspective written protocol. During the final session, participants filled out the exit survey after the introspective form.

During experimental trials, participants are presented with a binary, 'SÍ' (*YES*) / 'NO' (*NO*) response option and an auditory speech act in the form of a pre-recorded utterance. Half of the participants were presented with the 'yes' option on the left and the other half saw the 'yes' option on the right to control for a potential left or right bias. In this study, individual utterance audio recordings are the stimuli, for which a response is required in the form of pressing a button. The data output for each stimulus is coded as *correct* or *incorrect*. Correct responses are recorded when a request utterance receives a 'yes' response and when a non-request utterance receives a 'no' response. Additionally, the reaction time, in milliseconds, is recorded for each button press, which is marked from the beginning of playback for each utterance.

Given the extra time necessary for completion of the consent form, background questionnaire and follow-up qualitative feedback, the first session took approximately 30

minutes per participant. Subsequent data collection sessions required approximately 15 minutes each.

3.5 DATA

The data produced by the participants of this study reflect accuracy as a d-prime (d') statistic, reaction time (RT, in milliseconds), time-varying individual differences and fixed individual background characteristics. The selection of d' in place of mean accuracy is based on Signal Detection Theory (Macmillan & Creelman, 2005) in which sensitivity to the experimental construct is extracted from data that contain biases for one response over another; 'yes' as opposed to 'no', in this case. This procedure is necessary in place of an aggregate count of correct critical items, which confounded the analysis of Taguchi (2005, 2007, 2008a, 2008b) as discussed in Section 1.2. In this study, the accuracy measure must be able to take into account a bias towards over-identifying utterances as requests, simply because the study highlights the speech act of requests.

The d' statistic, calculated based on the button responses, is a measure of distance between correct responses for experimental items and incorrect responses for distracter items commonly used to represent accuracy. Thus, larger d' statistics represent higher accuracy. D' is calculated for all items and again for each level of directness by subtracting the z-score of the percentage of distracter items that were incorrectly classified as requests, the 'false alarm', from the z-score of the percentage of correctly classified Request items, the 'hit rate', such that:

$$d' = z(\text{HIT RATE}) - z(\text{FALSE ALARM RATE})$$

Considering that probabilities for z-scores cannot be '0' (0%) or '1' (100%), it is customary to adjust such results. In the current data, every '0' percentage is replaced with '.000001' and every '1' with '.999999' in order to approximate the original values.

According to these specific adjustment values, a completely accurate result is $d'=9.51$. Given the formula above, a $d'=0$ represents completely random responses; an *at-chance* score in which the participant is equally probable to classify the target items correctly as reject distracter items correctly. Similarly, a negative d' statistic results in such a case that a participant classifies more non-requests as requests than correctly classifying requests.

Additionally, in the case of reaction time data, it is important to note that absolute values are not the focus in this experiment, but rather the relative change over time. That is, no claims or generalizations about the actual time-course of pragmatic processing are sought. Pragmatic comprehension is inherently a higher-order processing task in that it is the culmination of a variety of lower-level processing tasks. Thus, the observed reaction time data relate to the complex system of pragmatic comprehension, the emergent result of cumulative processing of a variety of linguistic and contextual phenomena. It is for this reason that the guiding research questions of the current study do not seek to uncover the time course of pragmatic comprehension in its own right, but rather the development of such processing, of which one dynamic observation can be made from reaction time changes (Spivey, 2007, p. 56).

The current data set reflects responses from the 25 participants retained for analysis. The raw data include 7140 RT observations. However, data cleansing is necessary given outlier RT values nearing 40 seconds registered in response to utterances that never exceeded six seconds. Therefore, in keeping with common practices of RT data, all data were trimmed by two standard deviations (Ratcliff, 1993) of the mean for each individual across all other categories, resulting in 6811 remaining observations. Next, overall accuracy for each participant results from d' values calculated from the trimmed data of all trials per session. Additional d' statistics are calculated for each of the

three levels of directness of requests per participant, per session, in order to track the relative trajectories.

The final data set was created after dropping the distracter and incorrect request response observations in accordance with the practice of analyzing only correct trial reaction times, resulting in 1904 RT observations.

The time variable in all models reported in the results in Chapter 3 uses the continuous measure of number of days from the initial session for each participant as opposed to the categorical *wave* designation since participation occurred optionally over the course of a three-day window at each wave. However, the term ‘wave’ is maintained for simplicity of reporting and discussion.

The independent variables coded in the final data set include beginning proficiency, end proficiency, net proficiency change, previous in-residence Spanish credit, time spent studying Spanish outside of class (TSTUDY), time spent listening or reading Spanish aside from class assignments (TRECEIVE), time spent interacting in Spanish outside of class (TPRODUCE), motivation and strategy type.

One coursework-related variable concerns the number of previous semesters of Spanish study for each participant. This variable correlates highly to L2 proficiency ($r=0.42$, $p<0.05$). This high correlation coefficient is unsurprising in that more previous coursework and exposure to Spanish should increase proficiency. However, such a relationship is not guaranteed because it is plausible for a student to take several Spanish courses and not develop in proficiency due to many factors in SLA, such as those discussed in Section 2.1. Regardless, in the current data and analysis, the variable for the number of previous Spanish classes is eliminated due to the high correlation as a redundant measure of L2 knowledge that weakens the power of the effect of proficiency.

Potential motivation to continue learning Spanish beyond the minimum curricular requirements was measured on the exit survey (Appendix G). While this construct is a highly dynamic and important element in learning, a sensitive measure of motivation is beyond the scope of the current study. Therefore, this variable is coded simply as a binary categorization of either reporting intention to continue learning Spanish or not.

The wave-varying survey of potential explicit processing strategies is coded categorically according to three general categories: surface feature, conceptual or none reported. These categories reflect ‘cognitive strategies’ in the framework of Rebecca Oxford’s (1990) SILL, discussed in Section 2.1.3. A conceptual, or top-down processing (Section 2.1.1), approach to the pragmatics listening task involves interpretation according to the operationalization of requests and how each utterance stimulus applies. Strategies coded as ‘conceptual’ include responses such as focusing on the beginning of the utterance, references to meaning, content or context, trying to figure out if the utterance requires action by the listener and whether the action benefits the speaker. Conversely, a ‘surface feature’, or bottom-up processing (Section 2.1.1), strategy represents relying on linguistic surface features such as imperative verb forms or interrogative intonation.

The role of strategies in this case is duplicitous. Conceptual pragmatic processing leads to more accurate categorization with potentially slower response times. Surface feature strategies are relatively fast since they do not require fully parsing an utterance for meaning, although the appropriate interpretation is at chance. This unreliability of superficial processing stems from the distribution of the same surface features across speech act types. In the current data set, an equivalent number of request and non-request distracter items employ each type of surface feature. As such, participants relying on these strategies are just as likely to categorize non-requests as requests that share the

same surface feature. Subsequently, these participants are not in reality processing for communicative function within the given minimal context of the experiment. The use of the d' statistic enables the analyses of accuracy in the current study to account for such issues.

3.6 ANALYSIS PROCEDURE

Once the aggregate data are inspected and descriptively reported, initial analysis utilizes growth modeling. The model for the current study takes the form of a multi-level model that differentiates between “within individual change” and “interindividual differences in change” (Singer & Willett, 2003, p. 9). As such, Singer & Willett (2003) describe the methodological implications for truly studying change over time, which are: “the availability of (1) multiple waves of data; (2) a substantively meaningful metric for time; and (3) an outcome that changes systematically” (p. 9). With more than three waves of data, the researcher can test the *nature* of growth; whether it is nonlinear, curvilinear, or linear in chunks, etc. The idea here is to trace development continuously as L2 pragmatic representations form and L2 processing control develops (Bialystok, 1993), in search of the more complex patterns of L2 development unavailable through discrete pre- and post-testing.

However, an important question would be how this analytical approach is different from other methods often employed for longitudinal data such as repeated measures analysis of variance (ANOVA). The answer lies in the research questions guiding the experiment. For example, if the study were simply seeking to show that two independent groups taken from the same population acquire relatively more or fewer gains in accuracy and/or comprehension speed after experiencing different pedagogical interventions, a repeated measures ANOVA would be appropriate. The focus in such case

would be whether there is a main effect for the treatment, as well as any potential interactions with the treatment. However, in the case of this study, because the focus is the actual process of L2 pragmatic comprehension development over time, a multi-level statistical model is better suited for inferential analysis. In the context of whether or not there is a significant difference between data collection waves or over the course of the experiment (RQ1) is essentially inconsequential in a CT/DST framework. This model is advantageous as well because there is no requisite assumption of a normal distribution of observations, as there is with ANOVAs. The period of time selected in experimental design is arbitrary to the scale of natural development. If a significant improvement in L2 pragmatic comprehension is found, then one semester is a relevant time-scale for pragmatic development. On the other hand, a lack of significant improvement simply means that such development occurs over a larger timescale, requiring methodological adjustments for subsequent research. Rather, as multi-level models take into account the changes of within-individual as well as between-individual factors *over time*, an illustration of the trajectory of L2 pragmatic development is feasible.

Ultimately, the goal in using statistical growth models for the data is not only to analyze the trajectory of L2 pragmatic development, but also to test whether such development can be explained in terms of level of directness and individual experiential differences while respecting individual change over time. Next, a comparison of the regression coefficients of the two variables can be done to look at the relative effects of each predictor variable.

The problematic analysis of the interrelation of accuracy and speed is achievable through multi-level modeling. Previously, Taguchi (2005) reported no significant correlation between accuracy and reaction time; however, it is uncertain how reliable a correlation is between task scores and individuals' average reaction times. Therefore, in

the current study, the same multi-level model for growth that is fitted for change in d' (accuracy) is replicated with the inclusion of reaction time results as a factor, in that the reaction times are a nested level to a participant's d' -prime statistic. The results of this analysis yield a verdict as to whether processing gains are related to accuracy and, if so, to what extent.

Next, the relative accuracy and reaction time data of different levels of Spanish request are explored in order to assess RQ2. In looking at the responses along the nested levels of directness, the results will reveal the nature of concurrent developmental patterns. Rather than simply showing the same staged development of direct to more indirect consistently seen in previous research, the continuous measures in the current design allow for a more nuanced view of L2 development that can reveal the emergence of comprehension processing of different directness levels, at varying rates, across each time point. The primary multi-level models for accuracy and reaction time developed for RQ1 above are utilized again at level-specific measures of accuracy in order to examine the possibility of interactions between levels of directness and particular points of time in the study.

In addition, individual characteristics are explored in order to examine differences in developmental trajectories and significant predictors across groupings of net proficiency improvement, participants based on previous Spanish coursework, reported time spent across practice variables, motivation and strategy use.

Finally, macro-contextual effects due to the institutional setting are discussed in terms of the relationship between the timing of data collection sessions and curricular events such as assessments and pragmatics-related activities.

3.7 SUMMARY

This chapter describes the current longitudinal experimental study of L2 pragmatic comprehension during one semester. There were 25 participants retained in the data sample who were recruited from an intermediate level university Spanish class. The primary dependent measures of this study involve responses to a computerized listening comprehension task in which participants categorize isolated utterances as requests or non-requests. The request stimuli (Appendix E) are formulated based on previous research on Spanish requests (Félix-Brasdefer, 2005, 2007, 2009, 2010; C. García, 1993; Koike, 1989b, 1994; Márquez Reiter, 2000) and are equally distributed across three levels of directness and mitigation strategies. An equal number of non-request distracter items represent a variety of other speech acts across levels of directness with similar mitigation strategies. In addition, experiential data were collected through a background questionnaire, written protocols after each data collection session and an exit survey. These materials probed aspects of L2 proficiency, previous L2 Spanish coursework, L1 and L2 language background, strategies for responses to the experimental task, amounts of time spent on different types of L2 practice and motivation to pursue the acquisition of Spanish beyond required coursework. Next, the experimental procedure was described as a series of five data collection waves over 13 weeks. These sessions produced data in the form of correct and incorrect responses to each item along with the registered RT. This data was trimmed to eliminate extreme RTs for each individual. Next, d' statistics were calculated for all requests as well as for each level of directness for each participant at each wave. These data, coupled with the independent variables recorded from the written protocols, formed the final data set. Last, the data analysis procedure involves mixed-effects growth models that respect individual variation for accuracy and comprehension speed measures as well as the interaction between the two. Subsequent analysis of

individual differences utilizes the same statistical methods along sup-groupings. In Chapter 4, these statistical analyses, in addition to graphical representation of the developmental trajectories of accuracy and comprehension speed, are reported. In Chapter 5, these results are discussed further in terms of the guiding research questions and theoretical framework outlined earlier.

Chapter 4: Results

The organization of the results in this chapter reflects the hierarchy of the research questions in Section 2.4.1 from general trends to more specific factors. Section 4.1 reports and describes aggregate results in terms of accuracy, reaction time (RT), the relationship between the two, as well as the relevant predictor variables for each continuous measure. Section 4.2 focuses on individual differences grouped by shared responses on the background questionnaire and on the written protocol provided after the end of each session of the pragmatics listening comprehension task. Section 4.3 explores macro-contextual effects not only on the principal dependent measures of accuracy and comprehension speed, but also on practice variables. These qualitative differences allow for further, narrower quantitative analysis of L2 pragmatic comprehension development of the 25 participants retained in the study. The exploration of the results of this longitudinal study of L2 pragmatic comprehension then forms the basis for discussion of relevant theories of skill acquisition in Chapter 5.

4.1 AGGREGATE RESULTS

The aggregate data consist of the subsections of accuracy results in the form of d' statistics, comprehension speed results as RTs recorded in milliseconds and practice variables in the form of hours per week. Section 4.1.1 reports d' across all requests as well as for each level of directness of Spanish requests: direct (DR), conventionally indirect (CI) and non-conventionally indirect (NCI). As discussed in Section 3.5, larger d' values, shown as *higher* on the y-axis, indicate *higher accuracy*. Subsequently, Section 4.1.2 reports RT results similarly structured. However, lower RTs reflect *faster* responses. To frame this analysis in the context of the current study, raw d' and RT values are not focal, but rather the emphasis is the change over time and the relationship

between changes in each measure, discussed in Section 4.1.3. Finally, Section 4.1.4 reports the relative amounts of time spent across three outside of class practice variables: TSTUDY, TRECEIVE and TPRODUCE.

4.1.1 Accuracy Results

This section reports accuracy as a mathematical function of request identification and non-request rejection across levels of directness and waves of data collection. For a comprehensive account of the data, accuracy results appear below first as response frequencies, followed by d' across waves and level of directness, and finally as relative change between waves. Table 4.1 below shows the raw number of correct and incorrect responses across each category of requests and non-request distracters over each wave. The relatively higher value in each section is bold and highlighted.

Table 4.1: Distribution of Responses by Wave and Stimulus Type

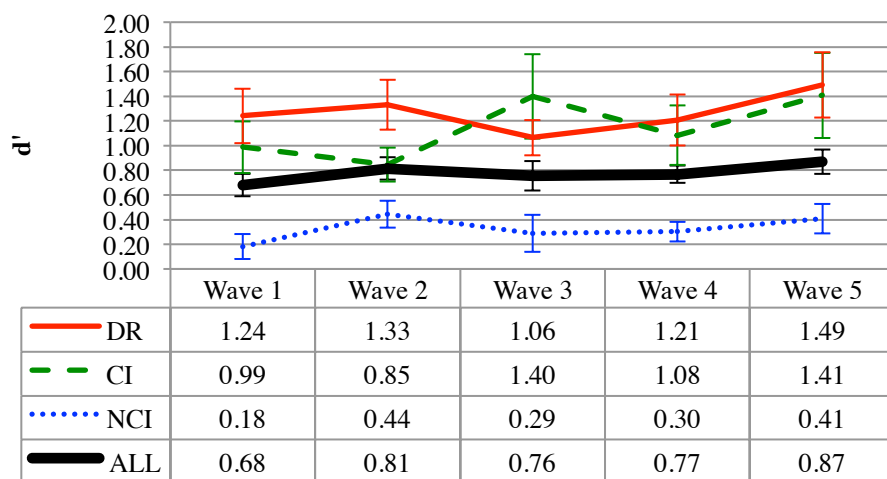
	Response	DR	CI	NCI	Distracters
Wave 1	Incorrect	62	82	136	246
	Correct	174	152	97	459
Wave 2	Incorrect	74	101	137	201
	Correct	168	139	101	528
Wave 3	Incorrect	72	77	131	185
	Correct	139	131	76	442
Wave 4	Incorrect	77	86	132	169
	Correct	136	130	82	462
Wave 5	Incorrect	81	99	151	177
	Correct	155	135	89	540
Total	Incorrect	366	445	687	978
	Correct	772	687	445	2431

Responses to all items show a consistent trend in terms of accuracy in that proportionately more correct responses are given for DR requests, CI requests and non-

request distracters – overall and at each wave. Conversely, responses for NCI requests show the opposite trend in which the majority of these utterances are perceived incorrectly as non-requests at each wave. Indeed, for all requests, degree of directness is not independent of accuracy ($\chi^2(2)=207.75, p<0.001$). It is true that the first interpretation of all NCI request utterances would be other speech acts given that these items are *indirect*. However, in the present experiment they are requests, as validated by a native Spanish speaker control group, reported at the end of Section 3.2. Nevertheless, the Spanish L2 learners appear to fail more often in arriving at the same interpretation.

Over the course of the study, it would appear that virtually no real change occurs in terms of the relative proportions of correct and incorrectly identified utterances. However, raw frequencies are misleading due to insensitivity to individual variation in development over time. In addition, raw response counts conceal the underlying trends in accuracy across not only data collection waves, but also across levels of request directness, as indicated in the d' results in Figure 4.1 below:

Figure 4.1: Accuracy Results by Wave and Level of Directness



While the scores for all requests increase measurably from the first data collection session to the last, the developmental trajectory over time is visibly non-linear and irregular. Indeed, there is only a near-significant linear trend of overall accuracy across waves ($\chi^2(1)=3.18$, $p=0.07$). Accuracy across all requests¹ changes significantly over the five data collection waves ($b=0.03$, $z=2.48$, $p<0.05$), despite a period of relative stability and insignificant change ($b=0.00$, $z=-0.17$, $p>0.05$) from Wave 2 to Wave 4. Conversely, the total development from only Wave 1 to Wave 5 is highly significant ($b=0.04$, $z=3.33$, $p<0.01$). However, the data collected between endpoints reveal a visibly distinct trajectory of development given an initial increase in accuracy, a period of stability and a final increase. In an effort to account for this trajectory, the only significant factor identified is the amount of time participants spent listening to or reading Spanish outside of class and aside from coursework (TRECEIVE: $b=0.13$, $z=4.40$, $p<0.001$) for all requests over the course of the study, although a correlation of accuracy by beginning proficiency approaches significance ($b=0.09$, $z=1.60$, $p=0.11$). A further examination of why other variables do not predict accuracy is discussed later in Section 4.1.4 when presenting the distribution of L2 practice.

While all critical experimental stimuli reliably indicate the request speech act, the subcategories differentiated by directness are of further interest in the context of the current study. The difference in accuracy between the levels of directness is significant ($b=-0.47$, $z=-7.62$, $p<0.001$) over the course of the study and there is a significant interaction between level of directness and data collection wave ($b=-0.05$, $z=-3.32$, $p<0.01$). However, across all three relative levels of directness, change over time only

¹ D' for 'all requests' is calculated for each individual at each wave; this value is not the average of DR, CI and NCI accuracies because this average would conflate the effect of distracter responses.

approaches significance ($b=0.06$, $z=1.74$, $p=0.08$), suggesting differential trajectories of development by request type. Figure 4.1 above shows generally higher accuracy for DR requests and CI requests in comparison to NCI requests. In addition, accuracy for the DR requests and CI requests overlap, resulting in a lack of significant difference ($b=-0.13$, $z=-0.98$, $p>0.05$). As such, it is the divergent NCI responses that produce significance across all three levels. This result conflicts with the theoretical construct of the separation of three distinct levels of (in)directness (Austin, 1962; Grice, 1975; Searle, 1975b) in that the two non-implied types of requests, DR and CI, do not differentiate in terms of accuracy, even in L2 development. However, the construct of *conventionalization* does align CI and DR speech acts conceptually. Remarkably, no practice or background variables significantly factor into accuracy across levels of directness.

Considering only DR requests, the lone significant factor in accuracy is the background variable of participants who had previously taken the prerequisite course at the same university ($b=-0.63$, $z=-2.77$, $p<0.01$). However, the development is non-linear ($\chi^2(1)=0.23$, $p>0.05$) and not significant across all five waves ($b=0.05$, $z=0.74$, $p>0.05$) or from Wave 1 to 5 ($b=0.07$, $z=0.82$, $p>0.05$). In the non-linear ($\chi^2(1)=0.28$, $p>0.05$) development of CI requests alone, no significant change is found across all waves ($b=0.10$, $z=1.70$, $p=0.09$) or from Wave 1 to 5 ($b=0.12$, $z=1.38$, $p>0.05$). The closest possible predictor variable for CI items is TSTUDY ($b=0.12$, $z=1.78$, $p=0.08$). Similarly, NCI requests do not improve over all waves statistically speaking ($b=0.03$, $z=1.16$, $p>0.05$) or W1=>5 ($b=0.06$, $z=1.59$, $p=0.11$) with no significant predictor of accuracy. However, the trajectory of these implied requests is closer to linear than for DR and CI, though not significantly ($\chi^2(1)=0.76$, $p>0.05$). At this level of analysis, it appears that there is no statistically significant change in comprehension speed over the course of the

study with little in the way of significant factors of correct responses and development across all 25 participants.

Part of the reason for this lack of reliable predictors is that the nature of change in accuracy between the levels of directness is disparate, shown by the proportionate change in accuracy from wave to wave in Table 4.2 below. Periods of accuracy regression are in bold and highlighted.

Table 4.2: Proportion of Change in Accuracy from Wave to Wave

	W1=>2	W2=>3	W3=>4	W4=>5	W1=>5
DR	7%	-20%	13%	23%	20%
CI	-14%	65%	-22%	30%	42%
NCI	146%	-35%	5%	34%	125%
ALL	20%	-7%	1%	13%	28%

Both DR and NCI requests follow a similar trajectory from wave to wave: IMPROVE => DECLINE => IMPROVE => IMPROVE. However, the magnitude of positive change is much higher for NCI (146%) over DR (7%) at Wave 1, reflecting the largest increase in pragmatic comprehension accuracy for the most indirect and implied request expressions. Conversely, CI requests change in the opposite direction as DR and NCI items between Waves 1 => 2 => 3 => 4, although all levels increase from Wave 4 to 5. While there is no significant difference between DR and CI requests over the duration of the study, their relative paths are noticeably different in terms of positive versus negative change up to Wave 4. However, only at Wave 2 are the accuracy measures significantly different between DR and CI items ($b=-0.49$, $z=-2.49$, $p<0.05$). Over the course of the entire study, requests of increasing indirectness show higher proportionate gains in accuracy of pragmatic comprehension, reflected in the far right column of Table 4.2. The

question then becomes whether this trend is due to relative *stability*, in that DR requests begin and end the study with the highest accuracy, while CI and NCI requests show comparatively more room for improvement by these learners.

The results reported above reflect overall accuracy favoring DR and CI requests over NCI requests, although, responses to NCI items exhibit the most proportionate, though not significant, development over the course of the study. In addition to variation in overall development, each of the three levels of request directness follows a distinct trajectory. However, one similar component in the development of L2 pragmatic comprehension accuracy is the role of the practice variable that measures the amount of time participants spent studying outside of class (TSTUDY). In the following section, analysis continues concerning the developmental trajectories and relative change in terms of L2 pragmatic comprehension speed over all requests as well as along each sub-type of request.

4.1.2 Reaction Time Results

This section reports the general patterns and developmental trajectory of the Spanish learners' comprehension speed of requests over the course of the current 13-week study. The aggregate results of RT data are distributed across the three levels of request directness and distracters over the five data collection waves as accuracy results in Section 4.1.1. However, this section focuses only on RT results; Section 4.1.3 to follow provides a cross-analysis of accuracy and RT results. Below is the distribution of mean RT data for correct and incorrect responses across categories with standard deviations in parenthesis. Relatively *faster* means are in bold and highlighted.

Table 4.3: Distribution of Reaction Times by Wave and Stimulus Type

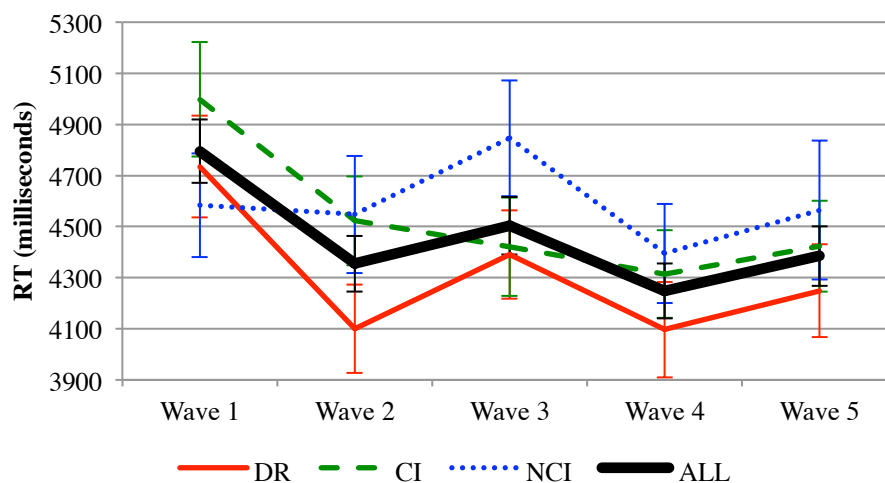
	Response	DR	CI	NCI	Distracters
Wave 1	Incorrect	5107.24 (2579.64)	5699.34 (2730.81)	5347.57 (2305.40)	4888.66 (2474.04)
	Correct	4735.15 (2635.38)	4998.12 (2756.51)	4583.62 (2007.71)	5417.31 (2810.94)
Wave 2	Incorrect	4647.35 (2204.80)	4989.26 (2716.18)	5006.49 (2218.84)	4657.87 (2321.56)
	Correct	4099.52 (2240.13)	4522.51 (2047.96)	4547.75 (2305.45)	4821.93 (2223.68)
Wave 3	Incorrect	5235.19 (2666.48)	5008.84 (2380.31)	4903.50 (2072.20)	4885.26 (2528.9)
	Correct	4391.31 (2047.48)	4421.79 (2207.27)	4845.93 (1980.61)	4785.89 (2092.10)
Wave 4	Incorrect	4651.45 (1928.97)	4942.71 (2191.70)	4805.88 (1964.84)	4634.61 (2356.35)
	Correct	4096.81 (2185.78)	4314.00 (1950.91)	4395.02 (1756.93)	4521.95 (1957.61)
Wave 5	Incorrect	4626.35 (2168.18)	4997.96 (2734.42)	4959.90 (2232.35)	4661.00 (2530.46)
	Correct	4249.30 (2276.71)	4423.13 (2073.13)	4564.60 (2571.89)	4722.03 (2169.34)
Overall	Incorrect	4837.11 (2312.72)	5116.43 (2576.68)	5005.59 (2167.10)	4755.48 (2444.14)
	Correct	4324.91 (2308.19)	4549.55 (2248.61)	4581.72 (2150.38)	4838.59 (2283.12)

In general, participants respond to the aural experimental stimuli about 4-5 seconds on average after the onset of the first word. The RT results show a common and consistent pattern in which correct responses register significantly faster ($b=-430.73$, $z=-6.16$, $p<0.001$) than incorrect responses across requests, reflected in lower mean RTs. This trend is compatible with previous research in timed decision experiments in psychology (Ratcliff, 1985, 1993). However, this tendency does not hold for non-request distracters, most likely due to the variation of speech act constituency of those stimuli. Longer RTs for incorrect responses may be the result of multiple parses, conscious repetition due to uncertainty or the need for additional activation of relevant features.

However, in the case of random responses due to uncertainty of meaning and/or pragmatic function, both correct and incorrect response categories absorb prolonged as well as reduced RTs, controlling for the effect on any specific response type.

Below, Figure 4.2 shows the developmental trajectory of RTs over the course of the study. Values represent RT measures only for *correct* responses, listed in Table 4.3 above. *Lower* RT values represent *faster* comprehension; so, unlike the previous accuracy results above, down-sloped figure lines relate to improvement, or positive change.

Figure 4.2: Reaction Time Results by Wave and Level of Directness



The trajectory of comprehension development is again visibly non-linear and irregular with aberrations in the generally decreasing pattern at Wave 3 and Wave 5 and no phases of stability. However, general trend is statistically linear ($\chi^2(1)=5.87$, $p<0.05$). Overall, RTs significantly decrease over the course of the study ($b=-83.90$, $z=-2.68$, $p<0.01$), indicating observably faster L2 pragmatic comprehension in 13 weeks. No two consecutive waves show significant differences in RTs, although, similar to the accuracy

results above, the initial and final waves (W1=>5) show significant change ($b=-115.75$, $z=-3.13$, $p<0.01$). The additional three data collection waves within the 13 weeks of the study reveal a variable pattern of development. The only significant predictor of change in overall RT is the amount of time that participants reported spending listening to and reading Spanish outside of class (TRECEIVE: $b=419.17$, $z=5.00$, $p<0.001$). However, the coefficient is positive, indicating that the more time participants spent listening to or reading Spanish outside of class, the longer it took for them to respond. In addition, the amount of time that participants reported interacting in Spanish outside of class (TPRODUCE: $b=-152.47$, $z=-1.64$, $p=0.10$) approaches significance across as a factor to predict RTs.

Similar to the aggregate RT findings, the results for the three levels of directness significantly improve ($b=-84.56$, $z=-2.71$, $p<0.01$) over the course of the study. In addition, the comprehension speed across levels is significantly different ($z=180.72$, $z=3.21$, $p<0.01$). Among the levels of directness, DR requests exhibit faster RTs than CI ($b=287.44$, $z=2.84$, $p<0.01$) and NCI ($b=167.73$, $z=2.85$, $p<0.01$) requests. Conversely, participants took similar and not significantly different amounts of time overall on CI and NCI request items ($b=33.41$, $z=0.29$, $p=0.77$). This result is expected, in that the first interpretation of the DR utterances is a request, providing strong and frequent request category feature activations and requiring less time to arrive at the correct interpretation. However, it would also be expected that responses to CI requests would be timed similarly to those for DR items since they are *conventionalized*; therefore, the features of CI items would be associated directly with requests. Rather, the counterintuitive results indicate that CI and NCI requests are not differentiated by developmental L2 pragmatic processing times in the current data even though NCI are implied and require activation of more weakly represented request features. A similarly unanticipated result occurs at

Wave 1. Despite requiring the most interpretation, the fastest average responses correspond to NCI requests, although there is no significant difference between levels during the initial data collection ($b=55.29$, $z=0.43$, $p>0.05$), minimizing the importance of this trend.

Focusing on the non-linear developmental trajectory ($\chi^2(1)=2.36$, $p>0.05$) of DR requests, improvement is significant from the first to last data collection sessions ($b=-146.75$, $z=-2.37$, $p<0.05$), but not quite across all five waves ($b=-99.55$, $z=-1.93$, $p=0.05$). This difference in significance is due most likely to wide variation between the aggregate RTs at different waves. Over the course of the study, only TRECEIVE ($b=505.63$, $z=3.82$, $p<0.001$) significantly factors into DR comprehension speed. Comparably, the non-linear trend ($\chi^2(1)=2.92$, $p=0.09$) of participants' interpretations of CI request utterances significantly improve overall ($b=-160.12$, $z=-2.73$, $p<0.01$) as well across all five waves ($b=-116.53$, $z=-2.32$, $p<0.05$) with the same predictor variable of reading and listening to Spanish (TRECEIVE; $b=422.26$, $z=3.29$, $p<0.01$). In contrast, the correct responses for NCI requests do not significantly change overall ($b=3.59$, $z=0.05$, $p>0.05$) or across waves ($b=-5.08$, $z=-0.08$, $p>0.05$), in a statistically non-linear trend ($\chi^2(1)=0.96$, $p>0.05$). The factor common to the other two levels is the closest variable to significance for NCI requests: comprehension practice (TRECEIVE: $b=293.70$, $z=1.49$, $p=0.14$). The development of comprehension speed appears to vary across level of request directness, disfavoring NCI items, with the common TRECEIVE factor. The variation between the developmental trajectories of each level of directness is observable in terms of the relative amounts of change between waves, shown below in Table 4.4. The periods of comprehension speed regression, or slowing, are in bold and highlighted.

Table 4.4: Proportion of Change in Reaction Time from Wave to Wave

	W1=>2	W2=>3	W3=>4	W4=>5	W1=>5
DR	-13%	7%	-7%	4%	-10%
CI	-10%	-2%	-2%	3%	-12%
NCI	-1%	7%	-9%	4%	0%
ALL	-9%	3%	-6%	3%	-9%

Over the course of the study, both DR and NCI requests follow the same general pattern of change: IMPROVE => DECLINE => IMPROVE => DECLINE. Following a different trajectory, CI requests deviate slightly and also decrease from Wave 2=>3. From the beginning to the end of the data collection, comprehension speed gains are similar across DR (-10) and CI (-12%) requests. However, the L2 pragmatic comprehension time for NCI requests does not improve (0%) overall. Another notable difference is the proportion of change between Wave 1=>2 during which participants' responses to DR items display the largest change (-13%) whereas the responses for NCI requests increase negligibly (-1%). DR and NCI requests both display the largest magnitude of change between Wave1=>2, early in the semester. Conversely, comprehension speeds for NCI requests minimally change at this point and display more proportionate, though differential, development later. In addition, during the last observable period of change, Wave 4=>5, L2 pragmatic comprehension of all requests becomes comparably slower, though to no great degree.

The cumulative RT results above show overall faster processing of DR and CI requests compared to NCI utterances, reflecting slower activation of appropriate features and selection of request category. Additionally, the L2 pragmatic comprehension speed of DR and CI requests improves comparably over the course of this 13-week study. However, NCI request responses register no differently during the final data collection

session as during the first. Consistently, the only predictor variable relevant to RT results is the amount of time that participants reported spending each week listening to or reading Spanish outside of required coursework (TRECEIVE), although more L2 Spanish receptive time reported tends to predict prolonged RTs. The following section compares results from both measures, accuracy and RT, across the same three analyses presented previously.

4.1.3 Comparison of Accuracy and Reaction Time Results

This section offers the most critical examination of the results of the current study on the development of L2 pragmatic comprehension. While changes in accuracy and reaction time results reflect different components of L2 learning, the interaction of these trajectories directly is informed by theories of skill acquisition and development. As such, the exploration of this relationship provides a more fine-grained analysis of the emergence of L2 pragmatic comprehension. In this comparison, the above results are discussed as *convergent* versus *divergent* in relation to positive and negative change across measures. For example, if both accuracy and RT improve from wave to wave, their development is said to be convergent. Conversely, if RTs become slower while d' decreases, such global development is divergent. Similar to Sections 4.1.1 and 4.1.2 above, the discussion begins with the results distributed across +/- correct responses. Next, the relative trajectories and proportions of change are compared. Finally, relating relevant predictor variables and fitting a new model nesting RTs within d' exposes skill-differential patterns.

Accuracy and RT results across correct/incorrect responses display both convergent and divergent patterns. For both measures, correct responses to DR and CI request items not only outnumber incorrect responses, but also register more quickly.

While the trend of correct responses being faster than incorrect ones continues for NCI requests, there are comparatively more incorrect responses across waves, reversing the correctness proportion trend of DR, CI and distracter items. So, despite the higher proportion of incorrectly categorized NCI requests, RTs are still faster for correct identification. Nevertheless, aggregate frequencies and RTs are insensitive to the individual difference characteristics (Section 2.1.3) across time.

The analyses that model and compare the developmental trajectories of the relative levels of directness produce another divergent finding. In the accuracy results of Section 4.1.1, DR and CI requests patterned together, showing no significant difference in overall developmental trajectories over the course of the study. Conversely, the analysis of RT in Section 4.1.2 shows overlap and no significant difference between the speed of the participant's responses for CI and NCI requests. Taken together, the participants are similarly accurate in identifying non-implied Spanish requests while taking similar amounts of time to identify both categories of indirect items. Within these aggregate developmental trajectories variation over time, also available for comparison is *relative* change over time.

It is this relative change, between measures, that speaks most directly to theories of skill acquisition (Anderson, 1993; Anderson & Lebiere, 1998; Logan, 1992; Newell & Rosenbloom, 1981; Palmeri, 1999). According to their favored power law of learning (Figure 2.6), as accuracy increases (positive change), RT decreases (positive change). Conversely, in the *forgetting curve* (Anderson, 2010), as accuracy decreases (negative change), RT increases (negative change). These directions of change, positive (+) versus negative (--), serve to compare the developmental trajectories of accuracy and comprehension speed, shown in Table 4.5 below between waves:

Table 4.5: Comparative Change Across Measures

		W1=>2	W2=>3	W3=>4	W4=>5	W1=>5
DR	Accuracy	+	--	+	+	+
	RT	+	--	+	--	+
CI	Accuracy	--	+	--	+	+
	RT	+	+	+	--	+
NCI	Accuracy	+	--	+	+	+
	RT	+	--	+	--	+
Overall	Accuracy	+	--	+	+	+
	RT	+	--	+	--	+

For the most part, the trajectories of accuracy and comprehension speed are convergent over time, reflected in the white-background boxes sharing the same symbols (+/+ or --/--), in accordance with theories of skill acquisition. The far right column (W1=>5) shows that over the course of the entire study, the development of accuracy and RT of L2 pragmatic comprehension of Spanish requests is convergent, overall and on each level of directness. The interpretations by the participants of DR and NCI requests follow the same convergent trajectory over the first four waves of IMPROVE => DECLINE => IMPROVE. Conversely, the responses to CI items exhibit divergent patterns of development between Waves 1=>2 and Waves 3=>4. During both periods, accuracy declines while comprehension speed improves, countering theories of skill acquisition. A more salient trend occurs between Wave 4=>5 as accuracy improves while comprehension speed worsens, overall and across all three levels of directness. Although the participants became more accurate overall in categorizing requests at this time, they took relatively longer to arrive at the appropriate interpretation. This divergence in itself can occur more randomly, as in the case of CI requests; however, the consistent pattern violating the expected trend at the end of the study begs the question of what was happening to L2 development during this phase to incur divergent change.

Aside from the simple directions of change, the relative amounts of change are informative, as reported in Tables 4.2 and 4.4. However, caution must be taken against comparing absolute proportions of change because accuracy and d' use massively different scales. Collapsing the development to the change from Wave 1=>5, the three levels of request directness show divergent patterns concerning proportion of change across the two dependent variables. For the accuracy results, proportion of positive change increased greatly along increasing levels of indirectness: DR (20%) => CI (42%) => NCI (125%). Conversely, RT results show similar percentages of positive change for DR (-10%) and CI (-12%) requests while NCI (0%) items do not show improvement overall, despite the largest improvement in accuracy. From Wave 1=>2, NCI requests are differentiated further in that accuracy improved (146%) more than DR and CI requests as well as more than during any other period. Conversely, this period shows negligible change in RT for NCI requests (-1%) while DR (-13%) and CI (-10%) requests show more change than during later periods. Interestingly, all three levels show comparable proportions of change from Wave 4=>5 on both measures, divergent as they may be.

Other divergent results for accuracy versus RT data relates to the predictor variables. For accuracy results, more time reported by participants listening to or reading Spanish aside from coursework (TRECEIVE) significantly predicts higher accuracy across all requests. Conversely, the accuracy of responses to DR items is significantly higher for participants who completed the previous Spanish introductory course at the same university while the time spent studying Spanish per week (TSTUDY) is the only predictor of accuracy of CI request interpretation. For RT results, higher amounts of time reported for the variable TRECEIVE significantly predict higher RTs across all requests as well as those for DR and CI requests over the course of the study. The cumulative convergent result then is that the supplemental time learners spend listening to or reading the L2

significantly affects overall development of L2 pragmatic comprehension. While this effect is strong for and detrimental to comprehension speed, accuracy along each level of request is not influenced significantly by TRECEIVE. Rather, factors related to coursework more precisely predict accuracy.

4.1.3.1 Statistical Analysis Involving Accuracy and Reaction Time

While comparison of trends and proportions offers a traditional approach to the study of accuracy and RT, this method does not provide a reliable, generalizable answer as to the interaction between the two measures over the course of development. Previous research by Taguchi (2005, 2007, 2008a, 2008b) relied on correlation analyses to examine the direct relationship between accuracy and comprehension speed. The methodological issue of applying a relatively weak statistical test to two confounded variables was discussed in Section 1.2 and led to the use of d' for the current study (Section 3.6). The critique of Taguchi's analysis was that the interpretation of such results is suspect because of unreliability and invalidity. However, this assertion is speculative without showing how a more appropriate statistical analysis differs in terms of results. Therefore, two analyses follow in order to assess potential confounds of analytical procedure and to provide a more reliable test of interaction between measures. First, Table 4.6 reports a partial correlation analysis between accuracy and RT averaged by individual and level of directness, controlling for the effect of L2 proficiency reported at the beginning of the study. This analysis replicates Taguchi (2005, 2007, 2008a, 2008b). Second, a mixed effects model is reported that nests RT values within the relevant d' statistics for the purpose of comparing the results from these different analytical procedures.

Table 4.6: Partial Correlation of Accuracy and Reaction Time Results

	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Overall
DR	0.10	-0.12	0.31	0.06	0.06	0.05
CI	-0.03	-0.01	-0.21	-0.19	-0.15	-0.12
NCI	0.30	0.07	0.03	0.03	0.05	0.08
ALL	0.54**	-0.21	-0.12	0.15	0.12	0.08

In general, there is little significant correlation between accuracy and average RT in the current data. Only at Wave 1 is RT significantly correlated to overall request categorization accuracy. Within levels, DR requests at Wave 3 and NCI requests at Wave 1 show moderate, though non-significant, correlations. Notably, these correlations are positive, indicating that higher accuracy relates to higher RTs. So the more successful that the L2 learners are at identifying Spanish requests, the slower they are at making the decision.

In terms of change over the course of the study, the correlation between accuracy and comprehension speed does not maintain a consistent pattern. Accuracy in identifying all requests shows the greatest effect of RT at the Wave 1, after which there is no substantive relationship in either direction. DR requests show a different pattern, in which a moderate peak in interaction of the two measures arises at Wave 3. The only consistent pattern was found for CI requests in that the correlations between measures is negative at each wave, generally increasing in magnitude toward the end of the study. This result is what one would expect: lower RTs correlate to higher accuracy. Conversely, NCI requests show a notable positive relationship between accuracy and RT at Wave 1. However, at the subsequent data collection waves, this relationship is variable and weak. Another caveat is that the results for all requests in the last line of Table 4.4 are not comparable to those of Taguchi. Each partial correlation analysis by Taguchi involved

data for only one level of directness of one speech act. The same analysis is included here in order to assess potential cross-category effects. But in the current data, the lack of relationship between RT and accuracy is unsurprising due to the strong effect of level of directness, and the crossover of convergent results by level over the different measures. Taken together, these correlations reveal distinct patterns of interaction and change between the three levels of directness of the requests in this study.

The basic correlation analysis above provides no evidence for a consistent relationship between the development of accuracy and speed on the pragmatics listening comprehension task. Nevertheless, such correlation calculation does not take into account the variation, effects and interactions of several other factors. In an effort to advance analytical methodology of SLA research, the following analysis reports the results from mixed-effects regression models that nest each RT observation as a predictor of d' at the appropriate level by individual and wave. However, a direct comparison of all of the results of the rudimentary partial correlation analysis reported in Table 4.6 is not possible. The mixed-effects model first regresses multiple RT values to the single d' value for each participant at each wave. As such, correlating multiple observations to the same number causes the model to fail and report an error. Yet, modeling the relationship between RT and accuracy over time is tenable because the difference between waves allows for calculation. For the results for the mixed-effects models, the b -statistics are uninformative due to the massively different scales of d' (± 6) and RT (1000-6000 ms). The interpretation of the slope statistic is that d' changes b times for each one millisecond change in RT and such minute change is uninformative. Furthermore, the inferential statistics are different across analyses, so a direct comparison of values is not applicable. However, it is useful to compare directionality (positive versus negative values) and direction of change from wave to wave.

In the current data, growth modeling the relationship between accuracy and RT on the L2 pragmatics listening comprehension task appears to be tenuous. Reflecting the partial correlation analysis above and including only beginning proficiency as a predictor variable, the relationship is significant for all requests ($b=0.00$, $z=2.20$, $p<0.05$), but not for DR ($b=0.00$, $z=0.93$, $p>0.05$), CI ($b=0.00$, $z=-1.22$, $p>0.05$) or NCI ($b=0.00$, $z=0.45$, $p>0.05$) items. However, this model does not take change over time into account, similar to the overall partial correlations reported by Taguchi (2005, 2007, 2008a, 2008b). This analysis then assumes that the relationship between accuracy and RT over time is constant and fixed. By including the time variable along with beginning proficiency in a mixed-model, RT achieves a higher effect related to overall accuracy ($b=0.00$, $z=2.69$, $p<0.01$); though there remains no significant relationship between RT and accuracy for DR ($b=0.00$, $z=1.08$, $p>0.05$), CI ($b=0.00$, $z=-0.70$, $p>0.05$) or NCI ($b=0.00$, $z=0.45$, $p>0.05$) requests. However, the relationship does not hold with the inclusion of the three practice variables ($b=0.00$, $z=1.67$, $p=0.10$).

The difference between the partial correlation and the multi-level model is the significant relationship between RT and accuracy for all requests over time in the mixed effects model. The partial correlation of $r=0.08$ reflects a very weak relationship while the mixed-effects model found a much stronger interaction when accounting for individual trends over time.

The mixed-effects model, including the additional predictor variables, fits significantly better than the model that only controls for beginning proficiency according to a Hausman specification test ($\chi^2(2)=6.41$, $p<0.05$). This result indicates that the more elaborate model accounts for statistically more variation in accuracy. However, these predictor variables also interact with RT, although only TRECEIVE factors into comprehension speed to the point of significance. Over the course of the study, changes

in comprehension speed predict small, non-significant changes in d' in the same direction – slower => more accurate and faster => less accurate. Conversely, CI requests show a similar magnitude of relationship in the opposite direction. As learners' comprehension speed decreases, their accuracy in correctly identifying CI requests increases. NCI request accuracy shows a miniscule relationship with decision speed over the course of data collection. Finally, even with an elaborate statistical model and the most conservative design available, results show that there is generally no reliable relationship between L2 pragmatic comprehension accuracy and speed.

4.1.4 Summary of Aggregate Results

Taken separately, the data showing the developmental trajectories of accuracy (Section 4.1.1) and comprehension speed (Section 4.1.2) along the three levels of request directness provide novel insight into the nature of development of L2 pragmatic comprehension. Yet, it is the meta-analysis of the results of these two measures (Section 4.1.3) that reveals the more dynamic dimension of the cognitive reality of such development, as reflected in the mostly co-varying directions of distinctly different magnitudes of change. However, the lack of consistent predictor variables in a data set of 25 participants suggests that group averaging conceals important factors in change.

Ultimately, it may be that this effect of data aggregation hides the potentially dynamic factors and their interactions with accuracy and RT of speech act interpretation. Reflected in the mixed results of reliable predictors, Section 4.1 reported the aggregate results of accuracy and RT data for the L2 pragmatics listening comprehension task over the course of this 13-week study. While both measures ultimately improve, the developmental trajectories are not linear, exponential or even in a single direction. Rather, change over time is irregular and partially explained by types of practice. While

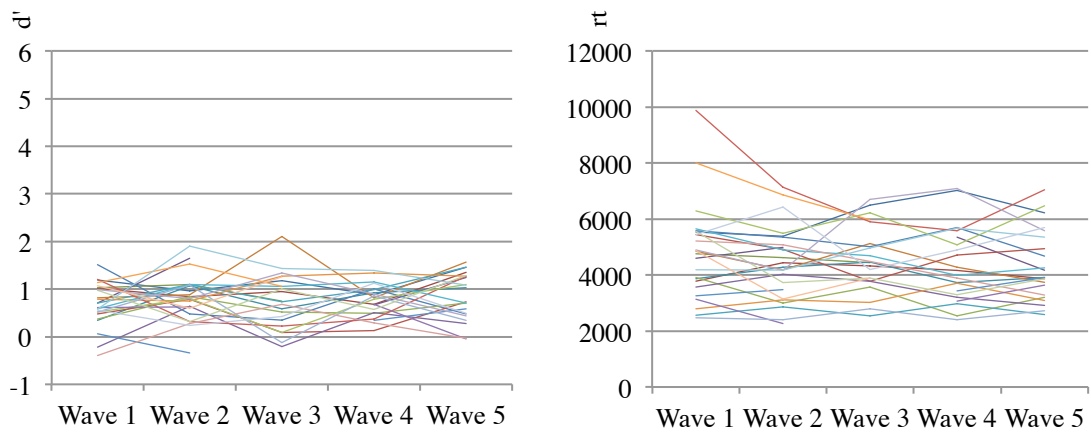
coursework corresponded more to accuracy, time spent listening to and reading L2 Spanish predicted comprehension speed. More theoretically relevant is the finding of an inconsistent, though patterned, relationship between accuracy and comprehension speed. This comparison (Section 4.1.3) further demonstrates different relationships between accuracy and speed for each level of directness. However, it is evident that group averaging dilutes the patterns of change. Consequently, it is necessary to pursue sub-analyses in order to look at individual differences that may only affect a few participants and could not shift the relevant aggregate analysis. As such, Section 4.2 examines individual differences, in reference to those often involved in SLA research discussed in Section 2.1.3, including overall L2 proficiency development, previous coursework, motivation, practice variables and response strategies in order to contextualize the lack of significance in the above models.

4.2 INDIVIDUAL DIFFERENCE FACTORS

While research analysis often groups participants *a priori* by some presumed factor, the current analysis also groups participants by responses during the study, in keeping with a CT/DST approach. As such, the current results relate to groupings according to individual difference factors probed on the written data collection materials recorded after each of the pragmatics listening comprehension tasks. To reiterate, Heritage Spanish learners and learners with study abroad or living abroad experience in a Spanish speaking country were not recruited and eliminated based on responses to the background questionnaire. Thus, these factors are not discussed.

Just as raw counts obscure individual differences, so do the means depicted above. In order to contextualize individual differences, Figure 4.3 shows the overall d' and mean RT for each participant over the course of the study.

Figure 4.3: All Request Results by Participant



For overall accuracy there is wide variation at Wave 2 and Wave 3, but less variation at Wave 4. From Wave 4=>5, it appears that there is a clear division between those participants who report some improvement and those that worsen. Conversely, RT data shows fewer outlier data points, particularly since the raw data are trimmed by two standard deviations of mean RT by individual. In this context, there is still clearly wider variation between individuals at Wave 1 and Wave 4 – even though Wave 4 shows the least variation in accuracy. Turning now to the nested data, Figures 4.4, 4.5 and 4.6 show the relative developmental trajectories of each participant along both measures over each of the three levels of directness.

Figure 4.4: Individual Trajectories for DR Requests

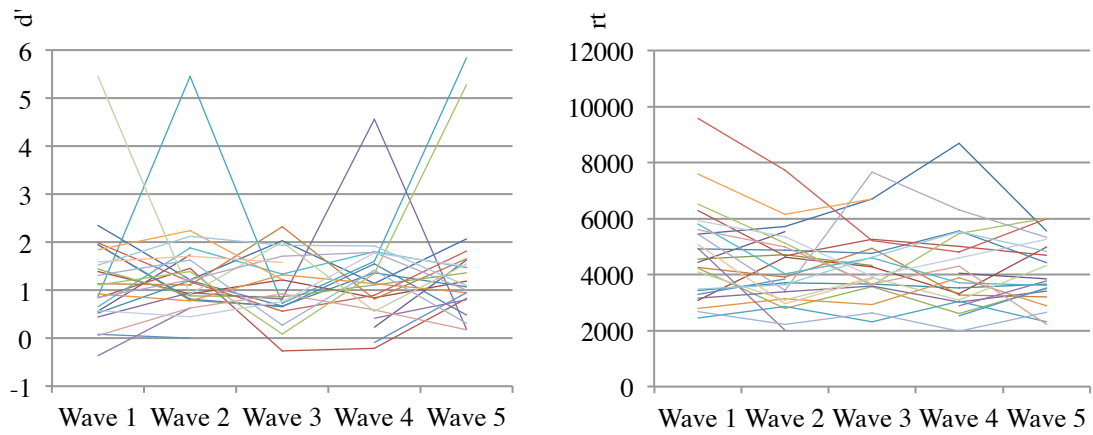


Figure 4.5: Individual Trajectories of CI Requests

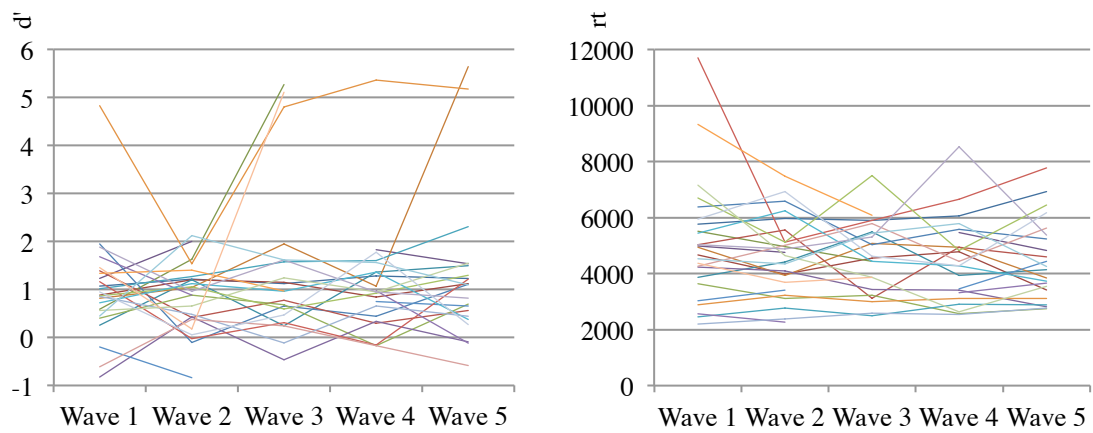
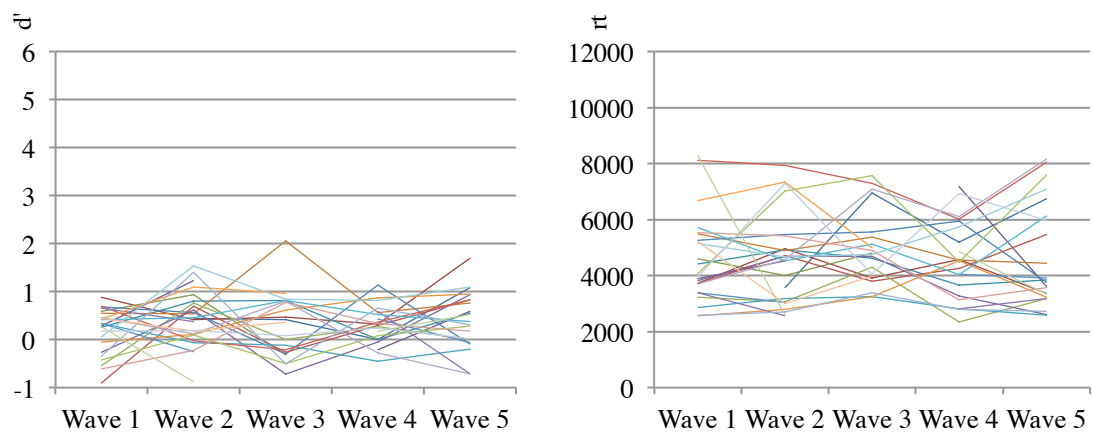


Figure 4.6: Individual Trajectories of NCI Requests



These figures reveal highly divergent individual developmental trajectories of L2 pragmatic comprehension. In order to account for this seemingly chaotic change, the rest of Section 4.2 discusses specific individual difference factors from the background questionnaire, introspective written protocol and exit survey. Each factor then licenses a sub-analysis of the resulting different participant clusters. Subsequently, a cross-analysis of the constituent participants in different individual difference factor groups explores potential latent interactions that account for further changes in accuracy and comprehension speed.

4.2.1 L2 Proficiency Development

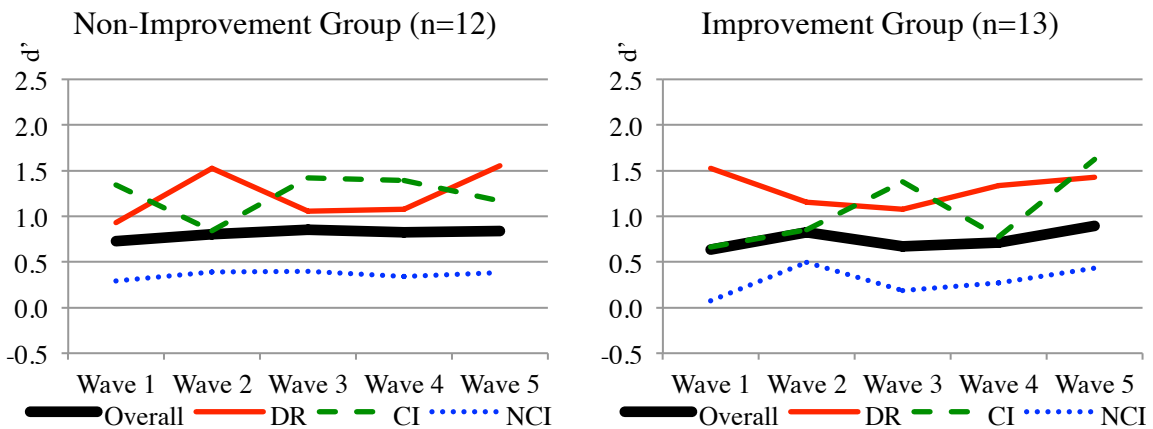
In the current study, the participants self-reported their level of L2 proficiency before the first exposure to the pragmatics listening task and after the final session, given that L2 proficiency is not static. As such, an additional proficiency measure reported in Sections 3.1 and 3.5 is the net change in proficiency over the course of the 13 weeks of the current study. This factor was marginally relevant to accuracy development overall and for DR requests in particular. The interpretation is that participants that report more gains in L2 proficiency are more likely to have improved on accuracy of request interpretation. Differences between participants in terms of change in L2 proficiency offers one sub-analysis in order to examine the relative developmental trajectories of learners that report overall improvement as opposed to those who do not. This approximately even division falls naturally at a net difference of zero between self-rated proficiency at the beginning and at the end of the study. This division produces a ‘non-improvement’ group of participants that reported either the same or lower proficiency level at both time points. The ‘improvement’ group reported end proficiency at least one level higher. Table 4.7 shows the distribution of the levels of change within each group.

Subsequently, Figure 4.7 shows the group trajectories for accuracy development across the two groups.

Table 4.7: Distribution of Proficiency Level Changes

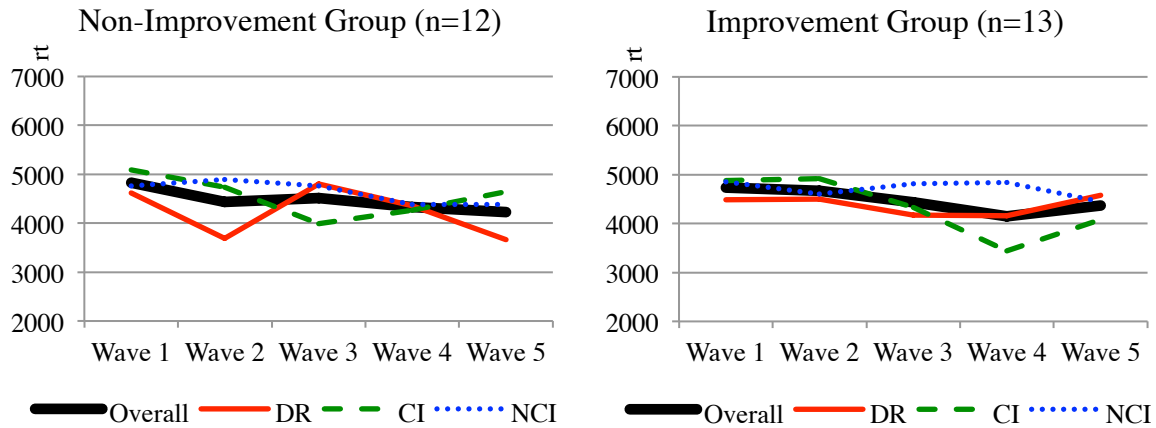
Non-Improvement Levels Changed		Improvement Levels Changed	
-1	n=5	1	n=8
0	n=7	2	n=4
		3	n=1
n=12		n=13	

Figure 4.7: Accuracy Results by Improvement Group



There are no significant differences between improvement groups overall, over any level of directness or at any data collection wave. Similarly convergent results are evident in the RT data for these two groups in Figure 4.8 below:

Figure 4.8: Reaction Time Results by Improvement



Again, there are no significant differences in the RT data between improvement groups by any dimension. Considering both accuracy and RT results, the amount of overall L2 proficiency change does not relate in any meaningful way with the development of L2 pragmatic comprehension in the current data. However, other factors do interact with this division, in that there is an interaction between improvement group and TRECEIVE ($b=0.12$, $z=3.56$, $p<0.001$). Participants that report improvement show a pattern like the aggregate results reported in Section 4.1, with TRECEIVE as the only significant factor ($b=0.11$, $z=2.96$, $p<0.01$) in accuracy and no significant predictor of RT. However, for participants that report no improvement, the variable of beginning proficiency ($b=0.18$, $z=2.45$, $p<0.01$), TSTUDY ($b=0.04$, $z=1.95$, $p<0.05$), TPRODUCE ($b=-0.13$, $z=-2.65$, $p<0.01$) and TRECEIVE ($b=0.17$, $z=3.08$, $p<0.01$) are all significant predictors of accuracy of request comprehension. Conversely, only the variable TRECEIVE ($b=998.41$, $z=6.56$, $p<0.001$) significantly predicts RT. Overall, the amounts of different types of L2 practice appears to be much more important in the accurate interpretation of

requests on the L2 pragmatics listening comprehension task for participants that do not improve.

Another difference is the lack of convergent results concerning the discrimination of the three levels of directness. Participants that do not improve in self-reported L2 proficiency over the course of this study do not quite significantly differentiate directness levels ($b=163.53$, $z=1.95$, $p=0.05$) by comprehension speed whereas participants that report L2 proficiency improvement do respond significantly more slowly along increasing levels of indirectness ($b=203.32$, $z=2.74$, $p<0.01$). However, neither group shows a significant relationship between RT and accuracy at any level of request analysis.

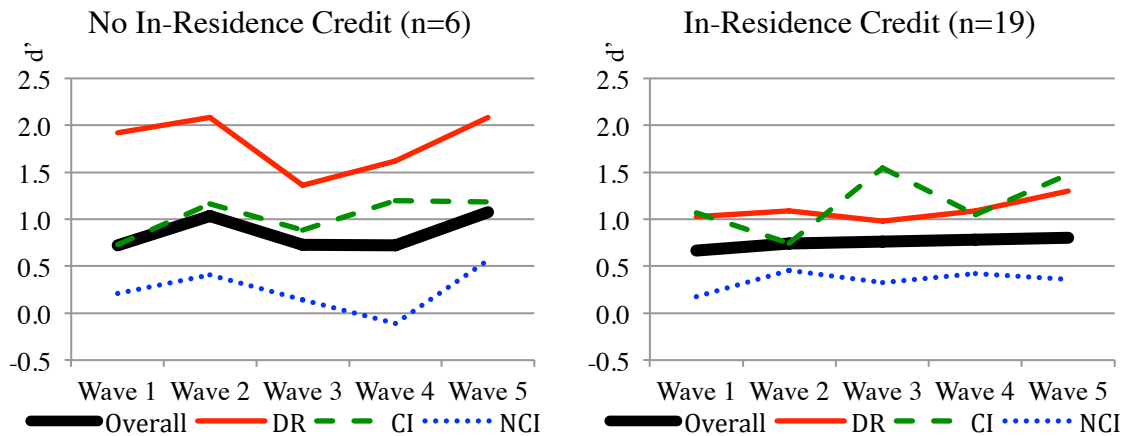
On the surface, it appears that there is no real difference among participants in the current study based on net improvement in L2 proficiency. While this holds true for the two focal measures of accuracy and comprehension speed, the factors that predict the same resultant responses are different between participants that improve and those that do not. Each measured type of L2 practice (TSTUDY, TPRODUCE and TRECEIVE) and higher initial proficiency affect the participants more that do not report higher end proficiency. In addition, the participants that do not improve appear not to differentiate the levels of directness described by Speech Act Theory while (in)directness factors significantly for improved participants. Next, another factor often related to proficiency, L2 coursework, offers an additional sub-analysis of the current data.

4.2.2 Previous Coursework

An additional, coursework-related, item on the background questionnaire targeted whether participants completed the prerequisite Spanish course at the same university for the course of enrollment from which all participants were recruited. This background

characteristic was simplified to ‘previous in-residence Spanish credit’, as opposed to transfer credit or credit-by-exam. This variable factored significantly with the accuracy of DR request discrimination, signaling a potential underlying effect useful for further analysis. However, this factor resulted in disproportionate subgroups in that six participants did not report previous in-residence credit while 19 participants did. Figures 4.9 and 4.10 below show accuracy and RT results for both groups of participants.

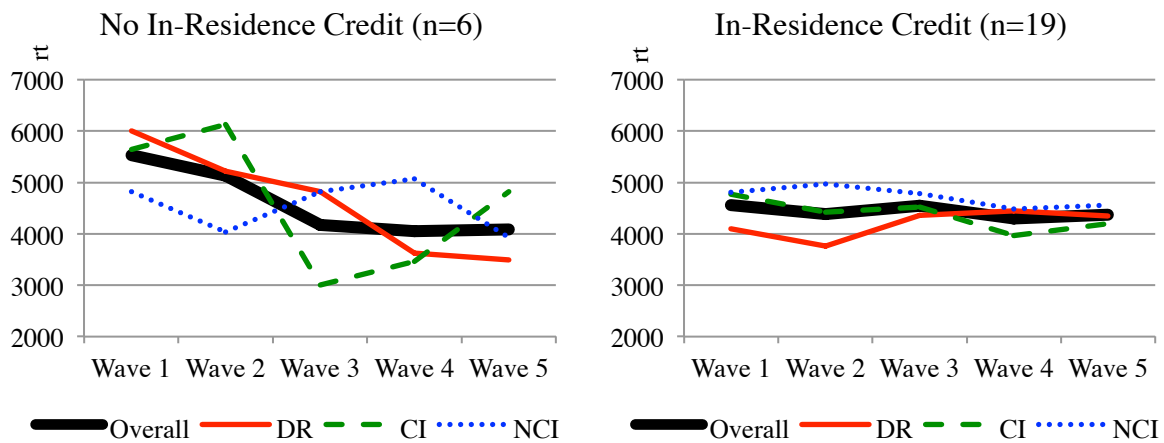
Figure 4.9: Accuracy Results by Previous In-Residence Spanish Credit



While there is no significant difference in accuracy results between groups overall, differences within groups do exist. Over the course of the study, the slight increase in overall request accuracy is significant for the 19 participants that had in-residence Spanish credit ($b=0.04$, $z=2.56$, $p<0.05$). This group also significantly differentiated the three levels of directness ($b=-0.38$, $z=-5.64$, $p<0.001$). While the group of six participants without in-residence credit shows a much higher degree of improvement, this change is not significant over all waves ($b=0.00$, $z=0.23$, $p>0.05$) or from just the initial wave to the last ($b=0.00$, $z=1.50$, $p>0.05$). However, this result is

likely due to the relatively low number of participants ($n=6$) of this group in the analysis. Reflecting the distance between trajectories in the figure, the levels are significantly differentiated ($b=-0.79$, $z=-5.95$, $p<0.001$). These relative differences are also mirrored in the RT results in Figure 4.10 below:

Figure 4.10: Reaction Time Results by Previous In-Residence Spanish Credit



As suggested by the overlap in the figure, the 19 participants with in-residence Spanish credit do not significantly change in terms of RT overall ($b=-48.26$, $z=-1.18$, $p>0.05$), across all five waves ($b=-31.52$, $z=-0.91$, $p>0.05$) or over any specific level of directness. However, level of directness ($b=198.51$, $z=3.26$, $p<0.01$) and TRECEIVE ($b=836.11$, $z=6.57$, $p<0.001$) are significant predictors of RT. Also, RT does not factor significantly into accuracy overall ($b=0.00$, $z=0.97$, $p>0.05$) or when controlling for the effect of levels of directness ($b=0.00$, $z=-0.95$, $p>0.05$). In an inverse pattern of results, the six participants without previous in-residence Spanish credit significantly improve in comprehension speed from beginning to end ($b=-262.05$, $z=-2.51$, $p<0.01$) as well as over all five waves ($b=-192.16$, $z=-2.34$, $p<0.05$). However, RT is not significantly

distinguished levels of directness by response speed ($b=131.49$, $z=0.97$, $p>0.05$) or predicted by any practice variable. Within the levels of request directness, only CI ($b=-411.49$, $z=-2.25$, $p<0.05$) and NCI ($b=-348.91$, $z=-2.22$, $p<0.05$) requests significantly change in terms of comprehension speed over the course of the study. Similar to the other group, there is no significant relationship between comprehension speed and accuracy overall ($b=0.00$, $z=0.64$, $p>0.05$) or over the levels ($b=0.00$, $z=-0.93$, $p>0.05$).

Given that previous coursework and L2 proficiency co-vary, an additional question in terms of factor interaction is whether the results in the previous section discussing L2 proficiency improvement over the course of the study interact with previous in-residence Spanish credit. Table 4.8 shows the distribution of number of participants across these two variables.

Table 4.8: Distribution of Participants Across Proficiency Improvement and Previous In-Residence Credit

		Previous In-Residence Credit	
		NO	YES
Proficiency Improvement	NO	2	10
	YES	4	9

In the mixed models for these two sub-analyses, no interaction holds. This result reflects that these two variables are not significantly related ($\chi^2(1)=0.13$, $p>0.05$)² in the distribution of participants.

This sub-analysis of the current longitudinal data of L2 pragmatic comprehension focuses on the differences in accuracy and speed results based on previous in-residence

² A Yate's correction is applied to the chi-square tests for independence between groups due to cells with low frequencies throughout Section 4.2.

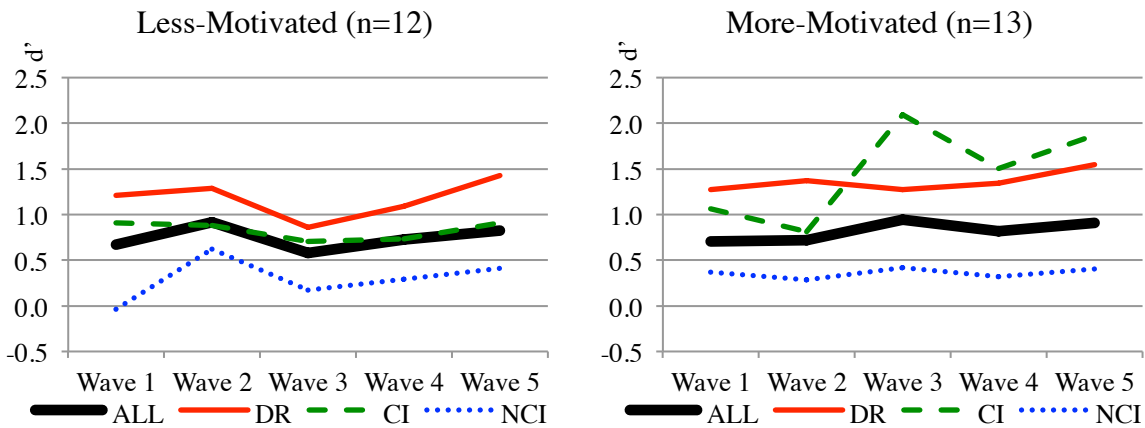
Spanish coursework by participants. While there is no overall effect for this distinction in L2 coursework, the trends and factors within each group are very different. The 19 participants with previous in-residence Spanish credit show a consistent, gradual and significant increase in overall d' , but chaotic and insignificant change in RT. Conversely, the six participants without previous in-residence Spanish credit show a consistent, gradual and significant speeding of overall RT, but chaotic and insignificant change in accuracy despite registering the most overall gains in both dimensions.

The previous sub-analyses focus on the effects of L2 proficiency and coursework. This focus has proved beneficial in exposing the relative differences underlying the aggregate results reported in Section 4.1. Both sections uncovered inverse trends in terms of accuracy and comprehension speed as well as relevant predictor variables. These analyses serve as explorations of learner-external factors whereas the subsequent analyses turn to learner-internal individual difference factors concerning motivation and strategies.

4.2.3 Motivation

In addition to proficiency and coursework effects in SLA research, motivation is consistently one of the most reliable individual difference predictors of L2 development. Of the 25 participants retained in the study, 12 report no interest in further Spanish study beyond the minimum required coursework while the other 13 reported between some interest to specific affirmations of additional coursework and study abroad in Spanish. As reported in Sections 3.1 and 3.3, these questions provide a primitive metric of motivation, which is a highly variable and continuously dynamic variable. Despite the rudimentary approach to motivational assessment, the following analyses reveal distinct differences in trends within each group. First, Figure 4.11 shows the developmental trajectories of accuracy data by motivation grouping.

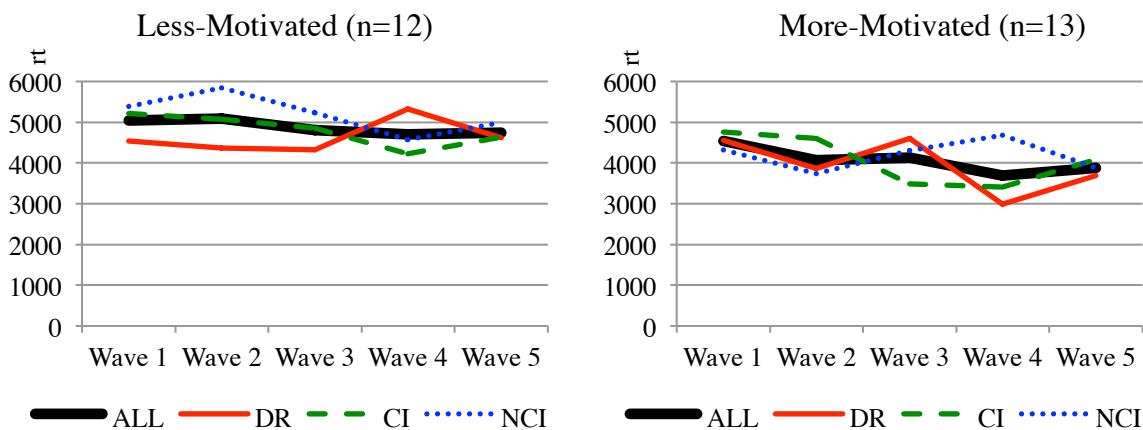
Figure 4.11: Accuracy Results by Motivation



There is no significant difference in accuracy between motivation groups for all requests ($b=0.06$, $z=0.44$, $p>0.05$). Again, this result belies underlying differences, particularly in the case of a near-significant interaction between motivation and beginning proficiency ($b=0.07$, $z=1.68$, $p=0.09$). For the 12 participants relatively uninterested in further Spanish study, accuracy development from beginning to end is significant ($b=0.04$, $z=2.43$, $p<0.05$) but not over all five waves ($b=0.02$, $z=0.84$, $p>0.05$). For this group, higher beginning proficiency ($b=0.14$, $z=2.17$, $p<0.05$), more time reported for TRECEIVE ($b=0.30$, $z=2.36$, $p<0.05$) and no previous in-residence Spanish credit ($b=-0.41$, $z=-2.11$, $p<0.05$) are significant correlates of overall request development; though no significant interaction holds between motivation and previous in-residence credit ($b=0.23$, $b=1.21$, $p>0.05$). However, the relationship is negative in that those less-motivated participants who took the prerequisite course at the same university obtained lower accuracy. In addition, this less-motivated group significantly differentiated the three levels of directness ($b=-0.44$, $z=-7.63$, $p<0.001$); however, no specific type of request develops significantly. On the other hand, the 13 more-motivated

participants improved significantly over all five waves ($b=0.05$, $z=2.87$, $p<0.01$) with the sole correlate of accuracy being more time spent listening to or reading Spanish outside of class (TRECEIVE: $b=0.09$, $z=2.70$, $p<0.01$). This group also significantly distinguished the levels of directness ($b=-0.50$, $z=-4.60$, $p<0.001$) and significantly improved in CI request accuracy ($b=0.21$, $z=2.05$, $p<0.05$) over the course of the study. Similar to previous sub-grouping analyses, each group shows different variables that factor into accuracy. Though both groups improve overall and the accuracy results are not statistically different between them, more factors, including beginning proficiency and previous in-residence credit are significant for the less-motivated participants. Another distinction stems from the finding that only the accuracy data of more-motivated participants are statistically different across the three types of requests. Below, Figure 4.12 shows the developmental trajectories of comprehension speed by motivation group.

Figure 4.12: Reaction Time Results by Motivation



Considering all requests, there was a near significant difference in comprehension speed between motivation groups ($b=-878.10$, $z=-1.82$, $p=0.07$), in which the more-

motivated participants responded almost a full second faster across items. In addition, there is an interaction between motivation and the practice variable accounting for time spent interacting in Spanish outside of class (TPRODUCE) ($b=-248.91$, $z=-2.63$, $p<0.01$). The 12 participants that reported no motivation to continue learning Spanish did not significantly improve overall ($b=-10.29$, $z=-0.16$, $p>0.05$) or across all five waves ($b=52.54$, $z=1.00$, $p>0.05$). In terms of predictors of RT, more time spent reading or listening to Spanish outside of class (TRECEIVE: $b=787.59$, $z=4.38$, $p<0.001$) significantly predicts slower RTs. The difference in comprehension speed across levels of directness only approaches significance ($b=156.85$, $z=1.77$, $p=0.08$) and there is no significant change over time for any specific level of request. Also, RTs are not significantly associated with accuracy on any level for the less-motivated participant group. Conversely, participants that report at least some interest in further Spanish acquisition significantly improve across all five waves ($b=-133.90$, $z=-3.44$, $p<0.01$) and significantly differentiate the levels of speech act directness ($b=196.98$, $z=2.79$, $p<0.01$). Furthermore, TPRODUCE ($b=-182.78$, $z=-2.07$, $p<0.05$) significantly predicts comprehension speed, while TRECEIVE approaches significance ($b=171.21$, $z=1.80$, $p=0.07$). Similar to the results of the less-motivated group, the relationship between RT and accuracy for the more-motivated participants is not significant.

Considering that the previous analyses in Sections 4.2.1 and 4.2.2 also revealed inverse results for the respective sub-groups, one potential confounding factor may be that these three groupings are not exclusive. Table 4.9 reports the distribution of participant constituency across sub-analyses.

Table 4.9: Distribution of Participants Across Motivation, Proficiency and Coursework

Motivation		Proficiency Improvement			Previous In-Residence Credit	
		NO	YES		NO	YES
		4	8		2	10
	YES	8	5		4	9

Across these distributions, the indirect motivation measure is independent of both proficiency improvement ($\chi^2(1)=1.02$, $p>0.05$) and previous in-residence Spanish credit ($\chi^2(1)=0.13$, $p>0.05$).

This section presents the sub-analysis based on general and indirectly measured motivation. There were no statistical differences in terms of L2 pragmatic accuracy or comprehension speed whether or not participants reported some degree of interest in continuing to learn Spanish beyond the minimum required coursework. However convergent the dependent measures may be, the factors underlying these results varies by grouping. Regarding the accuracy results, both groups significantly improved and differentiated the levels of request directness. However, the beginning proficiency and previous in-residence Spanish credit interact significantly only for the less-motivated participants. Furthermore, these two factors have differential effects on accuracy for this group. Higher beginning proficiency was correlated with higher accuracy while taking the prerequisite course at the same university predicted lower accuracy. In relation to comprehension speed development, only the more-motivated group showed significant improvement and discrimination of directness levels. Taken together, motivation appears to affect the two components of L2 pragmatic listening comprehension measured in the current study differentially. Often, motivation to learn has a much more direct influence on the next individual difference analysis concerning the different types of L2 practice.

4.2.4 Practice Variables

Sections 4.1.1 and 4.1.2 above report the aggregate results for accuracy and RT data on the L2 pragmatics listening task for the 25 intermediate Spanish L2 learners over the course of this 13-week experimental study with relatively little effect of practice. While theories of skill acquisition anticipate robust effects of different types of practice on these measures, few predictor variables resulted from the preceding analysis. One variable, the amount of time that participants reported listening to or reading Spanish aside from coursework (TRECEIVE), most often predicts both accuracy and comprehension speed, though not consistently across measures or directionality. Avoiding the elimination of the effect of course-supplemental practice, the distribution of the reported amounts of practice below is very revealing.³ Table 4.10 shows the mean number of hours per week over the three weeks preceding each data collection session that participants report for each type of practice.

Table 4.10: Distribution of L2 Practice in Hours per Week

TSTUDY		Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Overall
	Mean	2.09	1.89	2.80	2.51	2.76	2.41
	<i>sd</i>	(1.44)	(1.35)	(2.07)	(2.41)	(2.49)	(1.57)
	Range	0.00-5.00	0.33-5.00	0.00-8.00	0.00-10.00	0.17-9.00	0.57-6.87
TPRODUCE		Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Overall
	Mean	0.33	0.15	0.13	0.11	0.25	0.19
	<i>sd</i>	(0.92)	(0.28)	(0.20)	(0.36)	(0.69)	(0.32)
	Range	0.00-4.50	0.00-1.33	0.00-0.67	0.00-1.67	0.00-3.33	0.00-1.25

³ The distribution of amounts of practice by individual participant is available in Appendix L.

Table 4.10 continued

TRECEIVE		Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Overall
	Mean	0.34	0.09	0.07	0.06	0.41	0.20
	<i>sd</i>	(0.84)	(0.14)	(0.15)	(0.14)	(1.34)	(0.37)
	Range	0.00-4.00	0.00-0.50	0.00-0.67	0.00-0.67	0.00-6.67	0.00-1.69

Totals		Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Overall
	Mean	0.92	0.71	1.00	0.89	1.14	0.93
	<i>sd</i>	(1.37)	(1.15)	(1.71)	(1.81)	(2.02)	(1.41)
	Range	0.67-8.00	0.33-5.50	0.00-8.83	0.00-10.12	0.17-14.33	0.00-14.33

Overall, there is a significant difference between types of L2 practice ($b=-1.10$, $z=-13.31$, $p<0.001$). The amount of time participants spent studying outside of class (TSTUDY) is significantly higher than the amount of time participants spent interacting in Spanish (TPRODUCE: $b=-2.20$, $z=-13.07$, $p<0.001$) and listening to or reading Spanish (TRECEIVE: $b=-1.10$, $z=-13.48$, $p<0.001$) outside of class over all waves. In addition, there is a weak correlation between TSTUDY and TRECEIVE ($r=0.18$, $p<0.05$) indicating that participants that study more are more likely to listen to or read Spanish outside of class activities. However, there is no difference between the amounts of time for TPRODUCE and TRECEIVE ($b=0.00$, $z=0.04$, $p>0.05$), which remain relatively low due to a floor effect for many participants. There is, nevertheless, a moderate correlation between these two variables ($r=0.31$, $p<0.001$), indicating that participants that engage in one practice activity are likely to engage in the other. In addition, the pattern of change in TSTUDY and the total amount of practice coincides with change in accuracy (Section 4.1.1): DECREASE $\Rightarrow$ INCREASE $\Rightarrow$ DECREASE $\Rightarrow$ INCREASE, even though this variable is not a significant predictor of accurate interpretation of requests.

Considering the trends and mean amounts of practice shown in Table 4.10 above, it is unsurprising that TRECEIVE and TPRODUCE were not stronger factors. On average, all participants spent well under half an hour per week on these three types of L2 practice. More specifically, only four participants reported spending more than 10 minutes per week interacting in Spanish outside of class and aside from course-related activities during more than half the study. Similarly, three different participants report spending more than 10 minutes per week listening to or reading Spanish outside of coursework. As such, this minimal production practice does not affect learning in the current data. The noticeable difference in amount of practice among waves is also evident in that participants reported more practice at the beginning of the semester leading up to Wave 1 and again toward the end of the semester before Wave 5. Across all five Waves, TSTUDY varies significantly ($b=0.20$, $z=2.42$, $p<0.05$); meaning that while classroom contact hours was controlled, additional L2 developmental practice significantly fluctuated over the semester. On the other hand, TPRODUCE ($b=-0.02$, $z=-0.54$, $p>0.05$) and TRECEIVE ($b=0.01$, $z=0.30$, $p>0.05$) do not significantly change, as both measures begin low, decrease slightly and remain near zero hours per week.

Across these three measures of L2 practice, the specific participants reporting higher amounts of time for all categories are exclusive. Only one participant reported relatively high amounts of time for each type of practice (id=1021) and one other (id=1017) reports high for TSTUDY and TRECEIVE. This result raises a substantial issue of skewed data when looking at individual differences in L2 practice. While one method for further analysis is to select participants in an upper percentile of average time for each type of practice, this method is inherently insensitive to participants with greatly disproportionate practice at one wave.

Previously mentioned is the potential for interaction between other individual factors and L2 practice. Here, time spent across each practice variable becomes the dependent measure in order to assess whether the preceding sub-groupings factor statistically. However, it is important to remember the consistently low amounts of practice for TPRODUCE and TRECEIVE, making it difficult for either of these L2 practice variables to factor mathematically into the statistical analyses of accuracy and comprehension speed. As such, net proficiency development does not affect practice time ($b=0.13$, $z=1.16$, $p>0.05$), indicating no relationship between amount of practice and general L2 development. However, there is an interaction between type of practice and previous in-residence Spanish coursework ($b=-0.92$, $z=-10.14$, $p<0.001$) in which participants who completed the prerequisite course at the same university were significantly less likely to record time for TRECEIVE ($b=-0.36$, $z=-2.18$, $p<0.05$). Finally, motivation approaches significance as a positive correlate of practice across types ($b=0.23$, $z=1.65$, $p=0.10$) and for TRECEIVE ($b=0.16$, $z=1.79$, $p=0.07$). Overall, it appears that there is not strong association between the individual differences discussed so far and the amount of time participants spent studying, interacting and listening to or reading Spanish outside of class.

In the current data, the reported amounts of time spent on three types of L2 practice, TSTUDY, TPRODUCE and TRECEIVE, are not robust predictors of performance or change in accuracy and speed of L2 pragmatic comprehension. However, this section reveals that the lack of effects of different forms of practice is due to relatively little time spent with the L2 outside of the classroom. In addition, there is little reliable interaction with other individual differences. To this point, the sub-analyses based on the factors of proficiency, coursework, motivation and practice reflect the most common and effective factors in SLA research (Section 2.1.3). The following section that addresses participants'

response strategies, an additional and less commonly studied influence on SLA, serves as the final sub-analysis aimed at examining individually-dependent factors in the development of L2 pragmatic comprehension.

4.2.5 Response Strategies

The analyses discussed above reveal various patterns of accuracy and comprehension speed development over the course of this 13-week study. Within the aggregate trends, different trajectories and factors shape the processes underlying seemingly equal trends. To analyze such individual differences further, this section seeks to explore the role of strategies that participants employ to make a pragmatic interpretation.

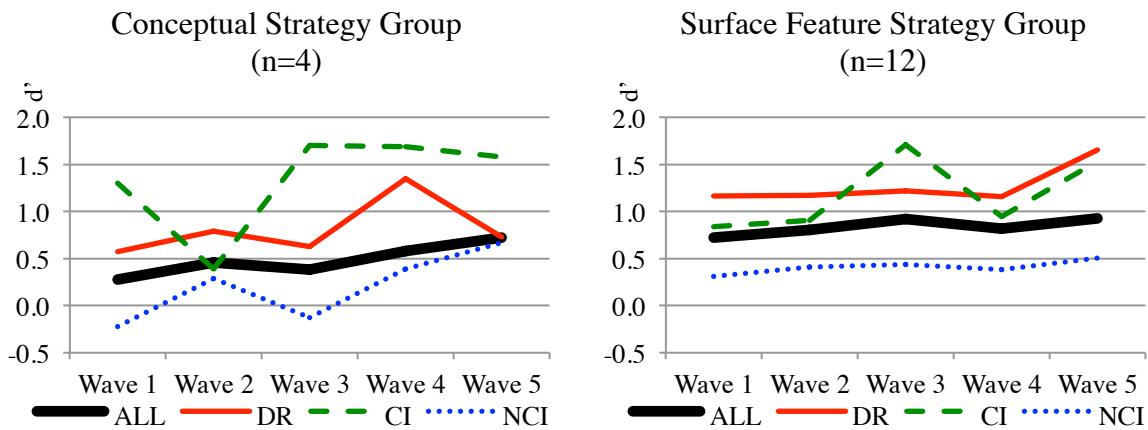
Described in Section 3.3, the introspective written protocol completed immediately following each experimental data collection session probed potential strategy use by each participant. Surface features reported by participants include: interrogative intonation, interrogative words (e.g. *qué* ‘what’), imperative verb forms (e.g. *ayuda* ‘help’), subjunctive verb forms (e.g. *lleve* ‘take’), mental state verbs (e.g. *creo que* ‘I think/believe that’), indirect object pronouns (e.g. *me* ‘me’) and formulaic expressions (e.g. *tienes que + INF* ‘you need to ...’, *necesitar + INF* ‘I need/you need to ...’, *deber + INF* ‘you should ...’ and *poder + INF* ‘you can/could ...’). Over all waves and levels, strategy type has no effect on RT ($b=48.20$, $z=0.34$, $p>0.05$) or on accuracy overall ($b=-0.02$, $z=-0.30$, $p>0.05$) or across levels ($b=-0.01$, $z=-0.05$, $p>0.05$). However, these generalities mask latent trends. Section 4.2.5.1 analyzes participant groups that consistently reported conceptual strategies ($n=4$) and surface feature strategies ($n=12$). These groupings omit the five participants that did not supply responses to the questions regarding strategies. In addition, four participants shifted strategies over the course of the

study. A subsequent analysis in Section 4.2.5.2 explores the trajectories of these participants to observe changes in accuracy and RT when there is a change in strategies.

4.2.5.1 Participant Patterns with Stable Strategies

Only four participants reported stable, consistent conceptual strategies at each data collection session over the course of the study (participants 1008, 1010, 1013 and 1012). Data from only four participants is highly unreliable in terms of inferential statistics, so the following results are exploratory. Another twelve participants reported stable strategies based on surface features. The accuracy developmental trajectories across these two groups appear in Figure 4.13 below.

Figure 4.13: Accuracy Results Across by Strategy Groups

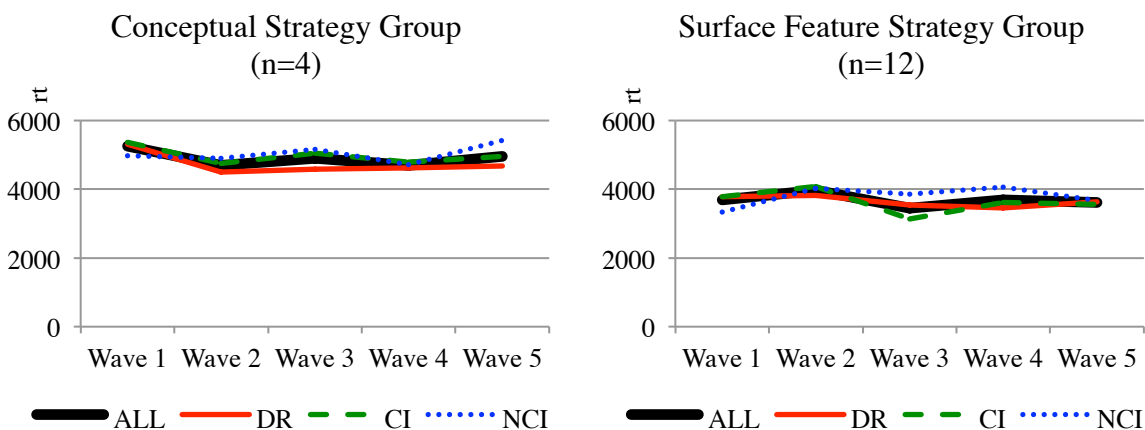


Over all requests, there is no difference between group accuracies ($b=-0.31$, $z=-1.41$, $p>0.05$) or across levels ($b=0.00$, $z=0.01$, $p>0.05$). However, there is an interaction between level of item directness and strategy group ($b=-0.17$, $z=-3.46$, $p<0.01$). The surface feature strategy group performs significantly better on DR requests ($b=-0.50$, $z=-2.02$, $p<0.05$) due to a focus on a surface feature specifically relevant to this category:

imperative verb forms. The surface feature strategy group significantly improves overall ($b=0.00$, $z=2.48$, $p<0.05$) but not on any specific level, although they do differentiate levels significantly ($b=-0.43$, $z=-5.15$, $p<0.001$). For all requests, TRECEIVE significantly predicts accuracy ($b=0.00$, $z=3.24$, $p<0.01$) and TSTUDY approaches significance ($b=0.00$, $z=-1.77$, $p=0.08$) for this group. Referring to the left side of the figure, the four participants who consistently use conceptual processing improve significantly overall ($b=0.00$, $z=2.88$, $p<0.01$). However, higher amounts of TRECEIVE ($b=-0.02$, $z=-2.72$, $p<0.01$) and TPRODUCE ($b=-0.10$, $z=-3.02$, $p<0.01$) significantly correlate to lower accuracy while a positive relationship with TSTUDY approaches significance ($b=0.00$, $z=1.78$, $p=0.08$). Unlike the previous group, the participants that focused on meaning and context did not distinguish levels ($b=-0.30$, $z=-1.47$, $p>0.05$) in terms of accuracy. However, these four participants did improve significantly only in distinguishing NCI requests ($b=0.01$, $z=2.60$, $p<0.01$).

Below, Figure 4.14 shows the developmental trajectories of comprehension speed across levels of directness by strategy group.

Figure 4.14: Reaction Time Results by Strategy Group



The stable-conceptual strategy group is almost significantly faster than the stable-surface feature strategy group across levels of directness ($b=-1132.78$, $z=-1.92$, $p=0.06$). The participants who reported a stable pattern of surface feature strategies did not significantly improve in time ($b=-75.02$, $z=-1.49$, $p>0.05$), but did significantly differentiate the levels of directness ($b=233.96$, $z=2.58$, $p<0.05$). For these participants, the only predictor variable for RT data is TRECEIVE ($b=871.41$, $z=6.00$, $p<0.001$). However, this finding indicates that more time that participants reported spending listening to or reading Spanish correlates to slower RT. Showing divergent results, the four participants that consistently report conceptual strategies do not improve significantly ($b=-59.47$, $z=-1.30$, $p>0.05$) or distinguish indirectness ($b=86.06$, $z=1.09$, $p>0.05$). In accounting for response speed, TPRODUCE is a significant factor ($b=-15572.22$, $z=-3.69$, $p<0.001$), while TSTUDY ($b=121.45$, $z=1.95$, $p=0.05$) approaches significance. Once again, this group represents only four participants and these results are not generalizable. RT does not predict accuracy for either group across levels of analysis.

Similar to previous sections, the question arises as to whether type of response strategy correlates to other individual factors. Table 4.11 below presents the distribution of participant constituency across the individual difference variables discussed in Section 4.2 only for the 16 participants who reported stable strategies.

Table 4.11: Distribution of Participants by strategy group, proficiency change, previous coursework and motivation

Strategy		Proficiency Change			Previous In-Residence Credit			Motivation	
		NO	YES		NO	YES		NO	YES
Strategy Group	Surface Feature	6	6		1	11		5	7
	Conceptual	3	1		2	3		1	3

There is no significant relationship between strategy and proficiency change ($\chi^2(1)=0.09$, $p>0.05$), previous in-residence Spanish credit ($\chi^2(1)=0.74$, $p>0.05$) or motivation ($\chi^2(1)=0.00$, $p>0.05$). These results indicate that neither previous in-residence Spanish credit or general motivation correspond to either strategy group. In addition, the use of one type of strategy of the other does not lead to more or less overall L2 proficiency development.

The influence of response strategy in the development of L2 pragmatic comprehension is difficult to interpret in the current data. Only four participants consistently used a strategy that involves conceptual processing of the utterance while approximately half of the current sample relied on surface level linguistic features such as interrogative intonation and imperative verb forms. However, within this group there are divergent uses of the same features. Among the participants that reported interrogative intonation as a relevant feature, two participants employed interrogative intonation as a request cue while three rejected such stimuli. Even so, participant 1012 responded to the written protocol question concerning strategies at Wave 3, by stating that after categorizing some items with interrogative intonation as requests, the participant realized that the utterances were not requests. This reflection of explicit noticing of the unreliability of intonation in identifying requests shows a transitional stage at which the overt feature still triggers a conditioned response, but at the same time negative evidence is building.

This section discussed the exploratory analysis of the effect of consistent response strategies over the course of the study. The most prominent finding is that relatively few participants consistently relied on conceptual strategies. Rather, these Spanish language learners tended to focus on surface linguistic features such as morphology and intonation in determining the pragmatic function of auditory stimuli. In terms of accuracy, there is

no overall effect for strategy and both groups improved over the course of the study. Only the conceptual strategy group was similarly accurate across levels of request directness. Within levels, participants who followed surface feature strategies performed significantly better on DR requests. In terms of development, the conceptual strategy group showed significance only for NCI requests. In addition, accuracy for both strategy groups showed a significant effect for the L2 practice variable TRECEIVE as well as the near significant effect of TSTUDY. However, the relationship between TRECEIVE and accuracy is different for each group. In addition, the results concerning the development of L2 pragmatic comprehension speed showed no significant improvement for either group. While the four participants who used conceptual strategies were significantly faster overall, comprehension speed was different across request types only for the surface feature strategy group. The predictor variables are completely different for each group. The surface feature strategy group shows a positive relationship between RT and TRECEIVE; more time listening to or reading Spanish correlated to longer, slower comprehension speed. Conversely, the stable conceptual group shows an inverse relationship between TPRODUCE and RT, where extra L2 interaction practice led to faster RTs. No significant relationship between accuracy and comprehension speed held for either group at any level. Last, the distribution of participant constituency across individual difference factors indicates no interaction and exclusivity of effects.

While this section focuses on groups of participants that consistently reported use of one type of response strategy, strategies were not necessarily static over 13 weeks. As such, the following section discusses the four participants that shifted strategies from wave to wave over the course of the study.

4.2.5.2 Strategy Shifts

Analysis of written protocol responses reveals that four participants (1004, 1007, 1009, 1019) shifted strategy usage at some point during the series of data collection sessions of the L2 pragmatics listening comprehension task. These shifts follow three patterns: (1) conceptual toward surface feature, (2) surface feature toward conceptual or (3) sporadic. The motivation for change in strategies is not provided by the current data.

Participant 1019 reported surface feature strategies across all waves except at Wave 3. On the post-experimental written protocol at this point, this participant stated: “This time I listened to who the sentence was directed at”. This statement contrasts with a focus on verbal morphology at Wave 1 and strategies at Waves 2, 4 and 5 that make reference to unspecified ‘trigger words’ or ‘cue words’. Depicted in Figure 4.15 below, accuracy at each level at Wave 3 falls to the lowest d' values for this participant. So, a shift from surface features to conceptualization corresponded to a decline in accuracy and slower responses across request types as compared to Waves 1, 2 and 4. These results invite a further comparison with the results of Participant 1004, shown in Figure 4.16, who demonstrates the inverse pattern of strategy shift.

Figure 4.15: Results for Participant 1019

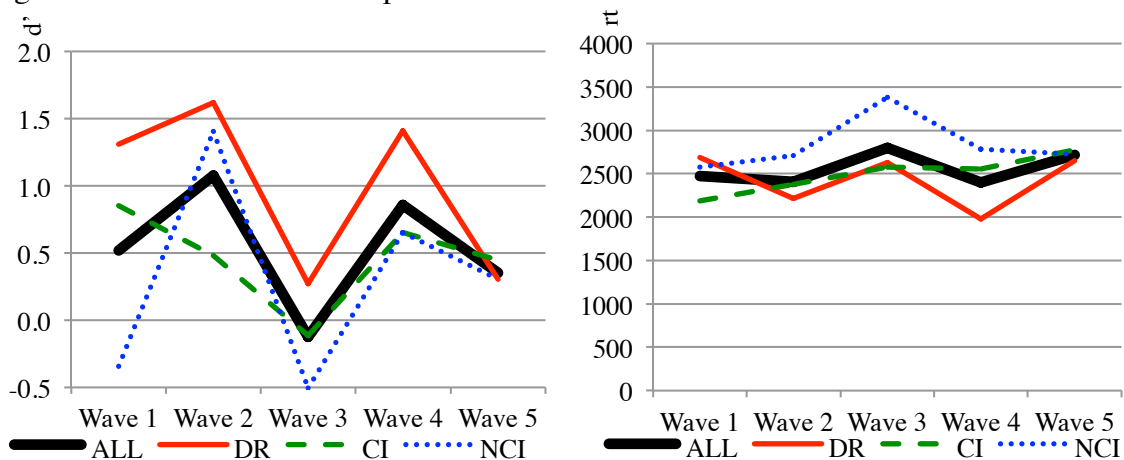
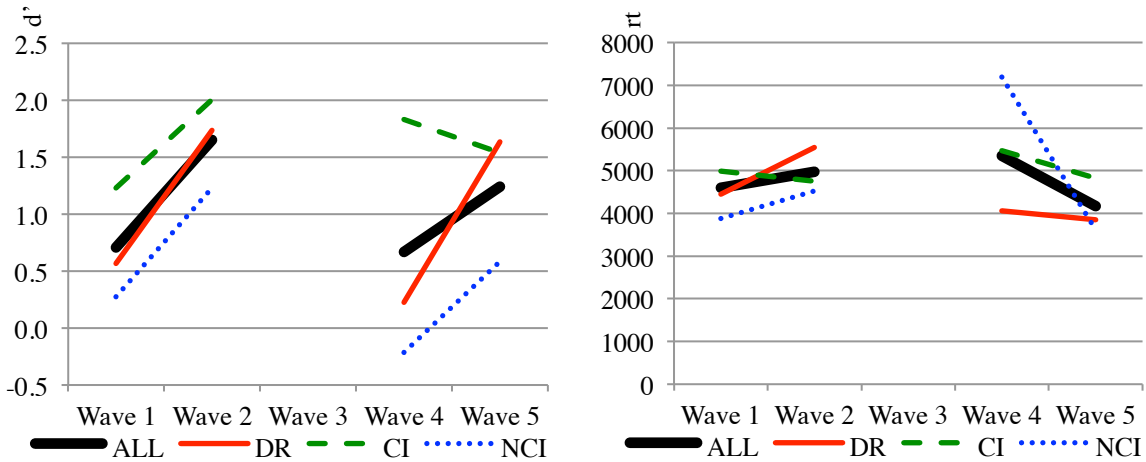


Figure 4.16: Results for Participant 1004



Unlike participant 1019, participant 1004 shifts from conceptual strategies during Waves 1 and 2, did not attend the data collection session for Wave 3 and returns with surface feature strategies at Waves 4 and 5. The effect of this shift is a drop in RTs for DR requests and a slowing in responses to CI and NCI requests. There is also a larger decrease in accuracy for DR and NCI items. However, there is only one retained response observation in the data for NCI requests at Wave 4 due to the data trimming procedure described in Section 3.5. Next, results for two participants that alternated back-and-forth between strategies are shown in Figures 4.17 and 4.18.

Figure 4.17: Results for Participant 1009

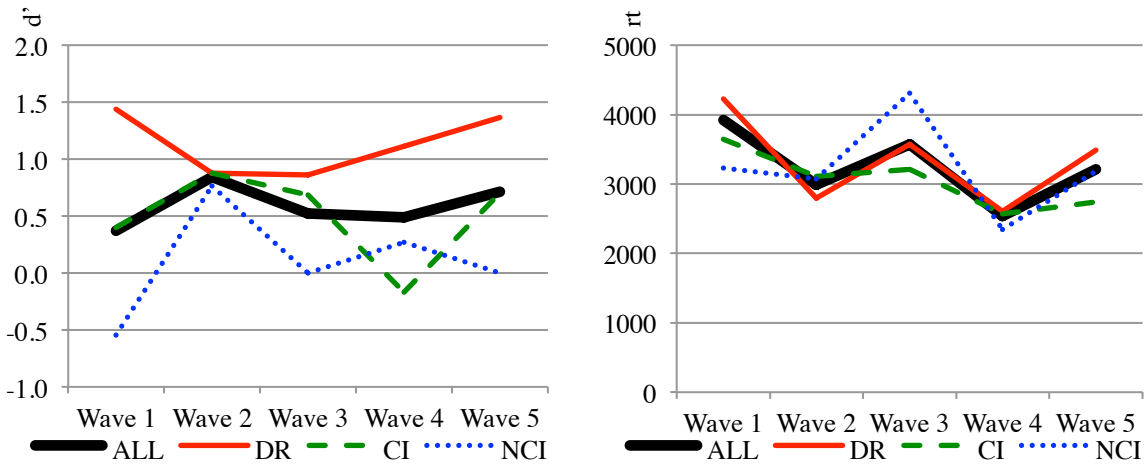
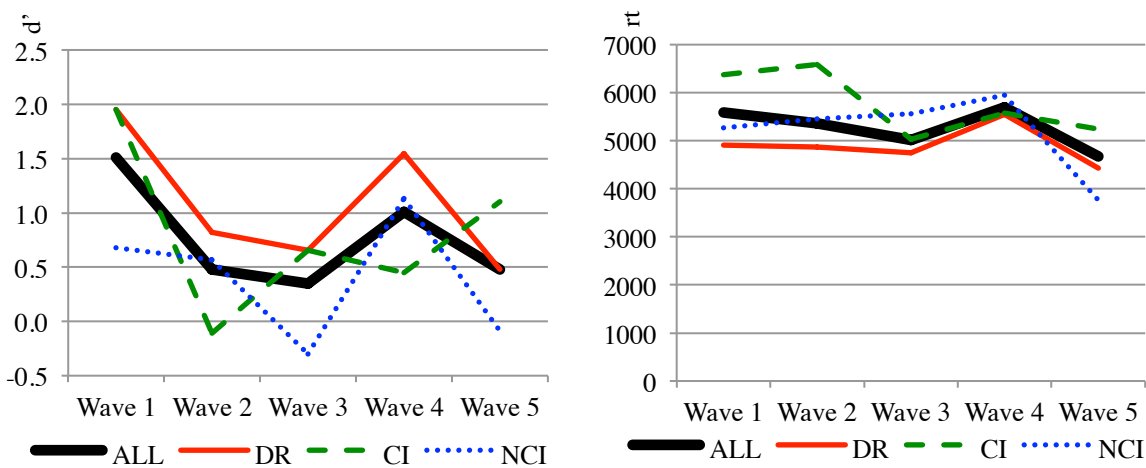


Figure 4.18: Results for Participant 1007



From wave to wave, participant 1009 shifted strategies from conceptual => surface feature => conceptual => surface feature => surface feature while participant 1007 shifted from surface feature => conceptual => surface feature => conceptual => surface feature. For these participants, shifting strategy appears to have had no consistent effect on accuracy or comprehension speed.

These methodological shifts while completing the study indicate that response strategies reflect differences in performance between groups, and also within individuals. However these data do not record all change in pragmatic interpretation strategy. While several participants mostly, if not always, used surface feature strategies, several others reported more global changes on the exit survey. Two questions probed whether participants believed that participation in the study affected their approach to Spanish class or Spanish in general. Figure 4.19 below presents these responses:

Figure 4.19: Global Changes from Exit Survey

- “It has made me look past vocab and conjugations for meaning, and look more at context.” (1001)
- “There are many ways to say the same things and also sentences with different tones or connotations can sound similar.” (1008)
- “I see the importance of context and tone. It probably changed a little bit, but I still focused on grammar a lot.” (1015)
- “I think this study showed functional use of the language, and how to communicate needs, rather than look solely at the grammar.” (1023)

The collective observations are increased attention to context and decreased focus on grammar. Because the study never makes explicit reference to grammatical forms, these participants adapted to the pragmatic nature of the task. This type of change led away from linguistic surface feature-based response strategies toward conceptual processing of the utterance in a plausible context. However, this change was not immediate and even when there was a clear shift, the effects on accuracy and

comprehension speed are not consistent across individuals. Rather, it appears that cognitive strategy change and use develop on a scale longer than the 13 weeks in the current study.

This section provides an exploration of the effect of response strategies for the L2 pragmatics listening comprehension task. While the general division between conceptual and surface feature strategies is methodologically useful, it does not account for substantial patterns of accuracy or comprehension speed in the current study. Section 4.2.5.1 discussed the differences of accuracy and RT results among participants that maintain strategies over the course of the study. Given the congruency between DR requests and the linguistic surface features identified by the surface feature strategy group, these participants responded significantly more accurately on this type of request. Conversely, the four participants who used stable conceptual strategies significantly improved in the interpretation of the most implied and indirect request items and registered faster responses overall. Section 4.2.5.2 shows the seemingly chaotic results found when participants shifted strategies between data collection sessions. Even so, qualitative responses on the exit survey revealed that global changes to the approach to communicative functions can occur without appearing on the wave-specific strategy responses. This finding reveals mixed strategy use that confounds the current analysis.

4.2.6 Summary of Individual Difference Factor Results

Following the analysis of the aggregate results in Section 4.1, Section 4.2 focused on individual differences that permit further sub-analyses into the developmental trajectory of L2 pragmatic comprehension. Section 4.2.1 divided the sample by participants who did and did not report improvement in overall L2 proficiency. These results show no differences between the two groups' accuracy and comprehension speed,

but rather, distinctly different factors underlying performance and development. For participants that did not record improvement in L2 proficiency, beginning proficiency and amount of practice are significant predictors and they do not differentiate levels of directness on either measure. Next, Section 4.2.2 reported that the factor of previous in-residence Spanish credit was associated with groupings that exhibited divergent results across each of the measures. The 19 participants that took the prerequisite course at the same university showed consistent and significant improvement in accuracy but fluctuating change in comprehension speed. Conversely, the six participants without in-residence Spanish credit showed significant and gradual improvement of comprehension speed while accuracy development was erratic. Next, Section 4.2.3 addressed the effect of motivation. Regardless of interest in further Spanish study, all participants became more accurate and differentiated the three types of requests over the course of the study. However, beginning proficiency was a significant and positive correlate to accuracy only for the less-motivated participants. In addition, less-motivated participants that completed the prerequisite course at the same university register lower accuracy statistics. With regards to comprehension speed, only the more-motivated participants significantly improved. Subsequent analysis delved deeper into the three practice variables reported in Section 4.2.3. Though the time spent studying Spanish (TSTUDY) and interacting in Spanish (TPRODUCE) per week outside of class were not robust factors for accuracy or RT data, the time spent reading or listening to Spanish (TRECEIVE) per week outside of class was frequently a factor across both measures. However, the specific relationship between TRECEIVE and these dimensions of L2 pragmatic comprehension is inconsistent. In some models, higher amounts reported for TRECEIVE predict higher accuracy or faster RT, as expected by increased practice. However, an inverse effect was sometimes seen in relation to TRECEIVE, where the more time participants reported listening to or reading

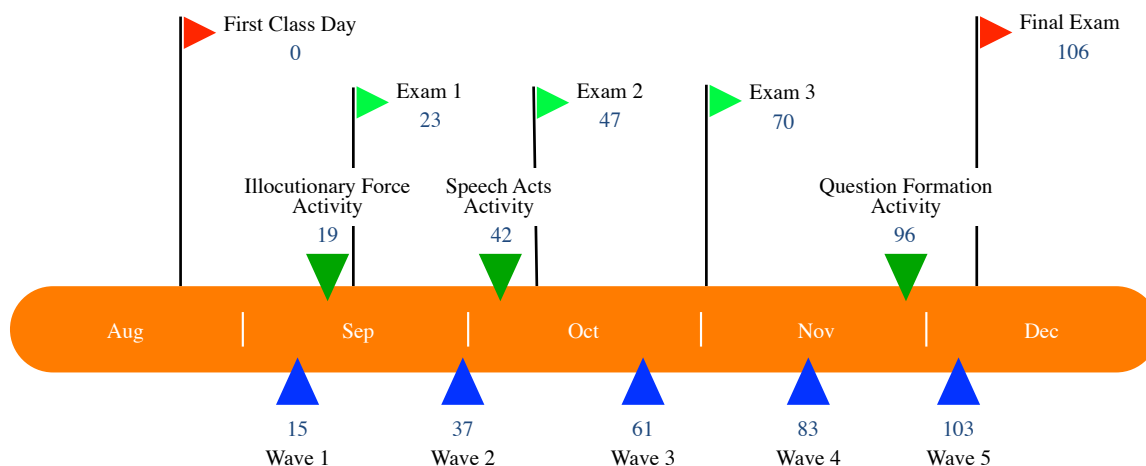
Spanish outside of class corresponded to lower accuracy and slower comprehension speed. Furthermore, the weak effects of these practice variables, TRECEIVE and TPRODUCE in particular, stems from minimal amounts of time reported for each. Few participants consistently spent more than 10 minutes per week for TRECEIVE and TPRODUCE or two hours for TSTUDY. Finally, Section 4.2.4 reported the distribution and effects of response strategies that participants used at each data collection session. An inherent mix of strategies during the unfolding cognitive of each decision confounded these results. This analysis reveals that only four of the 25 participants consistently used conceptual processing strategies and 12 participants maintained strategies based on linguistic surface features. The use of surface feature strategies benefitted DR request interpretation while the conceptual strategy group responded significantly faster, despite deeper processing. The great amount of variation within some of these sub-groupings reflects the reality that certain factors, such as the three measures of L2 practice, may originate not within the learning process itself or through individual differences. Rather, moderating variables beyond the specific experimental context affect and interact with these processes and factors.

4.3 MACRO-CONTEXTUAL FACTORS

This section explores influences on L2 performance and development outside of the variables discussed in Sections 4.1 and 4.2 that are applicable across the current sample of 25 participants. Of course, no experiment occurs in a bubble, impervious to extraneous influences that corrupt data. While most research must accept this reality as the ‘background noise’ within which analysis occurs, the current study involves supplemental information about the macro-context due to the institutional setting of L2 learning. The specific effects of the current analysis relate to events listed on the

standardized course calendar for the intermediate Spanish course of all the study participants. These events included major exams and activities focused on communicative functions in Spanish that presumably either affected accuracy and RT on the L2 pragmatics listening task or the amount of time reported across the three practice variables. Figure 4.20 below represents a timeline of relevant course events over the course of the semester during which the five data collection waves occurred. Course-related events appear above the main timeline while indications of each wave fall below. The number below each event corresponds to the number of days that event occurs relative to the first day of classes for this semester.

Figure 4.20: Timeline of Data Collection Waves and Course Calendar



Wave 1 occurred approximately two weeks into the semester following class-related review and practice with imperative verb forms and other formulaic expressions. These included *debes + INF* ‘you should/must ...’, *puedes + INF* ‘you can ...’, *tienes que + INF* ‘you have to ...’, *necesitas + INF* ‘you need to ...’, *es importante + INF* ‘it is

important to ...', *es necesario* + *INF* 'it is necessary to ...' and *hay que* + *INF* 'one has to ...'. While imperative verb forms coincide with DR requests, these formulaic expressions can also be associated with CI requests. However, the presentation of all of these forms describes their function as ones 'used to give advice', although 'advice' is a particular speech act. The distribution of examples and potential form-meaning-use mappings cover several categories, including requests. As such, DR and CI requests show higher accuracy than NCI requests at Waves 1 and 2. Subsequently, as the Spanish curricular focus shifts away from imperative verb forms toward more complex utterance structures such as the use of the subjunctive to give advice (*Es importante que reciclares* 'It is important that you recycle') and a wider variety of communicative functions, accuracy drops and RT slows for DR requests at Wave 3.

After Wave 1, the participants completed a class activity focused on illocutionary force, as seen in Figure 4.21. The content of this activity involves nine manifestations of the same general request without reference to the term 'request'. Rather, the activity requires categorization of each utterance as *débil* 'weak', *fuerte* 'strong' or *muy fuerte* 'very strong'. Below are the part of the instructions that provide context and the example sentences taken from the source textbook (Murphy et al., 2011). The English translations do not appear in the textbook.

Figure 4.21: Example Class Activity on Illocutionary Force (Murphy et al., 2011, p. 62)

<i>Imagínate que quieres convencer a alguien para que deje de usar tanto su teléfono celular.</i>	'Imagine that you want to convince somebody to stop using their cellular phone so much.'
<i>Oye, ¿qué tal si dejas de usar tu celular tanto?</i>	'Hey, what if you stop using your phone so much?'
<i>¡Deja de usar tu celular o te lo quito!</i>	'Stop using your phone or I will take it from you!'
<i>Sugiero que dejes de usar tu celular en la playa.</i>	'I suggest you stop using your phone on the beach.'
<i>De verdad, necesitas dejar de usar tu celular, ya.</i>	'Really, you need to stop using your phone already.'
<i>Me preocupa verte siempre hablando por teléfono.</i>	'I'm worried seeing you always talking on the phone.'
<i>¿Por qué no dejas de usar tu celular?</i>	'Why don't you stop using your phone?'
<i>Es importante que dejes de usar tu celular.</i>	'It is important that you stop using your phone.'
<i>¿No quieres dejar de usar tu celular, por favor?</i>	'Don't you want to stop using your phone, please?'
<i>Hombre, tienes que dejar de usar tu celular.</i>	'Man, you have to stop using your phone.'

These examples demonstrate a variety of DR and CI level requests involving different mitigation strategies. Nevertheless, the goal of the activity is to introduce learners to moderating illocutionary force and allow them to extrapolate the concept across speech acts. The possible effect on the results of the current study can correlate logically to either helping participants to differentiate the levels of directness and/or improve the accuracy of interpretation of DR and CI requests. However, the effect at Wave 2, approximately 18 days later, is mixed across these two levels for accuracy. There is a spike in accuracy for NCI requests and the largest single increase in overall accuracy at Wave 2. Subsequent to Wave 1, the curriculum introduces the subjunctive mood in Spanish in the particular context of desires and recommendations. The effect of this course content appears to weigh on the strategy reported by participant 1012. This participant maintains conceptual processing strategies over all waves except Wave 2, at which the participant reports 'subjunctive triggers' as specific cues for requests. However, this generalization is unreliable because any given recommendation may or

may not benefit the speaker, a crucial distinction for the operationalization of requests in the current study.

Shortly after Wave 2, participants experience an activity explicitly labeled *actos de habla* ‘speech acts’. This activity provides practice in categorizing discourse openers, politeness markers, interruptions, agreement, disagreement, suggestions, opinions, opinion avoidance and closing a conversation. The focus on grammatical structures of the first quarter of the course also concerns ‘structures used to give advice’, although, the specific course content corresponds to different speech acts. This lack of distinction of the differences within the construct of ‘advice’ has a duplicitous effect on the data. Participants experienced more exemplars with respect to communicative functions, some of which were unidentified requests. However, the lack of distinction may have encouraged overgeneralization of all taught ‘advice structures’ or suggestions to be associated with requests in this experiment. As such, this curricular event may have confounded the current results.

Lastly, an activity focusing on Spanish question formation reviews interrogative words, interrogative intonation and subject-verb inversion after Wave 4. While participants report interrogative words and intonation as explicit elements with reference to response strategies, no increase in frequency arises at Wave 5. Rather, these salient features are most commonly reported toward the beginning of the study.

In addition, the timing of curricular events over the semester established in the timeline in Figure 4.20 affects L2 practice. TSTUDY significantly changes over waves, but not TPRODUCE or TRECEIVE. The vacillation of TSTUDY is an artifact of the (perceived) need to study during specific periods of time for major course assessments. The higher relative rate of reported practice across types at the very beginning of the semester may signal either an early enthusiasm for studying and learning Spanish, a perceived lack of

preparation after a summer vacation without Spanish or simply a larger proportion of available time with which to spend on Spanish before the demands of the semester increase through higher difficulty, workload and fatigue of cumulative coursework of all classes taken. Later, the highest average amount of time reported for TSTUDY precedes the most complex assessments, at Wave 3 and Wave 5. In the interim, Wave 4 is the only data collection session to occur the furthest from any significant assessment or relevant activity, approximately two weeks. After a busy time period such as preparing for an exam, there is often a swing in the opposite direction to compensate for the previous added stress and work/study load, possibly leading to the performance at Wave 4 marked by stability in accuracy and faster responses compared to the previous data collection session at Wave 3. This trend is due potentially to lower global stress, which is expected to allow for more efficient use of attentional resources.

Another specific example of a macro-contextual effect comes from participant 1008, who records a unique response on the exit survey. On a question concerning whether they would change anything about their approach to the first session, this participant reports: “Just before the first session, my father was diagnosed with cancer, so I was a bit distracted”. Socio-familial issues like this one undoubtedly affect performance and learning; nevertheless, they usually make up the background variation. However, no consistent trend occurs across levels and measures from Wave 1 to 2 for this participant: DR request accuracy and RT improve, CI request accuracy decreases and RT slows and NCI request accuracy improves but RT slows. However, over all request types, accuracy improves and responses are quicker at Wave 2.

4.3.1 Summary of Macro-Contextual Factors

This section reported the relationship between the data collection sessions of the current study in the macro-context of the curriculum of the concurrent semester. Undoubtedly, experimental research cannot account for all of the potential factors outside of the methodological design. However, the institutional macro-context of the current study of the development of L2 pragmatic comprehension allows for an exploratory analysis of the relationship between significant Spanish course-related events and trends in the present data. While the interactions are not absolute, the critical understanding is that extraneous effects inevitably contaminate data, especially in longitudinal research. In this case, the request speech act is not an isolated focus in the class materials, but exposure to a variety of levels and structures is seen in the early part of the Spanish course curriculum. This material often reappears with less frequency and regains importance with the approach of the final cumulative exam. In addition, increasing demands on time and attention build over the course of the semester and spike around exams. This survey of extraneous effects seeks to situate the study-specific focus on the developmental trajectories of accuracy and comprehension speed on the L2 pragmatics listening task within the institutional macro-context.

4.4 SUMMARY OF RESULTS

This chapter reports the results of the present experimental pragmatic study of L2 development. This quantitative analysis focuses on the accuracy of request speech act identification as obtained by d' statistics and comprehension speed in milliseconds over five data collection waves overall and across three levels of directness. Background variables related to proficiency and previous coursework combined with time-varying amounts of practice across three types of L2 practice provide predictor and co-variate factors for these two dimensions. Section 4.1 explored the responses of all 25

intermediate Spanish learner participants retained in this 13-week longitudinal study. The general developmental trends involve more correct responses for DR and CI requests as well as non-request distracters and faster correct responses over the course of irregular and non-linear change. Table 4.12 below summarizes these results across levels and factors for each measure:

Table 4.12: Summary of Aggregate Results

		Improvement Over Waves	Improvement from W1=>5	Effect by Level	Factors for Higher Accuracy Significant	Nearly Significant
ACCURACY	ALL	✓	✓	✓	More TRECEIVE	Higher Proficiency
	DR	×	×	Higher than NCI	No Credit In-Residence	Less TSTUDY
	CI	×	×	Higher than NCI		More TSTUDY
	NCI	×	×	Lower than DR & CI		
					Factors for Faster RT	
RT	ALL	✓	✓	✓	Less TRECEIVE	
	DR	×	✓	Faster than CI & NCI	Less TRECEIVE	
	CI	✓	✓	Slower than DR	Less TRECEIVE	
	NCI	×	×	Slower than DR		Less TRECEIVE

The improvement across measures on the L2 pragmatics listening comprehension task shows differential results for DR and CI requests. Though no robust result holds for the development of accuracy for any level of directness, the comprehension of CI and DR requests statistically improved over the course of the study. For accuracy, the learners' comprehension of DR and CI items trended similarly while their identification of CI and

NCI items registered equivalent RTs over the course of the study. In terms of predictive factors, accuracy shows a wider variety with differential effects. Even though an increase in the amount of time spent studying per week favored the development of CI requests, the same increase appears to affect DR requests negatively. Across levels of requests, the L2 practice variable TRECEIVE maintained a negative relationship with comprehension speed. This counterintuitive finding indicates that participants were slower when they spent more time listening to or reading Spanish outside of coursework.

The developmental trajectories of the two focal measures discussed in Section 4.1.3 reveal convergent patterns that improve or decline across between Waves 1 to 4 overall and for DR and NCI requests. However, divergent patterns occur for CI items between Waves 1 and 2 as well as 3 and 4 as accuracy declined while responses became faster. Another divergent finding is better accuracy with worse comprehension speed from Waves 4 to 5 across all levels of request directness.

Further analysis of the relationship between accuracy and RT using a mixed-effects model predicated on individual development shows differential results by level of directness. The development of the learners' DR request comprehension shows a positive and moderate relationship in that their increasing RTs correlated to increasing accuracy. Conversely, the relationship between accuracy and RT on responses to CI requests involved a similar magnitude, though in the opposite direction. As the comprehension of CI requests became more accurate, the response times for these items decreased.

These aggregate results offer a global view of L2 pragmatic comprehension development while the subsequent analysis in Section 4.2 explores individual differences in the current data. This section reveals that seemingly convergent accuracy and comprehension speed results between sub-groups obscures differential patterns and factors within each. The performance and development of request comprehension by

participants that do not report motivation for further Spanish study or net improvement in proficiency tended to correlate more with beginning proficiency and an increased amount of time spent across practice variables. Conversely, participants who reported some motivation and general L2 development were more likely to improve on one or both measures and statistically differentiated the three levels of request directness. This section also explored the lack of effect of practice variables in the aggregate results due to relatively low reported time. In addition, response strategies reported by participants at each wave and upon completing the study indicate that the majority relied on linguistic surface features that consistently correspond to DR and CI requests.

Finally in this chapter, curricular events related to the institutional macro-context were explored in terms of potential effects on the responses during the current series of data collection sessions. Specific coursework, such as the example in Figure 4.21, targeted the pragmatic phenomena of illocutionary force and speech act categorization and made the participants aware of their forms and meanings. In addition, the timing of significant assessments such as exams offers insight into the potential motivation for varying amounts of L2 practice reported (TSTUDY, TPRODUCE and TRECEIVE).

The results described in this chapter represent data collected from a longitudinal experimental study of the developmental trajectory of L2 pragmatic listening comprehension. As such, these results show the change in accuracy and reaction time over the course of 13 weeks. In the next chapter, results are discussed in terms of theoretical implications involving theories of skill acquisition and Complexity Theory / Dynamic Systems Theory. This discussion follows the current guiding research questions posed in Section 2.5.1 regarding the nature of change, the relationship between the two dependent measures and the relationship of relative levels of directness, as well as the predictor variables across analyses.

Chapter 5: Discussion and Conclusion

This final chapter presents the significance of the results of the current study in the context of the previous L2 pragmatic comprehension research and theoretical approaches to development discussed in Chapter 1 and Chapter 2. Specifically, this discussion interprets the findings according to traditional theories of skill acquisition (Anderson, 1996, 2010; Anderson & Lebiere, 1998; DeKeyser, 2007; Logan, 1988, 2002; Palmeri, 1997, 1999) and the modern evolution of exemplar-based accounts in the form of the Complexity Theory / Dynamic Systems Theory (CT/DST) (de Bot et al., 2007; N. Ellis, 2008; Larsen-Freeman & Cameron, 2008a; Verspoor et al., 2011) framework. First, the research questions (Section 2.5.1) guiding the current study frame this discussion. Next, the findings of the current study are extended to the areas of L2 pragmatics, SLA research in general and L2 pedagogy. Finally, limitations of the experimental methodology are discussed before exploring potential future directions for research based on this study.

5.1 DISCUSSION OF RESEARCH QUESTIONS

This section examines the findings reported in Chapter 4 according to each research question in the context of previous L2 pragmatic comprehension research and the skill acquisition theories that those studies employed. The first research question deals with the nature of the developmental trajectories of accuracy, comprehension speed and the relationship between the two measures on the computerized L2 pragmatics listening task. Next, discussion targets the relative development across experimental items that are distinguished by the three levels of directness of Spanish requests. The last research question addresses the relevancy of the predictor variables from the written data

collection materials to the development of accuracy and comprehension speed of L2 request identification.

5.1.1 Research Question One

The overarching focus of this longitudinal examination of L2 pragmatic comprehension is captured in the first research question:

(1): What is the nature of the developmental trajectory of Spanish L2 request comprehension over the course of one semester of study, in terms of accuracy, comprehension time and the relationship between the two measures?

Across all 25 participants and all experimental stimuli, L2 pragmatic comprehension became statistically more accurate and faster over the course of the 13-week period of this series of experimental data collection sessions. However, the nature of this path of L2 Spanish request development was irregular and non-linear over time across accuracy and comprehension speed. This finding reflects the validity of this time scale to investigate L2 pragmatic development. In addition, this result reflects previous L2 pragmatic comprehension research. Taguchi (2007, 2008a) also found significant improvement in accuracy and comprehension speed over the course of seven-week and four-week studies. Nonetheless, significant improvement alone on each measure does not address relevant theories of learning; but rather it is the relationship between the two that speaks to the theoretical constructs and predictions.

In order to explore the application of these theories (Anderson, 1993; Anderson & Lebiere, 1998; Logan, 1988, 1992, 2002; Palmeri, 1997, 1999), the relative change in speed and accuracy is central, although the relationship between accuracy and response

speed on the L2 pragmatic comprehension task appears to be highly sensitive to the type of statistical analysis, reported in Section 4.1.3. No significance is found with a partial correlation analysis, mirroring previous L2 comprehension research (Taguchi, 2007, 2008b). However, the fundamental problem with this type of analysis is that it tests only whether higher accuracy corresponds to longer or shorter RTs. Instead, the theoretical application concerns the relative change longitudinally. For example, two participants may have the same level of accuracy but register very different RTs, which says nothing about skill acquisition. Rather, it is the inverse *change* for each measure over time that traditional theories of skill acquisition predict. That is, for each of two hypothetical learners, as their accuracy increases, their relative RTs should decrease. The fact that one participant is initially faster, but similarly accurate, is irrelevant to development. Therefore, only when controlling for the effect of time does the relationship of speed to accuracy become theoretically germane.

For the purpose of modeling appropriately the relationship between accuracy and speed, further analysis was achieved with a mixed-effects model that nests RT observations for each individual within their corresponding d' statistic. This procedure found a significant, though positive, relationship between the developments of each measure. This finding does not support Bialystok's (1993) assertion that the development of L2 knowledge and control of processing are independent processes. While this finding corresponds logically to a relationship between accuracy and speed during L2 pragmatic comprehension development, the specific nature is problematic for previous theories of skill acquisition. These theories hypothesize a relationship with a negative correlation: as accuracy increases, speed decreases. Conversely, the results of the current study indicate that participants that respond more slowly are generally more accurate.

An analysis of the more localized relationship between the two principal measures tracked the relative changes between each data collection wave. The trajectories of request comprehension development across measures were convergent until the last time period. Convergence was achieved between each of the first four waves in that accuracy and speed either improved or declined together. However, between the fourth and the final data collections, accuracy improved as comprehension speed declines. A closer examination shows that the general parameter of the power law of learning held until the end of the study: accuracy and comprehension speed change in the same directions. However, the lack of consistency in this relationship and the period of divergent trajectories at the second wave problematized the application of previous accounts of skill development.

Furthermore, the development tracked by the current study also varied greatly for individual participants due to the highly complex nature of L2 learning and L2 pragmatic comprehension. The majority of the participants (18 of 25) showed overall improved accuracy. Among these participants, only half achieved faster comprehension speed by the end of the study, in line with the power law of learning supported by theories of skill acquisition. However, the results of rest of the data conflict with this paradigm. As such, it appears from the findings of this study that symbolic (Anderson, 1993; Anderson & Lebiere, 1998) and exemplar-based (Logan, 1988, 1992, 2002; Palmeri, 1997, 1999) approaches to general cognitive skill development may oversimplify, and may be incongruent with, learning a complex phenomenon such as L2 pragmatic comprehension.

Ultimately, in the development of L2 pragmatic comprehension, as learners become more aware and analytical of functions, indirectness and mitigation strategies associated with different speech acts, they increase accuracy while slowing their interpretation process. This depiction violates traditional theories of skill acquisition, but

is in line with the concept of a ‘U-shaped’ learning curve and hypothesis testing (Carlucci & Case, 2013).

5.1.2 Research Question Two

The second research question concerns the differentiation of requests according to the construct of indirectness. The stimuli of the current experiment consist of an equal distribution of critical request and non-critical distracter items across three levels: direct (DR), conventionally indirect (CI) and non-conventionally indirect (NCI).

(2): How do the developmental trajectories of different levels of directness of requests vary relative to each other?

In general, the three levels of directness showed significant differentiation according to accuracy and comprehension speed measures. The finding of less accurate interpretation of implied requests is in line with early L2 pragmatic comprehension research by Carrell (1979, 1981) and Bouton (1994). However, there was variation within this differentiation. The interpretation of DR and CI requests by participants showed similar degrees of accuracy over all five data collection waves and these request types were consistently more accurately identified than NCI requests. This trend reflects the difficulty that these L2 learners had in processing weak representations of request features of an utterance with an implied meaning in order to apply contextual inferences and heuristics. In terms of comprehension speed, the correct categorization of DR requests was faster than that of CI and NCI items, which were similarly timed. These results parallel the findings by Taguchi (2005) and Röver (2005), which also found more accurate and faster responses for less-implied utterances. However, the difference in

response speed between DR and CI requests conflicts with a previous L2 pragmatic processing study by Takahashi and Roitblat (1994), who found no difference in reading times for direct versus conventional meanings.

Not only did the three levels of directness differ in terms of accuracy and speed, but the relative trajectories also showed differences. No single level of directness improved significantly in accuracy across all five waves or from the beginning of the study to the final session. However, comprehension speed significantly improved overall for DR and CI requests and across all five waves for CI items. Across levels, DR request results were consistently more accurate and faster than NCI request data; however, both show the same general trajectory of change in accuracy and comprehension speed. This shared trajectory involved convergent change in d' statistics and RT observations over the first four waves and a divergent change between the penultimate and final waves. However, DR requests improved somewhat on both measures over the course of the study while NCI showed the highest proportion of improved accuracy for any level, but no net improvement in comprehension speed. This result indicates that the 13-week time window of the current study was insufficient for statistical improvement in the speed of implied meaning comprehension. The CI request results tended to show the inverse direction of change between waves, but accuracy of responses on these items still improved on both measures over all five waves. Reflecting across these findings, the differences in directions of change, convergence of accuracy and speed results and magnitude of change reveal that each level of directness developed along distinct trajectories in the current data. These paths support the analysis of each type of request within the overall development of request speech act comprehension and different timescales of development, particularly in the case of implied utterances.

5.1.3 Research Question Three

The final research question addresses factors underlying performance and development of the ability to discern L2 Spanish requests across accuracy and comprehension speed in the current data. The term experiential refers to individual differences in background characteristics of proficiency and coursework as well as the amounts of time spent on three types of L2 practice outside of class.

(3): What experiential factors account for the variation in the development of accuracy and comprehension speed?

Significant predictors for the development of L2 pragmatic comprehension in the current study varied across accuracy and speed measures. One notable contradiction is the role of the amount of time that participants reported listening to or reading Spanish aside from coursework (TRECEIVE). *More* time reported for TRECEIVE correlated to higher accuracy across all request items while *less* time resulted in faster responses overall and for each level of request, but less accuracy. This trend clearly conflicts with traditional theories of skill acquisition because this variable measures the amount of L2 practice that trains the specific skill tested here, which is comprehension.

The findings of the current study that the predictor variables factor differently for accuracy and speed are supported by previous findings in L2 pragmatic comprehension. Taguchi (2005) found a larger effect of L2 proficiency on accuracy over RT. Also, Taguchi (2007, 2008b) found that accuracy was significantly predicted by general L2 proficiency while comprehension speed was correlated with lexical access speed. Taguchi (2008a) also found faster lexical access speed to correlate with faster RTs in addition to the greater amount of time spent reading or listening to the L2, an equivalent

of the variable TRECEIVE in the current study. Taken together, Taguchi consistently found that measures of L2 knowledge and proficiency positively correlated to accuracy. Correspondingly, faster comprehension speed was associated with measures of speeded cognitive processes and more comprehension-related L2 practice. These findings reflect skill-specificity effects of L2 practice previously investigated (DeKeyser & Sokalski, 1996), which do not hold in the current data.

Another counterintuitive finding relates to the role of L2 proficiency. Within the previous L2 pragmatic comprehension studies, Bouton (1994) and García (2004) observed that more successful interpretation of indirect speech acts correlated to higher L2 proficiency. Similarly, Taguchi (2005, 2007, 2008a, 2008b, 2011a, 2011b) also found L2 proficiency to be a factor of greater accuracy and, to a lesser extent, comprehension speed. The results of the current experiment found only a near significant relationship between proficiency and overall accuracy. However, the present study did not seek to examine differences by proficiency levels. Rather, there was little variation in the self-reported L2 proficiency levels of the 25 participants recruited from the same university course-level (Section 3.1). In addition, overall improvement of L2 proficiency from the beginning to the end of the study was never a significant predictor in any analysis. The resulting question is then: does the development of L2 pragmatic comprehension follow a distinct trajectory apart from overall L2 proficiency development? Instead, it may simply be the case that these two constructs develop along different timescales and, therefore, no statistical relationship is feasible.

Another unclear finding related to the experiential data is seen in the analysis of strategies employed to interpret communicative function. The strategies found reflect cognitive and compensation strategies according to Oxford's (1990) learning strategy typology, shown in Table 1.1. The results of the survey of strategy usage indicated that

participants that maintained conceptual, top-down processing of utterances were faster to respond, but not more accurate. It may be that participants that relied on bottom-up strategies that focused on linguistic surface features did so as a coping device to compensate for either weaker comprehension skills or listening comprehension anxiety. Several participants reported that they wanted to be able to hear the stimuli multiple times or have each utterance appear on the computer screen. Instead of processing for meaning and context, these participants appeared to rely on salient features. This type of strategy reflects the findings by García (2004) of an interaction between the interpretation of different speech acts and linguistic elements such as modals. This method is further reflected in the behavior noted by a few participants that they would categorize an utterance as a non-request if they did not understand it. However, a few other participants reported the opposite strategy in that they assumed an utterance to be a request if they could not comprehend all of the words. This difference of strategy for the same surface feature shows a tenuous relationship between meaning and form in L2 listening comprehension. While the experimental instructions and examples focused entirely on meaning and communicative function, participants nevertheless resorted to more tangible grammatical elements. This finding also reflects the elements of the ‘formulaic’ and ‘unpacking’ stages in the development of L2 requests noted by Kasper and Rose (2002), shown in Figure 2.4. This may be a mechanism for dealing with the cognitive stress of the task at a lower level of proficiency. Conversely, it may reflect the macro-contextual effect of institutional foreign language education that tends to focus on grammar. As such, the tendency to focus on surface features to the detriment of meaning and function was not easily abandoned in the current data.

While the questions on the written feedback protocol probed overall strategy use, these categorizations cannot be assumed to be rigid. Once a participant hears an utterance

that does not contain one of the anticipated surface features, subsequent conceptual interpretation is the only option to arrive at a decision. This blending of strategies then confounds these participant groupings. Another problematic aspect of strategy analysis is the fact that the experimental materials ask participants explicitly to report strategies, which can cause them to feel obligated to answer. They may then provide relevant information that fits the criteria of the questionnaire, but that may not reflect accurately their online processing strategies employed during the experiments.

5.2 EXTENDING THE CURRENT STUDY TO RELEVANT FIELDS

The results of the current study provide an analysis of the relative developmental trajectories of L2 pragmatic comprehension development as a seemingly chaotic and non-linear process that is influenced differentially by various factors. This depiction echoes one conclusion by Koike (1989a, p. 286) regarding the development of L2 speech act production:

We must recognize that learners' interlanguage is made up of several components and that the components may develop toward native-like L2 fluency in different ways. The nature of learners' interlanguage is then more complex than previously described, and these complexities can contribute to the difficulty in predicting how learners will express certain propositions such as those intended in speech acts.

The complexities and differing levels of development along different timescales of the current data question theories of skill acquisition discussed in reference to the research questions in Section 5.1, as well as methodologies and accepted findings across previous L2 pragmatic research (Bouton, 1994; P. García, 2004; Taguchi, 2002, 2005, 2007, 2008a, 2008b, 2011a, 2011b; Takahashi & Roitblat, 1994). Given these insufficiencies, the following discussion extrapolates the present findings to the broader

field of L2 pragmatics as a complex, dynamic system. Further implications for SLA research in general and L2 pedagogy are discussed as well.

5.2.1 L2 Pragmatics as a Complex, Dynamic System

The current research represents the continuation and elaboration of investigation targeted at the development of non-native language use (Canale & Swain, 1980) and the differentiation of L2 pragmatic production versus underlying competence (Koike, 1989a). More specifically, this study answers directly a previous call (Kasper, 2009, p. 264) to address the underserved area of comprehension research within the field of L2 pragmatics by combining pragmatic theories with a cognitive approach. While the present study contributes to this area of research, previously utilized theories of general skill acquisition such as ACT-R (Anderson, 1993; Anderson & Lebiere, 1998) are inadequate to account for the current results, as discussed in Section 5.1. Therefore, this section discusses the present findings in terms of CT/DST as a more applicable theoretical account of L2 pragmatic development.

The first fundamental concept in CT/DST that is relevant to the current data is ‘emergence’ (Section 1.3). L2 pragmatic listening comprehension inherently draws on the contributions of the systems related to auditory perception, lexicon, syntax and interactional functions, to name but a few. As such, L2 pragmatics is an emergent system that manifests through the interaction of its components, resulting in dynamic behavior. Furthermore, the construct of emergence is an alternative to the reductionistic approach that emphasizes only two dimensions of L2 pragmatic competence (Section 1.1) (Bialystok, 1993). Instead, a CT/DST approach to L2 pragmatics allows for conceptualization and methodologies that recognize the ‘different ways’ that the ‘several components’ develop within this system (Koike, 1989a, p. 286).

Similarly, Section 1.3.2 discussed emergent constructs relevant to CT/DST, which now come to bear on the findings of the current research. The concept of ‘co-adaptation between linked systems’ (Larsen-Freeman & Cameron, 2008a, p. 230) in the current data is reflected in the interaction between specified systems by learners and the resultant effect on L2 pragmatic comprehension. It is important to note that co-adaptation does not mean that each sub-system adapts in *parallel*, but *reciprocally*. Take for example the three constructs of: (1) the expansion of the grammatical repertoire, such as the use of the subjunctive, (2) the growing awareness of illocutionary force in the L2 due to curricular intervention and (3) the development of overall better listening comprehension. Adaptation occurs as additional grammatical realizations are used to modify illocutionary force while the change in both systems provides more target exemplars for activation during listening. In addition, improvement in the efficiency and effectiveness of listening comprehension frees up more attentional resources to allocate to the potential range of illocutionary force and varied syntax. The interaction and co-adaption of these three components in this example demonstrate the emergent nature of L2 pragmatic development, as opposed to the discrete acquisition of a single property operationalized as ‘L2 pragmatic competence’.

Another relevant CT/DST construct concerns ‘emerging patterns of stability and variability around stability’ (Larsen-Freeman & Cameron, 2008a, p. 230). In the current data, the ability to identify requests is not fully acquired as evidenced by the lack of complete success by any participant at any level of analysis. However, varying degrees of L2 pragmatic competence are seen in that the vast majority of the accuracy measures are positive, indicating a statistically-verified ability by learners to identify Spanish requests, particularly direct and conventional expressions. In this way, learners’ pragmatic interpretation in the L2 becomes more stable in the short period of time observed as

accuracy increases, but this competence still shows variability, as the system is still open to change and instability.

It is this flexibility that leads to the theoretical focus on ‘points of change or transition when a system shifts from one behavior to another’ (Larsen-Freeman & Cameron, 2008a, p. 230). The most recognizable application of this CT/DST concern is in the findings on L2 practice, which shifted most at the beginning and at the end of the semester, and reported strategy usage, which showed idiosyncratic changes. These subsystem shifts become moderating influences on the larger system of L2 pragmatic comprehension, each of which was discussed in relation to the curricular macro-context in Section 4.3.

Another conceptual tool for L2 pragmatics, and pragmatics in general, is the use of ‘attractor states’ (Section 1.3). In development, the strengths of associations between linguistic and interactional features adapt to previous experience. In the current data, attractors are evident in the differentiation between not only requests versus non-requests, but also the three levels of request indirectness. The similarity of accuracy in participant responses for DR and CI requests suggests overlap of the relevant linguistic and interactional features that define these still developing speech act representations. In the interpretation of implicature, fewer specific features related to a speech act are available in the input overtly that allow for quick attraction to the intended communicative function. As such, the less accurate interpretations of NCI request items reflect the cognitive task demand to respond before the utterance is forgotten. In terms of working memory, a response is needed before the utterance is no longer available in the phonological loop (Section 2.1.3) (Baddeley, 2003; Baddeley & Hitch, 1974). This situation conflicts with the need for learners to process the utterance in search of contextual relevancy, given weaker cognitive representations of features. Over the course

of the development of the sub-systems related to L2 pragmatic comprehension, feature associations strengthen, increasing the speed and probability of selection of the relevant attractor state or ‘fuzzy’ representation (Spivey, 2007), in this case related to pragmatic function. This conceptualization of pragmatic phenomena in terms of attractors is also compatible with the research by Cooper (1999) in which he developed a theoretical ‘attractor grammar’ in order to offer a dynamic systems account of linguistic universals.

Furthermore, two methodological issues emphasized by CT/DST that are supported in the current data and relevant to L2 pragmatics involve the analysis of development over nested levels and multiple scales. The change over time over all requests as well as along each level of directness revealed different trajectories and rates of change. This analysis showed a systematic dynamic, as multiple factors interact in different ways, such as L2 proficiency, within different sub-groupings, particularly the less-motivated participants, to produce convergent accuracy and speed results across groups. Therefore, future research on L2 pragmatics must take into consideration acquisitional differences not only over time, but also in terms of the discernable levels within linguistic phenomena, such as indirectness in speech acts, along different observable scales of development, from milliseconds to years.

The current discussion seeks to explore a viable application of CT/DST as a theoretical framework for the cognitive development in L2 pragmatic research. The need for this advancement stems from the inadequacies of previously favored general theories of cognitive skill development such as ACT-R (Anderson, 1993; Anderson & Lebiere, 1998) to account for the findings of this dissertation. In light of the current data, CT/DST constructs such as emergence and attractor states do indeed reflect accurately L2 pragmatic phenomena and development. Next, this discussion is further extended to the research interests of SLA in general.

5.2.2 Implications for SLA Research in General

While the current study focuses on the development of pragmatic comprehension, it also involves theoretical and methodological implications for research across the domains of SLA. If L2 pragmatics is a complex, dynamic system, the L2 system that envelopes it is even more complex and dynamic, as the new language system emerges through the co-adaptation of myriad constituent components.

One dynamic factor pertinent to any study of SLA is the significant change in the amount of time that participants reported studying Spanish outside of class over the course of this study. Many studies track differences in treatment groups and/or conditions without measuring or considering the dynamic nature of such directly relevant variables that are often not included for analysis, such as DeKeyser's (2000) reduction of SLA factors to age of first L2 exposure and language aptitude. However, the results of the current study have two distinct implications for SLA research methodology. First, large differences in the total amount of L2 practice per week among individuals (such as the range of 0-10 hours in the current study) should be considered. To extend the CT/DST framework, the treatment or condition focus of a study may even interact with this variable in that the experience of participating in an experiment may encourage participants to practice more or less. In such a scenario, the interpretation of the results would attribute changes to the treatment or condition directly, rather than understanding the experimental intervention as a moderator of L2 engagement and experience. Second, the behavior by participants on assessment and/or the effect of a treatment is influenced by macro-contextual factors such as higher enthusiasm early in learning or early in a semester of L2 study, curricular workload fluctuations over time, fatigue, positive motivation and negative attitudes. Therefore, SLA research would be benefit greatly by

exploring potential interactions with experimental constructs, particularly by considering all variables as potentially dynamic.

Furthermore, another aspect of the CT/DST approach that is particularly relevant to SLA research in general is the concept of nested levels of analysis and interconnected systems. The target linguistic phenomenon of any SLA research inherently consists of component sub-systems and is itself a sub-system of the developing L2. In the present study, L2 pragmatics was discussed as drawing on the developing L2 systems of phonetics, phonology, lexicon and syntax, to name a few. Previous research has directly addressed the relationship between L2 grammar and pragmatic development (Bardovi-Harlig, 2009; Koike, 1989a). Similarly, the L2 lexicon cannot be considered exclusive from phonetics because words have specific phonetic components, just as syntax is not independent of semantics due to the influence of argument structure. As such, SLA research in general would benefit conceptually from the CT/DST framework.

5.2.3 Implications for L2 Pedagogy

One context for the process of SLA is the L2 classroom. While this dissertation does not involve a pedagogical intervention, the current findings in terms of complexity and dynamics have some implications for L2 pedagogy. The first and most predictable suggestion for teaching a foreign language from the perspective of an L2 pragmatics study is the need for a greater focus on the wide variety of realizations of different communicative functions, like requests. The added attention to pragmatic phenomena can offer a beneficial effect of co-adaptation with other L2 target features, such as syntactic complexity. By referring to grammatical constructs, phonology or vocabulary, for example, in terms of communicative functions, stronger attractor states form for each component, as in the example of grammatical repertoire and illocutionary force in

Section 5.2.1. The result is stronger representations of the L2 for the learner and more efficient activation of relevant knowledge.

Related to the issue of strength of cognitive representation is whether to focus on L2 products versus process of acquisition (Section 2.3) in the L2 classroom. This concern stems from the complex interaction of various components of L2 knowledge in the process of SLA. The implication of this issue for L2 pedagogy relates to the question of assessments performed at arbitrary time points. Testing for the acquisition of specific linguistic products of learning implies stable representations that associate target language-like features. However, partial representations that do not produce the intended responses may be indistinguishable from a lack of any L2 learning. This insensitivity to the continuum of acquisition reflects a weak measure of L2 competence. One potential alternative to traditional L2 product-oriented testing that is compatible with a CT/DST approach could be ‘dynamic assessment’ (Lantolf & Poehner, 2011), which addresses this continuum.

Another specific implication of pragmatic processing in light of the current findings is a greater emphasis by L2 educators and learners on conceptual, top-down processing strategies. In the present data, the participants largely reported that their experimental responses were based on bottom-up comprehension strategies that focused on specific linguistic surface features such as imperative verb forms in order to interpret communicative function. The modification of these unreliable strategies can be achieved through the use of ‘negative evidence’ where similar surface features are shown with a variety of communicative functions, which does not confirm such simplification of the connection between feature and function. Then, learners can be asked to associate the various linguistic features with the different interactional uses explicitly. This exercise can have two effects: (1) breaking the overgeneralization of a connection between a

specific linguistic feature and only one communicative function and (2) expanding the variety of forms associated with different functions. In the face of losing a simplification strategy, further emphasis can be placed on the conceptualization of the utterance meaning and the consideration of contextual information. The goal is then to shift or to avoid the stabilization of unreliable associations between linguistic and interactional features (attractor states) in the L2 system. Further extensions of CT/DST for L2 pedagogy will require additional research targeted toward this end.

5.3 CONCLUSION

This dissertation employed an experimental pragmatics approach to the investigation of the developmental trajectory of L2 Spanish requests. The findings of the current longitudinal study of L2 pragmatic listening comprehension do not support the simplistic predictions of skill acquisition theories (Anderson, 2010; Anderson & Lebiere, 1998; Logan, 1988, 2002; Palmeri, 1997, 1999) that were previously applied to L2 pragmatics. Instead, this study shows that the dynamic and complex nature of the development of L2 pragmatic comprehension is more compatible with the CT/DST framework (de Bot et al., 2007; N. Ellis et al., 2009; Larsen-Freeman & Cameron, 2008a; Verspoor et al., 2011). Moreover, the results revealed that requests globally and at each level of directness develop on differential timescales and that the factors in this development are also dynamic over the course of this 13-week study.

5.3.1 Limitations

While innovative in its analytical and theoretical approach, this study does have methodological limitations. First, the experiment sought to study pragmatics, which is highly context-driven, in a laboratory-based environment. However, participants were given a minimal context overarching all stimuli and were expected to interpret meaning

according to Relevance Theory (Sperber & Wilson, 1995), in line with previous research on pragmatic comprehension (Cameron & Williams, 1997; Taguchi, 2002), discussed in Section 2.2.

Another issue was the fairly limited number of participants. While many students initially volunteered for the study, only 25 qualified participants completed the study. While statistical methods were employed that dealt with individual variation, the generalizability of the resultant trajectories cannot be extended beyond the current sample. In addition, this study involved participants from only one course-level of L2 Spanish study. Therefore, the specific results cannot be extrapolated to L2 pragmatic comprehension development in general, but only for this intermediate-level of L2 development. While it would be improbable that substantial data would come from lower proficiency participants, the developmental trajectories of learners of a higher level of proficiency may offer additional understanding of the focal process.

Furthermore, the procedure of cleaning the data of outlier responses reported in Section 3.5, while methodologically valid, also limits the reliability of the current results. The issue stems from the fact that d' statistics were calculated based on observations trimmed by two standard deviations of each participant's mean RT. The problem lies in the cases where very few observations remained for a participant at one level and data collection wave. That is, it is possible that a particularly high d' value corresponded to the calculation of complete success in identifying the request, but on only one or two remaining items.

Another artifact of the data is that the faster responses for DR request items may correspond to differences in *when* exactly during listening that request-markers occur across utterance types. For DR items, the realization of overt request-markers occurs at the beginning of an utterance, often in the form of an imperative verb form (e.g. *Dame ...*

‘Give me ...’. This timing inherently favors the bottom-up, surface feature processing strategies that the participants reported frequently. Conversely, even the formulaic CI items required slightly more time for the more complex modal structures to unfold. This difference may explain why DR requests were registered significantly faster than CI requests, even though these two levels were no different in terms of accuracy.

5.3.2 Future Research

Despite these limitations, the results of the current study raise additional questions for future research. While this study investigated the developmental trajectories of different types of Spanish requests, additional research could look at the relative development in comprehension of other L2 speech acts. A related interest is whether the same predictor variables hold across other types of communicative functions such as expressions of opinions and refusals. Just as this experiment sought to elaborate the previous research by studying the language pairing of L1 English and L2 Spanish, further experiments should look at the developmental trajectories of additional language pairings that are similar to those in this study as well as different, like the English and Japanese language pairing of the studies by Taguchi (2002, 2005, 2007, 2008a, 2008b, 2011a, 2011b).

Furthermore, the inverse effect on comprehension speed of the time spent listening to or reading Spanish outside of class calls for additional, targeted research. This construct should also be broken down into the specific sub-skills of reading versus listening comprehension. Moreover, a longer time window of development may be needed in order to track the relationship between processing speed and L2 skill-specific practice in order to evaluate the appropriateness of applying the construct of U-shaped versus power law learning.

Beyond the study of developmental trajectories, future experimental research is needed that investigates the online processing of pragmatic phenomena according to utterance constituency, such as the specific types of modifiers used to vary the current experimental stimuli (Appendix A). This type of research is needed to understand further the processing that occurs during L2 pragmatic comprehension. In the current study, the specific cues that participants attended to were unobservable given the methodology employed. A question for this type of research might be: when reading, are learners of different levels of proficiency sensitive to pragmatic violations? Also, does this sensitivity vary by type of violation or distance of cues? Similarly, fertile research could study what features L1 and L2 speakers attend to when interpreting implicature.

Finally, this dissertation contributes directly to the underserved area of research concerning L2 pragmatic listening comprehension. In addition, the theoretical framework of CT/DST more closely accounts for the evidenced development of the current study as opposed to theories of skill acquisition employed by previous L2 pragmatic research. Taking into account the findings, limitations and potential for additional investigation, the current study encourages a continued and sustained effort to continue to develop theoretically-informed empirical knowledge about the development of the ability to reliably interpret interactional phenomena in a L2.

Appendix A: Request Modifiers (Schauer, 2004)

<u>External modifiers:</u>	Additional statements that support the request.
Alerter:	Used at the beginning of a request to get the interlocutor's attention. <i>Er, excuse me, hello, Peter.</i>
Preparator:	Follows the Alerter to prepare the interlocutor for the request. <i>May I ask you a favour?</i>
Grounder:	Provides an explanation for the request. <i>I have to hand in something.</i>
Disarmer:	Pre-empts the interlocutor's potential objections. <i>I know you are really busy but. . . .</i>
Sweetener:	Flatters the interlocutor and puts them into a positive mood <i>I think you are the best person to turn to.</i>
Imposition Minimizer:	Decreases the imposition of the request. <i>You get them back pretty fast, I promise.</i>
Promise of Reward:	Offers the interlocutor a reward for fulfilling the request. <i>I would fill in yours [the questionnaire] as well.</i>
Appreciator:	Usually employed at the end of the request to positively reinforce it. <i>That would be very nice.</i>
Smalltalk:	A short utterance at the beginning of the request that is intended to establish a positive atmosphere <i>Good to see you.</i>
Considerator:	Employed at the end of the request and reflecting consideration of the interlocutor's situation. <i>Only if you've got time of course.</i>
<u>Lexical downgraders:</u>	
Consultative Device:	Consults the interlocutor's opinion on the proposition of the request. <i><u>Would you mind</u> filling in this questionnaire for me?</i>

Politeness marker:	Bids for the interlocutor's cooperation. <i>Could you open the window a little bit, <u>please</u>?</i>
Downtoner:	A modal particle or sentence adverbial that is used to reduce the force of the request. <i>Perhaps we can have a meeting during the holidays?</i>
Understater:	An adverbial modifier that is employed to decrease the imposition of the request by under-representing the proposition of the request. <i>Can you speak up <u>a bit</u>, please?</i>
Hedge:	An adverbial that is used by the requester to make the request more vague. <i>Is it possible if we can arrange a meeting during the holidays somehow?</i>
Negation:	Used to decrease the expectations of the request being met. <i>Phil, <u>you couldn't</u> open the window for me, please?</i>
<u>Syntactic modifiers:</u>	
Past Tense Modals:	Tones down the expectations of the request being fulfilled by employing the past tense. <i><u>Could</u> you complete this for me, please?</i>
Tag Questions:	Tones down the impact of the request by consulting the interlocutor's opinion. <i>I don't suppose you could point me in the direction of some suitable one, <u>could you</u>?</i>
Appreciative Embedding:	Positively reinforces the request internally as hopes and positive feelings are stated. <i><u>It would be really nice</u> if you could fill it in.</i>
Tentative Embedding:	Makes the request appear less direct and shows hesitation. <i><u>I wondered</u> if I can pop into your office sometime.</i>
Conditional Clauses:	Used by the requester to distance themselves from the request. <i><u>I would like to ask if you could complete this.</u></i>

Appendix B: Spanish Recruitment Email

Subject: Se busca participantes para estudio lingüístico

Message:

Hola,

Busco personas cuya lengua materna es español que hayan comenzado a aprender inglés después de los 6 años de edad para un estudio lingüístico (mi tesis). Ofrezco como recompensa \$10 por 60 minutos máximo y prefiero dividirlo en dos sesiones. La tarea consiste en: escuchar unas oraciones grabadas, responder a unas preguntas con un clic en la computadora y finalmente contestar un breve formulario de reacción.

La participación es anónima.

Si te interesa o tienes preguntas, por favor mándame un email a:
rsauveur@mail.utexas.edu

Robert Sauveur
Department of Spanish and Portuguese
University of Texas at Austin

Appendix C: English Recruitment Email

Subject: Earn up to \$50 for Spanish study

Message:

Hello,

Would you like to earn some extra money this semester? Current SPN 610D students are needed for a Spanish language study this semester. All you have to do is sit at a computer, listen to pre-recorded sentences, click a 'yes/no' response and answer a couple of questions about how you selected your answers. The study will take place over the course of this semester and involves 5 sessions spread out over 10 weeks. Sessions are expected to take about 15-20 minutes each and scheduling is flexible. The incentive for participating is \$5 per session and a bonus of either \$10 for completing fewer than 5 sessions, but including the final session or \$25 for completing all 5 sessions.

However, not everybody can qualify for this study. Unfortunately you are not eligible if you grew up in a house where Spanish was spoken or if you study or speak any languages other than English and Spanish.

Also, your participation is confidential; you will in no way be identified in the study or subsequent publication.

If you are interested or have further questions, please email me at:
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Appendix D: Background Questionnaire

1. What is your *native language*? _____
2. What languages other than English or Spanish do you speak? _____
3. Did you grow up in a Spanish-speaking family? _____ yes / _____ no
4. Self-Rated Proficiency:

How would you rate your level of Spanish?

Absolute Beginner

Native/Nativelike

1 2 3 4 5 6 7 8 9 10

5. Have you ever studied abroad in a Spanish-speaking country? If so, in which country and for how long?

6. Have you ever lived in a Spanish-speaking country (not while studying)? If so, in which country and for how long?

7. How many Spanish classes have you taken and where? (e.g. high school, college)

Appendix E: Experimental Stimuli

LIST 1 REQUESTS

Utterance	Translation	
<i>Mándame el artículo que escribiste.</i>	Send me the article that you wrote.	DIRECT
<i>Dame el libro de astronomía ahora.</i>	Give me the astronomy book now.	
<i>Tienes que ir a la fiesta esta noche.</i>	You have to go to the party tonight.	
<i>Hay que limpiar la cocina hoy.</i>	One has to clean the kitchen today.	
<i>Sal antes de que él llegue, amiga.</i>	Leave before he arrives, friend.	
<i>Ayúdame con las tareas, un ratito.</i>	Help me with the chores for a minute.	
<i>Necesito que me des tu opinión.</i>	I need you to give me your opinion.	
<i>Quiero que me prestes atención.</i>	I want you to pay attention to me.	
<i>¿Me sacas la basura de la cocina?</i>	Will you take out the kitchen trash for me?	
<i>¿Me mandas el artículo luego?</i>	Will you send me the article later?	
<i>¿Puedes aconsejarme?</i>	Can you advise me?	CONVENTIONALLY INDIRECT
<i>¿Qué te parece si trabajas para mí?</i>	What do you think about working for me?	
<i>¿Vas a pasarme la sal, chica?</i>	Are you going to pass me the salt, girl?	
<i>¿Vas a cerrar la puerta quizás?</i>	Are you going to close the door perhaps?	
<i>¿Por qué no me llamas por teléfono?</i>	Why don't you call me (by phone)?	
<i>¿Por qué no me compras la cena?</i>	Why don't you buy me dinner?	
<i>Creo que puedes traer el vino.</i>	I think you can bring the wine.	
<i>Pienso que necesito tus apuntes.</i>	I think that I need your notes.	
<i>¿Podrías callarte ahora?</i>	Could you shut up now?	
<i>¿Podrías traermé una copia?</i>	Could you bring me a copy?	
<i>Hace mucho frío en tu coche.</i>	It's very cold in your car.	NON- CONVENTIONALLY INDIRECT
<i>¿Manejas tu coche al campus hoy?</i>	You drive your car to campus today?	
<i>Necesito papel para imprimir el ensayo.</i>	I need paper to print my essay.	
<i>Quiero aprender a tocar la guitarra como tú.</i>	I want to learn to play the guitar like you.	
<i>Tienes mucha ropa en la sala, chica.</i>	You have a lot of clothes in the living room, girl.	
<i>Me falta dinero para pagar las cuentas esta vez.</i>	I don't have money to pay the bills this time.	
<i>No he conocido a tu novio acá.</i>	I haven't met your boyfriend over here.	
<i>No podré escribir el ensayo con tanto ruido.</i>	I will not be able to write my essay with such noise.	
<i>Leería tu libro si me lo permitieras.</i>	I would read your book if you let me.	
<i>Tomaría café si alguien lo hiciera.</i>	I would have coffee if somebody made it.	

LIST 1 NON-REQUEST DISTRACTERS

Utterance	Translation
<i>El hombre me dijo 'ayúdame'.</i>	The man said to me 'help me'.
<i>Necesito que mi hermano me llame.</i>	I need my brother to call me.
<i>Quiero que mi computadora funcione mejor.</i>	I want my computer to work better.
<i>Pagarías menos con otra empresa.</i>	You would pay less with another company.
<i>Hay que vivir sin preocupaciones.</i>	One has to live without worries.
<i>Tienes ojos magníficos.</i>	You have magnificent eyes.
<i>Me gustaría vivir tu vida.</i>	I would like to live your life.
<i>Creo que odio a tu mejor amiga.</i>	I think that I hate your best friend.
<i>Me compran el almuerzo los viernes.</i>	They buy me lunch on Fridays.
<i>No salgo hasta las diez de la noche.</i>	I don't leave until ten at night.
<i>¿Puedes montar a caballo?</i>	Can you ride a horse?
<i>Puedo llevarte a casa, si quieres.</i>	I can drive you home, if you want.
<i>¿Crees que es una buena idea?</i>	Do you think it is a good idea?
<i>Podría tomar la clase de francés.</i>	I could take the French class.
<i>Quieren usar mi móvil.</i>	They want to borrow my phone.
<i>¿Por qué no puedo encontrar mis llaves?</i>	Why can't I find my keys?
<i>¿Mira, te gusta la blusa roja o verde?</i>	Hey, do you like the red or the green blouse?
<i>Eres tan responsable, amiga.</i>	You are so responsible, friend.
<i>¿Qué te parece si tienes otro trabajo?</i>	What do you think about having another job?
<i>Perdón por contradecirte.</i>	I'm sorry for contradicting you.
<i>Para mí es un tema muy complicado.</i>	To me, it is a very complicated topic.
<i>Sería mejor si ella tuviera un coche.</i>	It would be better if she had a car.
<i>¿Tomarías otra clase si pudieras?</i>	Would you take another class if you could?
<i>Supongo que no hay otra opción.</i>	I guess there is no other option.
<i>No no, está bien; lo resuelvo.</i>	No no, that's ok, I'll resolve it.
<i>¿Tienes que trabajar este fin de semana?</i>	Do you have to work this weekend?
<i>No podría hacerlo sin ti.</i>	I couldn't do it without you.
<i>Llamo a un abogado si lo necesito.</i>	I'll call a lawyer if I need.
<i>Quería gritarles a los vecinos anoche.</i>	I wanted to yell at the neighbors last night.
<i>Hace mucho calor afuera.</i>	It is very hot outside.

LIST 2 REQUESTS

Utterance	Translation	
<i>Llévame a la biblioteca central.</i>	Take me to the main library.	
<i>Presta atención a lo que digo.</i>	Pay attention to what I say.	
<i>Tienes que llegar más temprano hoy.</i>	You have to arrive earlier today.	
<i>Tienes que viajar conmigo a San Antonio.</i>	You have to travel with me to San Antonio.	
<i>No me toques, amiga.</i>	Don't touch me, friend.	DIRECT
<i>¿Me traes una taza de té también?</i>	Bring me a cup of tea also?	
<i>Necesito que me ayude.</i>	I need you to help me.	
<i>Quiero usar tu coche hoy.</i>	I want to use your car today.	
<i>¿Me escribes un email sobre esto?</i>	Will you write me an email about this?	
<i>Pagáme por el trabajo que hice.</i>	Pay me for the work I did.	
<i>¿Puedo traer a mi novio?</i>	Can I bring my boyfriend?	
<i>¿Qué te parece si me prestas dinero?</i>	What do you think about loaning me money?	
<i>¿Vas a dejarme en paz, amiga?</i>	Are you going to leave me in peace, friend?	CONVENTIONALLY INDIRECT
<i>¿Vas a decirme su nombre quizás?</i>	Are you going to tell me their name perhaps?	
<i>¿Por qué no limpias el baño hoy?</i>	Why don't you clean the bathroom today?	
<i>¿Por qué no vas a la fiesta conmigo?</i>	Why don't you go to the party with me?	
<i>¿Puedes mandarme un mensaje después?</i>	Can you send me a message afterward?	
<i>Pienso que quiero tu consejo.</i>	I think that I want your advice.	
<i>¿Podría molestarte con unas preguntas?</i>	Could I bother you with some questions?	
<i>¿Podrías acompañarme al doctor?</i>	Could you accompany me to the doctor?	
<i>Mi compañera de cuarto anterior limpiaba más.</i>	My last roommate cleaned more.	
<i>Haces mucho ruido en la mañana.</i>	You make a lot of noise in the morning.	
<i>Necesito más sal de la tienda.</i>	I need more salt from the store.	
<i>Quiero ducharme primero.</i>	I want to shower first	
<i>Tengo mucha tarea ahora mi amiga.</i>	I have a lot of homework now my friend.	
<i>¿Vas a terminarte toda la leche?</i>	Are you going to finish all the milk?	
<i>No tengo una pluma para firmarlo.</i>	I don't have a pen to sign it.	
<i>No puedo mover el sofá yo misma.</i>	I can't move the sofa by myself.	
<i>Tomaría el autobús si tuviera dinero.</i>	I would take the bus if I had money.	
<i>Comería ahora si tuviera compañía.</i>	I could/would eat now if I had company.	NON- CONVENTIONALLY INDIRECT

LIST 2 NON-REQUEST DISTRACTERS

Utterance	Translation
<i>Necesitas comer más verduras.</i>	You need to eat more vegetables.
<i>¿No vas a creer qué pasó ayer!</i>	You aren't going to believe what happened yesterday!
<i>Quiero viajar durante las vacaciones.</i>	I want to travel during vacation.
<i>Se manda el mensaje cada día.</i>	The message is sent everyday.
<i>Tienes buen humor frente a este problema.</i>	You have a good demeanor in the face of this problem.
<i>Te llamaría si tuviera tiempo.</i>	I would call you if I had time.
<i>Voy a lavar los platos luego.</i>	I'm going to wash the dishes later.
<i>Lo siento haber llegado tan tarde.</i>	I'm sorry for arriving so late.
<i>Se me olvidaron las llaves en la oficina.</i>	I forgot the keys to the office.
<i>Tienes que ahorrar para comprar una casa.</i>	You have to save in order to buy a house.
<i>¿Puedes hablar alemán bien?</i>	Can you speak German well?
<i>Puedo hacer lo que quiera.</i>	I can do what I want.
<i>Podrías comprar una cama mejor.</i>	You could buy a better bed.
<i>¿Podría cocinar mejor?</i>	Could I cook any better?
<i>¿Por qué no llamas a tu madre?</i>	Why don't you call your mother?
<i>Está bien, tengo mi copia.</i>	It's ok, I have my copy.
<i>No sabes lo que dices, chica.</i>	You don't know what you are saying, girl.
<i>¿Piensas estudiar o dormir esta noche?</i>	Do you plan to study or sleep tonight?
<i>¿No conoces a mi primo de San Juan?</i>	You don't know my cousin from San Juan?
<i>Pues, no quiero ser grosera.</i>	Well, I don't want to be rude.
<i>No lo sé, tengo planes este fin de semana.</i>	I don't know, I have plans this weekend.
<i>Compraría una casa si tuviera el dinero.</i>	I would buy a house if I had the money.
<i>¿No te llamó tu hermana esta mañana?</i>	Didn't your sister call you this morning?
<i>No era mi intención golpear tu coche.</i>	I didn't mean to hit your car.
<i>Te prometo no hacerlo otra vez.</i>	I promise not to do it again.
<i>Prefiero la silla verde en mi cuarto.</i>	I prefer the green chair in my room.
<i>Buscan una descripción del ladrón.</i>	They are looking for a description of the thief.
<i>¿Por qué es muy mandón tu padre?</i>	Why is your father so demanding?
<i>Debes buscar un dentista mejor.</i>	You should look for a better dentist.
<i>¿Necesitamos algo para la fiesta?</i>	Do we need anything for the party?

LIST 3 REQUESTS

Utterance	Translation	
<i>Lláname por celular cuando estés lista.</i>	Call me by cell when you are ready.	DIRECT
<i>Dime el código de la puerta para entrar.</i>	Tell me the code to the door/gate to get in.	
<i>Tienes que pagarme este fin de semana.</i>	You have to pay me this weekend.	
<i>Tienes que ir a la calle seis conmigo.</i>	You have to go to 6th street with me.	
<i>Déjame en paz por unos minutos, chica.</i>	Leave me in peace for a few minutes, girl.	
<i>Cierra la ventana, tan pronto como puedas.</i>	Close the window, when you can.	
<i>Necesito que me escribas una referencia.</i>	I need you to write me a reference.	
<i>Quiero que me compres una mochila nueva.</i>	I want you to buy me a new backpack.	
<i>Prestáme tu escritorio para estudiar.</i>	Loan me your desk to study.	
<i>¿Me reciclas esta botella rota?</i>	Will you recycle this broken bottle for me?	
<i>¿Puedes llevar mi gato al veterinario?</i>	Can you take my cat to the vet?	CONVENTIONALLY INDIRECT
<i>¿Qué te parece si no fumas en la casa?</i>	What do you think about not smoking inside?	
<i>¿Vas a practicar conmigo, amiga?</i>	Are you going to practice with me, friend?	
<i>¿Vas a recoger tu basura, quizás?</i>	Are you going to pick up your trash, perhaps?	
<i>¿Por qué no tocas el piano en nuestra fiesta?</i>	Why don't you play the piano at our party?	
<i>¿Por qué no bailas con mi hermano? Es tímido.</i>	Why don't you dance with my brother? He is shy.	
<i>Creo que puedes hacer de voluntario conmigo.</i>	I think you can volunteer with me.	
<i>¿Podrías arreglar mi computadora luego?</i>	Could you fix my computer later?	
<i>¿Podría hablar contigo sobre tu novio?</i>	Could I talk to you about your boyfriend?	
<i>¿Podrías darme dinero para el almuerzo?</i>	Could you give me money for lunch?	
<i>Tienes tantos platos sucios en tu cuarto.</i>	You have so many dirty dishes in your room.	NON- CONVENTIONALLY INDIRECT
<i>Veo que no hay leche para el desayuno.</i>	I see there is no milk for breakfast.	
<i>Necesito usar el baño por la mañana también.</i>	I need to use the bathroom in the morning too.	
<i>Quiero salir sola este fin de semana.</i>	I want to go out alone this weekend.	
<i>Tu hermano es muy guapo y amable, chica.</i>	Your brother is very handsome and nice, girl.	
<i>No se ha cambiado la luz de la cocina todavía.</i>	The light in the kitchen hasn't been changed yet.	
<i>No puedo hacer la cama sola.</i>	I can't make the bed alone.	
<i>No sé qué hacer con mi reloj que dañaste.</i>	I don't know what to do with my watch that you broke.	
<i>Me gustaría ver la nueva película esta noche.</i>	I would like to watch the new movie tonight.	
<i>Manejaría si tuviera dinero para gasolina.</i>	I would drive if I had money for gas.	

LIST 3 NON-REQUEST DISTRACTERS

Utterance	Translation
<i>¿Conoces a alguien que toque la guitarra?</i>	Do you know somebody that plays the guitar?
<i>Tienes que tener más paciencia.</i>	You have to have more patience.
<i>¿Recomendarías la clase de química?</i>	Would you recommend the chemistry class?
<i>Necesito ir al gimnasio con más frecuencia.</i>	I need to go to the gym more often.
<i>¿Cuántos libros tienes que comprar?</i>	How many books do you have to buy?
<i>¿Por qué habla tan rápido el profesor?</i>	Why does the professor talk so fast?
<i>¿Por qué no quiere salir contigo?</i>	Why doesn't he want to go out with you?
<i>¿Vas a tomar la clase de biología?</i>	Are you going to take the biology class?
<i>¿Vas a comprarle un regalo a tu abuela?</i>	Are you going to buy a present for your grandma?
<i>¿Te gusta tu horario este semestre?</i>	Do you like your schedule this semester?
<i>Puedo ir en bicicleta si quiero.</i>	I can take (my) bike if I want.
<i>No sé si ella va a asistir a la reunión.</i>	I don't know if she will attend the meeting.
<i>Podría comer en casa para ahorrar dinero.</i>	I could eat at home to save money.
<i>Podrías tomar vino en vez de cerveza.</i>	You could drink wine instead of beer.
<i>Creo que perdiste el autobús esta mañana.</i>	I think you missed the bus this morning.
<i>Necesito que mis padres paguen la matrícula.</i>	I need my parents to pay the tuition.
<i>¿Qué te parece si te pago en una semana?</i>	What do you think if I pay you in a week?
<i>Si quisiera viajar por Europa, aprendería italiano.</i>	If I wanted to travel through Europe, I would learn Italian.
<i>¿Por qué no puedo parar de comer?</i>	Why can't I stop eating?
<i>Es importante que yo duerma más.</i>	It is important that I sleep more.
<i>¿Vas a ver el partido de fútbol este fin de semana?</i>	Are you going to watch the football game this weekend?
<i>¿Ya decidiste qué hacer para tu cumpleaños?</i>	Have you decided what to do for your birthday?
<i>¿Sabías que mi ex-novio se casó?</i>	Did you know that my ex-boyfriend got married?
<i>¿Vas a llevar tu perro a la playa?</i>	Are you going to take your dog to the beach?
<i>¿Por qué no viajas por México este verano?</i>	Why don't you travel through Mexico this summer?
<i>Si pudiera, mi padre controlaría toda mi vida.</i>	If he could, my father would control my whole life.
<i>Todavía estoy buscando un mejor coche para comprar.</i>	I am still looking for a better car to buy.
<i>¿Sabes que eres la mejor amiga?</i>	You know you are the best friend?
<i>Creo que deberías hacer lo que te haga feliz.</i>	I think you should do what makes you happy.
<i>Creo que vas a enamorarte del vecino.</i>	I think you are going to fall in love with the neighbor.

LIST 4 REQUESTS

Utterance	Translation	
<i>Abre la ventana de la cocina.</i>	Open the window in the kitchen.	DIRECT
<i>No dejes los platos en la mesa.</i>	Don't leave the dishes on the table.	
<i>Tienes que despertarme mañana.</i>	You have to wake me up tomorrow.	
<i>Hay que salir más temprano hoy.</i>	One has to leave earlier today.	
<i>Préstame tu computadora, amiga.</i>	Loan me your computer, friend.	
<i>Lee mi ensayo para mañana rapidito.</i>	Read my essay for tomorrow real quick.	
<i>Necesito que me traigas un abrigo.</i>	I need you to bring me a coat.	
<i>Quiero que me devuelvas mi falda favorita.</i>	I want you to give back my favorite skirt.	
<i>Tienes que regresar a casa por mi llave.</i>	You have to return home for my key.	
<i>Quiero que nos quedemos en casa esta noche.</i>	I want us to stay home tonight.	
<i>¿Puedes ir a la farmacia por mi medicina?</i>	Can you go to the pharmacy for my medicine?	CONVENTIONALLY INDIRECT
<i>¿Tienes ganas de ir a la tienda conmigo?</i>	Do you feel like going to the store with me?	
<i>¿Vas a asistir a mi presentación, chica?</i>	Are you going to attend my presentation, girl?	
<i>¿Vas a escucharme primero, quizás?</i>	Are you going to listen to me first, maybe?	
<i>¿Por qué no me esperas y luego vamos?</i>	Why don't you wait for me and later we will go?	
<i>¿Por qué no comemos en un restaurante?</i>	Why don't we eat in a restaurant?	
<i>Creo que puedes preparar la cena el martes.</i>	I think you can make dinner on Tuesday.	
<i>Creo que quiero tu pastel.</i>	I think I want your cake.	
<i>¿Podría usar tu coche para hacer unos mandados?</i>	Could I use your car to do some errands?	
<i>¿Podrías hacer las invitaciones para la fiesta?</i>	Could you make the invitations for the party?	
<i>No entiendo nada de lo que estás diciendo.</i>	I don't understand a word you are saying.	NON- CONVENTIONALLY INDIRECT
<i>Todo el mundo sabe que hay que cerrar la puerta.</i>	Everybody knows to lock the door.	
<i>Necesito una cámara para el viaje.</i>	I need a camera for the trip.	
<i>Quiero servir tus galletas en la fiesta.</i>	I want to serve your cookies at the party.	
<i>No entiendo tus planes para el viernes, amiga.</i>	I don't understand your plans for Friday, friend.	
<i>Es un poco difícil escucharte con la tele puesta.</i>	It is sort of hard to listen to you over the tv.	
<i>Todavía no he terminado de usar el microondas.</i>	I'm not finished using the microwave yet.	
<i>No voy a poder terminar el trabajo yo solita.</i>	I will not be able to finish the job by myself.	
<i>Estudiaría más si no tuviera que lavar los platos.</i>	I would study more if I didn't have to wash the dishes.	
<i>Iría al gimnasio más si alguien me acompañara.</i>	I would go to the gym more if somebody went with me.	

LIST 4 NON-REQUEST DISTRACTERS

Utterance	Translation
<i>¿Dios mío, siempre llegamos tarde!</i>	My goodness, we are always late!
<i>¿Estás bien cansada esta tarde, no?</i>	You're pretty tired this afternoon, no?
<i>Quiero que esa chica ya no me llame.</i>	I want that girl not to call me anymore.
<i>¿Por qué no te gusta el vino tinto?</i>	Why don't you like red wine?
<i>Prefiero tomar el autobús cuando puedo.</i>	I prefer to take the bus when I can.
<i>Creo que tienes tiempo para dormir antes.</i>	I think you have time to sleep first/before.
<i>¿Por qué no va al doctor si tienes fiebre?</i>	Why don't you go to the doctor if you have a fever?
<i>Creo que descansar es mi pasatiempo favorito.</i>	I think that relaxing is my favorite pastime.
<i>¿Vas a hacer de voluntario como dijiste?</i>	Are you going to volunteer like you said?
<i>Si tengo tiempo, voy al café antes de clase.</i>	If I have time, I go to the café before class.
<i>Tomaría más clases si no costaran tanto.</i>	I would take more classes if they didn't cost so much.
<i>Quieren irse ahora, pero tengo que trabajar.</i>	They want to leave now, but I have to work.
<i>Podríamos tener éxito si trabajáramos más.</i>	We could be successful if we worked more.
<i>No uso tu cepillo, tengo uno que es mío.</i>	I don't use your brush, I have my own.
<i>Tienes que ser tabajadora para graduarte.</i>	You have to be a hard worker to graduate.
<i>Me funcionó ayer, no lo entiendo.</i>	It worked for me yesterday, I don't understand it.
<i>Tienes que cuidarte mejor, chica.</i>	You have to take better care of yourself, girl.
<i>Me enfermo cuando camino bajo la lluvia.</i>	I get sick when I walk in the rain.
<i>¿A qué hora vas a volver de la fiesta?</i>	When are you going to return after the party?
<i>¿Vas a entrevistarle con la empresa de papel?</i>	Are you going to interview with the paper company?
<i>No tengo tiempo para alistarme antes.</i>	I don't have time to get ready beforehand.
<i>Me gustaría vivir en Barcelona algún día.</i>	I would like to live in Barcelona some day.
<i>Te divertirías mucho allá si no odiaras la playa.</i>	You would have a lot of fun there if you didn't hate the beach.
<i>Es importante tener una rutina diaria.</i>	It is important to have a daily routine.
<i>Vamos a celebrar cuando te gradúes.</i>	We are going to celebrate when you graduate.
<i>Necesito un clima sin tanta humedad.</i>	I need a climate without so much humidity.
<i>¿Vas a visitar a tus abuelos este fin de semana?</i>	Are you going to visit your grandparents this weekend?
<i>Me gustaría perder unas libras.</i>	I would like to lose a few pounds.
<i>Creo que tienes razón sobre este asunto.</i>	I think you are right about this.
<i>¿Tienes que leer cuántas páginas?</i>	You have to read how many pages?

LIST 5 REQUESTS

Utterance	Translation	
<i>Tráeme un pastel de la tienda también.</i>	Bring me some cake from the store too.	DIRECT
<i>No corras en el apartamento.</i>	Don't run in the apartment.	
<i>Tienes que decirme qué quieres hacer.</i>	You have to tell me what you want.	
<i>Tienes que probar la sopa rica que hice.</i>	You have to try the delicious soup I made.	
<i>No uses mi cepillo de dientes, chica.</i>	Don't use my toothbrush, girl.	
<i>Antes de quejarte, dame un momentito.</i>	Before you complain, give me a minute.	
<i>Necesito que me mandes esa confirmación.</i>	I need you to send me that confirmation.	
<i>Quiero que pagues la cena hoy y yo pago mañana.</i>	I want you to pay for dinner today and I will pay tomorrow.	
<i>¿Me pones la radio? No me gusta el silencio.</i>	Will you put on the radio for me? I don't like silence.	
<i>¿Me pasas el libro de historia que está en la mesa?</i>	Will you pass me the history book on the table?	
<i>¿Puedes encenderme la luz de la sala?</i>	Can you turn the light on in the room for me?	CONVENTIONALLY INDIRECT
<i>¿Qué te parece si me traes el almuerzo mañana?</i>	What do you think about bringing me lunch tomorrow?	
<i>¿Vas a comprarme otra copa de vino, amiga?</i>	Are you going to buy me another glass of wine, friend?	
<i>¿Vas a vestirme antes de que salgamos, quizás?</i>	Are you maybe going to get dressed before we leave?	
<i>¿Por qué no me das tus papas fritas?</i>	Why don't you give me your french fries?	
<i>¿Por qué no me paseas el perro antes de salir?</i>	Why don't you walk the dog for me before leaving?	
<i>Creo que puedes traer más platos de la cocina.</i>	I think you can bring more plates from the kitchen.	
<i>Creo que voy a coger prestada tu camisa roja hoy.</i>	I think I'm going to borrow your red shirt today.	
<i>¿Podría leer tu revista de salud cuando termines?</i>	Could I read your health magazine when you are done?	
<i>¿Podrías tomar el autobús? Hoy no voy en coche.</i>	Could you take the bus? I'm not driving today.	
<i>¿Sabes cuándo es mi cumpleaños, verdad?</i>	You know when my birthday is, right?	NON- CONVENTIONALLY INDIRECT
<i>Ya no pasamos tanto tiempo juntas.</i>	We don't spend much time together any more.	
<i>Quiero ir al concierto, pero no tengo con quién irme.</i>	I want to go to the concert, but I don't have a ride.	
<i>Necesito un nuevo iPod, pero no soy rica.</i>	I need a new iPod, but I'm not rich.	
<i>Qué sucio está el piso chica.</i>	How dirty the floor is, girl.	
<i>Todavía nos falta el queso para la fiesta del sábado.</i>	We still don't have the cheese for the party on Saturday.	
<i>No puedo ver el partido de fútbol en la tele.</i>	I can't see the football game on tv.	
<i>No encuentro el disco que te presté.</i>	I can't find the record that I lent you.	
<i>Podría escribir el ensayo más rápido si tuviera un diccionario.</i>	I could write the essay faster if I had a dictionary.	
<i>No me molestaría si fuera una fiesta sorpresa.</i>	I wouldn't be bothered if it were a surprise party.	

LIST 5 NON-REQUEST DISTRACTERS

Utterance	Translation
<i>¿Por qué no empiezas tu ensayo hoy?</i>	Why don't you start your essay today?
<i>Oye, ¿dónde están mis gafas, chica?</i>	Hey, where are my glasses, girl?
<i>Me duelen los dientes pero no sé por qué.</i>	My teeth hurt but I don't know why.
<i>Podré comprar una nueva computadora en una semana.</i>	I will be able to buy a new computer in a week.
<i>¿Qué grosero es el nuevo vecino!</i>	The new neighbor is so rude!
<i>¿Has escrito las cartas de agradecimiento de tu boda?</i>	Have you written the thank-you cards for your wedding?
<i>¿Por qué no llevas un vestido a la entrevista?</i>	Why don't you wear a dress to the interview?
<i>Ojalá me hubiera levantado más temprano.</i>	I wish I had gotten up earlier.
<i>Me pregunto qué le habrá pasado a mi botella de agua.</i>	I wonder what happened to my water bottle.
<i>No creo que tu amiga me caiga bien.</i>	I don't think I like your friend.
<i>No quiero trabajar con el sol tan fuerte.</i>	I don't want to work when the sun is shining so strongly.
<i>No puedo encontrar nada en mi cuarto.</i>	I can't find anything in my room.
<i>Voy a la tienda por unos limones, ¿quieres algo?</i>	I'm going to the store for some limes, do you want anything?
<i>Necesito terminar mi composición en esta hora.</i>	I need to finish my composition within the hour.
<i>Finalmente encontré un teléfono móvil mejor.</i>	I finally found a better cell phone.
<i>¿Cuándo perdiste tus llaves?</i>	When did you lose your keys?
<i>¿Qué tienes que hacer hoy?</i>	What do you have to do today?
<i>Tienes que conseguir un mejor coche.</i>	You need to get a better car.
<i>¿Recibiste el mensaje de tu madre?</i>	Did you receive the message from your mother?
<i>Te traigo un vaso de agua en un momentito.</i>	I will bring you a glass of water in a minute.
<i>Claro que tenemos el mejor equipo del mundo.</i>	Of course we have the best team in the world.
<i>Es verdad que ella no va a graduarse este año.</i>	It is true that she is not going to graduate this year.
<i>Creo que voy a quedarme durante las vacaciones.</i>	I think I'm going to stay during the vacation.
<i>¿Te interesan mucho los deportes universitarios?</i>	Are you very interested in college sports?
<i>¿Te da asco el consumo de recursos naturales?</i>	Are you disgusted by the consumption of natural resources?
<i>¿No me crees que tenga once hermanos?</i>	You don't believe me that I have eleven brothers?
<i>¿A cuál candidato apoyas en las próximas elecciones?</i>	Which candidate do you support in the coming election?
<i>No creo que haya nadie aquí en las tardes.</i>	I don't think there is anyone in the afternoons.
<i>Tengo que irme ahora, pero más tarde sí.</i>	I have to leave now, but later yes.
<i>Te dije que no tomo la clase de política.</i>	I told you I am not taking the politics class.

Appendix F: Introspective Written Protocol

DATE: _____

ID #: _____

- 1) What is your overall impression of the computerized comprehension task?
- 2) Please describe any strategies that you used to select your responses:
- 3) Do you feel that you tended to answer ‘sí’ or ‘no’ or even left or right generally or in response to specific types of prompts?
- 4) Did you ever wish you could go back and change a response after you had already clicked? Do you remember what the sentences were about when you wanted to change your mind?
- 5) Were you more concerned with answering *quickly* or *correctly*? How do you think that affected your responses?

6) Approximately how much time have you spent studying Spanish outside of class since the last session? (Remember, this is anonymous; you can be honest.)

7) Please briefly describe the type and amount of contact you have had with any Spanish *media* (i.e. movies, tv, radio, internet) since the last session – outside of class:

8) Please briefly describe the type and amount of contact you have had in Spanish with other *people* (e.g. workplace: customers/employees or relationships: roommate, friends, significant other) since the last session – outside of class:

Appendix G: Exit Survey

1. Do you think that participating in this study changed the way you approached the material for your class?
2. Do you think that participating in this study changed the way you think about Spanish? (Since this study asks you to assess the function of Spanish sentences rather than the grammar.)
3. Having completed multiple sessions, is there anything you would change about how you did the first session?
4. Self-Rated Proficiency:

How would you rate your level of Spanish?

Absolute Beginner

Native/Nativelike

1 2 3 4 5 6 7 8 9 10

5. Do you plan to study Spanish beyond your minimum degree requirement classes?
6. Do you plan to Study Abroad for Spanish in the future?

Appendix H: Participation Consent Form

IRB PROTOCOL # 2011-03-0056

Title: Emergence of Spanish Second Language Pragmatic Processing

Conducted by:

Robert Sauveur

The University of Texas at Austin

Department of Spanish and Portuguese

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Faculty Sponsor:

Dr. Dale Koike

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Department of Spanish and Portuguese

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You are being asked to participate in a research study. This form provides you with information about the study. The person in charge of this research will also describe this study to you and answer all of your questions. Please read the information below and ask any questions you might have before deciding whether or not to take part. Your participation is entirely voluntary. You can refuse to participate without penalty or loss of benefits to which you are otherwise entitled. You can stop your participation at any time and your refusal will not impact current or future relationships with UT Austin or participating sites. To do so simply tell the researcher you wish to stop participation. The researcher will provide you with a copy of this consent for your records.

Purpose: The purpose of the study is to investigate the development of pragmatic comprehension in Spanish as a second language. This study will involve 60 total participants, 10 native Spanish speakers and 50 learners of Spanish as a second language.

Procedures: In this study, participants will be asked to fill out a brief background questionnaire, complete a computerized Spanish pragmatics comprehension task and provide written feedback in English on the comprehension task. For students of Spanish, the comprehension task and feedback will be repeated for a total of 5 sessions over 10 weeks. For native Spanish speakers, there is only one session.

Time: This study will require no more than 20 minutes for each participant per session and an additional 10 minutes before the first session for orientation and consent form review. For students of Spanish, this study will last 13 weeks.

Risks / Benefits: The risk associated with this study is no greater than everyday life. There are no benefits for participation in this study.

Compensation: For students of Spanish: \$5 per session and a bonus of either \$10 for completing fewer than 5 sessions, but including the final session or \$25 for completing all 5 sessions. For native Spanish speakers: \$10 for only one session.

Confidentiality and Privacy Considerations: Participation in the current study is confidential and the following measures will be followed in order to protect participants'

privacy. No personally identifying information will be collected for this study (i.e. name, date of birth, address, etc.). In addition, each participant will be randomly assigned a numerical identification number for data tracking purposes only.

The records of this study will be stored securely and kept confidential. Authorized persons from The University of Texas at Austin, members of the Institutional Review Board, and study sponsors have the legal right to review the research records and will protect the confidentiality of those records to the extent permitted by law. All publications will exclude any information that will make it possible to identify you as a subject. Throughout the study, the researchers will notify you of new information that may become available and that might affect your decision to remain in the study.

Contacts and Questions:

If you have any questions about the study please ask now. If you have questions later, want additional information, or wish to withdraw your participation call the researchers conducting the study. Their names, phone numbers, and e-mail addresses are at the top of this form.

If you would like to obtain information about the research study, have questions, concerns, complaints or wish to discuss problems about a research study with someone unaffiliated with the study, please contact the IRB Office at (512) 471-8871 or Jody Jensen, Ph.D., Chair, The University of Texas at Austin Institutional Review Board for the Protection of Human Subjects at (512) 232-2685. Anonymity, if desired, will be protected to the extent possible. As an alternative method of contact, an email may be sent to orsc@uts.cc.utexas.edu or a letter sent to IRB Administrator, P.O. Box 7426, Mail Code A 3200, Austin, TX 78713.

You will be given a copy of this information to keep for your records.

Título: Surgimiento del Procesamiento Pragmático del Español como Segunda Lengua

Conducido por:

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Le pedimos su participación en un estudio de investigación. Este documento le provee con la información tocante al estudio. El investigador principal (el encargado de este estudio) también se lo describirá y podrá contestar las preguntas que tenga. Por favor, lea la información siguiente y haga preguntas sobre todo lo que no entienda bien, antes de decidir participar en este estudio. Su participación es enteramente voluntaria. Puede negarse a participar o parar su participación sin sanción administrativa ni pérdida de beneficios que le corresponden. Puede dejar de participar en este estudio en cualquier momento sin que se afecte sus relaciones con La Universidad de Texas en Austin ni con otra agencia afiliada con el estudio, ni ahora ni en el futuro. Simplemente dígame al investigador que quiere dejar de participar. Dicha persona le entregará una copia de este documento para sus propios efectos.

Propósito: El propósito del estudio es investigar el desarrollo de la comprensión pragmática en español como segunda lengua. Este estudio implicará a 60 participantes en total, 10 hispanohablantes nativos y 50 estudiantes de español como segunda lengua.

Procedimientos: En este estudio, se les pedirán a los participantes llenar un cuestionario historial breve, completar una tarea computarizada de la comprensión y proporcionar reacción escrita sobre la tarea de comprensión. Para los estudiantes del español, la tarea de comprensión y la reacción serán repetidas 5 veces en 10 semanas. Para los hispanohablantes del español, solo hay una sesión.

Tiempo: Este estudio requerirá no más de 20 minutos de cada participante por sesión y 10 minutos adicionales antes de la primera sesión para la orientación y revisión de forma de consentimiento. Para los estudiantes del español, el estudio durará 10 semanas.

Riesgos/beneficios: El riesgo asociado con este estudio es no más que lo que se encuentra en la vida cotidiana. No hay beneficios por la participación en este estudio.

Compensación: Para estudiantes del español: \$5 por sesión y una prima de: \$10 para completar menos que 5 sesiones, pero inclusive la sesión final o \$25 para completar las 5 sesiones. Para hispanohablantes nativos: \$10 para una sola sesión.

Consideraciones de la confidencialidad y la privacidad: La participación en el estudio actual es confidencial y se seguirán las medidas siguientes para proteger la privacidad de participantes. No se reúne información personal para este estudio (es decir nombre, la

fecha del nacimiento, la dirección, etc.). Además, se asigna a cada participante un número de identificación al azar sólo para el propósito de rastrear los datos.

La documentación de este estudio de investigación será mantenida seguramente y será confidencial. Personas autorizadas de La Universidad de Texas en Austin y la Junta de Revisión Institucional para la Protección de Sujetos Humanos (Institutional Review Board) tienen el derecho de revisar sus documentos y protegerán la confidencia de estos documentos dentro de los límites establecidos por ley. Fuera de eso, sus documentos no serán liberados sin su consentimiento, a menos que sean requeridos por la ley o la corte. Los resultados de su participación serán compartidos con otros investigadores en el futuro para otros fines de estudio no señalados en este documento. En este caso, los datos no contendrán información que pueda asociarle con este estudio o su participación en otra investigación.

Contactos y Pregunta:

Si tiene cualquier pregunta acerca del estudio, pregunte por favor ahora. Si tiene preguntas o desea más tarde información adicional, o si desea retirar su participación llama al investigador que realiza el estudio. Su nombre, el número de teléfono, y dirección de correo electrónico están en la parte superior de este documento.

Si también quiere informarse acerca de este estudio, si tiene preguntas, dudas, quejas, o quiere hablar de problemas que tenga con otra persona ajena al estudio, por favor llame a la Oficina de la Junta de Revisión Institucional (IRB Office) al 512-471-8871 o a Jody L. Jensen, Ph.D., Directora, Institutional Review Board for the Protection of Human Subjects, la Universidad de Texas en Austin, al 512- 232-2685. Si desea ser anónimo, se respetará su deseo a la medida de lo posible. Una alternativa que le corresponde es dirigirse al orisc@uts.cc.utexas.edu o al IRB Administrator, P.O. Box 7426, Mail Code A 3200, Austin, TX 78713.

Statement of Consent / La declaración de consentimiento:

I have read the above information and have sufficient information to make a decision about participating in this study. I consent to participate in the study.

He leído la información antes mencionada y tengo información suficiente para tomar una decisión acerca de tomar parte en este estudio. Consiento en tomar parte en el estudio.

Signature/Firma: _____

Date/Fecha: _____

Signature of Person Obtaining Consent

Firma de la persona que obtiene consentimiento

Date/Fecha: _____

Signature of Investigator: _____

Firma de investigador

Date/Fecha: _____

Appendix I: Experimental Task Instructions

Introducción

El tema de este estudio son los PEDIDOS. Un PEDIDO representa algo que el hablante quiere que el oyente haga, normalmente para el beneficio del hablante.

Un ejemplo es: “Dame la sal.” En este caso, el hablante hace un PEDIDO para que el oyente haga una acción – que le dé la sal.

Otro ejemplo es: “No me gustaría comer sola esta noche”. En este caso, el hablante hace un PEDIDO más indirecto para que el oyente cene con el hablante.

Oprime una tecla para continuar.

Pero, es importante saber que todas las preguntas no son PEDIDOS. Por ejemplo, “¿Te gusta la cena?” tiene la entonación interrogativa y es una pregunta pero no es un PEDIDO.

También, a veces las sugerencias pueden ser PEDIDOS. Por ejemplo, la oración “Por qué no compras una nueva computadora?” representa una sugerencia para el oyente, pero no tiene nada que ver con el beneficio del hablante. Entonces, este ejemplo no es un PEDIDO.

Por otro lado, “Por qué no me traes mi mochila?” indica una acción que el oyente hace para el hablante. En este caso, la sugerencia es un PEDIDO. Es necesario considerar todas las partes de una oración – las palabras, la gramática y la entonación – para decidir si es un PEDIDO.

Oprime una tecla para continuar.

Instrucciones

Vas a escuchar unas oraciones en español. Mientras escuchas, vas a decidir si corresponden o no a un PEDIDO. Hay el mismo número de oraciones que sí son PEDIDOS y que no son PEDIDOS y vas a escuchar cada oración solamente una vez. Simplemente tienes que escoger entre dos opciones, 'SÍ' o 'NO'. Es decir, respondes para decir "Sí, es un PEDIDO" o "No, no es un PEDIDO".

Para interpretar las oraciones, es importante tener un contexto. Todas las oraciones que vas a escuchar son parte de conversaciones entre dos chicas que son compañeras de cuarto y que además trabajan juntas.

Ahora vas a practicar con unas oraciones para familiarizarte con el estudio. Oprime la tecla que corresponde al lugar que indica esta opción.

Oprime una tecla para empezar la práctica.

<6 PRACTICE SENTENCES>

Oprime una tecla para empezar.

<60 EXPERIMENTAL SENTENCES>

Antes de salir, por favor completa el formulario de reacción.

¡Muchas gracias por tu participación!

Appendix J: Accuracy Results by Participant

ID		Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Net Change
1001	ALL	1.19	0.97	1.17	0.88	1.46	0.26
	DR	2.34	1.22	2.03	1.14	2.07	-0.27
	CI	1.07	1.22	1.12	1.28	1.23	0.16
	NCI	#	0.44	0.42	0.00	1.08	#
1002	ALL	1.02	0.84	0.94	0.67	1.36	0.33
	DR	1.39	0.93	1.21	0.84	1.19	-0.19
	CI	0.88	1.20	1.15	0.84	1.13	0.25
	NCI	0.88	0.42	0.47	0.32	1.70	0.82
1003	ALL	1.03	1.10	0.74		1.72	0.69
	DR	1.95	0.79	0.66		1.63	-0.33
	CI	0.59	1.63	5.28		6.20	5.61
	NCI	0.59	0.93	-0.32		1.02	0.43
1004	ALL	0.71	1.65		0.67	1.24	0.53
	DR	0.57	1.74		0.23	1.64	1.07
	CI	1.23	2.01		1.83	1.54	0.31
	NCI	0.28	1.23		-0.21	0.59	0.31
1005	ALL	0.34	1.07	0.58	0.93	1.02	0.68
	DR	0.52	1.20	0.67	1.37	1.07	0.54
	CI	0.25	1.20	0.24	1.37	1.50	1.24
	NCI	0.25	0.80	0.81	0.00	0.54	0.29
1006	ALL	0.82	0.88	2.11	0.82	1.57	0.75
	DR	1.14	1.11	2.33	0.82	1.66	0.53
	CI	0.82	1.04	1.94	1.07	5.65	4.83
	NCI	0.55	0.54	2.06	0.56	0.76	0.21
1007	ALL	1.51	0.48	0.35	1.01	0.48	-1.03
	DR	1.95	0.82	0.65	1.54	0.48	-1.47
	CI	1.95	-0.11	0.65	0.45	1.11	-0.85
	NCI	0.68	0.57	-0.30	1.13	-0.09	-0.77

1008	ALL	0.48	0.79	0.09	0.13	0.74	0.26
	DR	0.84	1.45	-0.27	-0.21	0.83	-0.01
	CI	1.38	0.42	0.78	0.30	0.56	-0.82
	NCI	-0.90	0.69	-0.27	0.30	0.83	1.74
1009	ALL	0.37	0.84	0.52	0.49	0.71	0.34
	DR	1.44	0.88	0.86	1.11	1.37	-0.07
	CI	0.40	0.88	0.68	-0.17	0.70	0.30
	NCI	-0.55	0.76	0.00	0.27	0.00	0.55
1010	ALL	-0.22	0.64	-0.21	0.51	0.28	0.50
	DR	0.44	0.94	0.82	4.56	0.18	-0.26
	CI	-0.83	0.43	-0.46	0.33	-0.09	0.74
	NCI	-0.26	0.61	-0.72	-0.05	0.94	1.20
1011	ALL	0.71	1.10	0.73	0.98	1.46	0.75
	DR	0.87	5.45	0.73	1.61	5.84	4.98
	CI	1.02	1.27	1.57	1.61	2.31	1.30
	NCI	0.34	-0.06	-0.11	-0.46	-0.19	-0.53
1012	ALL	0.79	0.75	1.27	1.34	1.27	0.49
	DR	0.93	0.78	1.33	1.14	0.96	0.03
	CI	4.83	1.53	4.80	5.37	5.18	0.35
	NCI	-0.06	0.11	0.61	0.87	0.96	1.01
1013	ALL	0.06	-0.34		0.34	0.59	0.53
	DR	0.08	0.00		-0.09	0.95	0.87
	CI	-0.19	-0.84		0.75	0.66	0.85
	NCI	0.33	-0.25		0.43	-0.06	-0.39
1014	ALL	1.20	0.31	0.22	0.37	1.27	0.07
	DR	1.99	1.17	0.56	0.89	1.81	-0.18
	CI	1.16	-0.03	0.31	-0.16	1.22	0.06
	NCI	0.70	-0.03	-0.22	0.37	0.83	0.13
1015	ALL	0.52	0.80	0.09	0.79	1.10	0.58
	DR	1.11	1.39	0.09	1.35	5.29	4.18
	CI	0.87	1.05	0.59	0.92	1.30	0.43
	NCI	-0.42	0.10	-0.50	0.08	0.28	0.71

1016	ALL	0.62	0.62		0.68	-0.05	-0.67
	DR	-0.37	0.62		0.41	0.80	1.17
	CI	1.68	0.88		0.98	-0.12	-1.80
	NCI	0.65	0.37		0.59	-0.71	-1.36
1017	ALL	0.59	1.09	1.05	1.15	0.71	0.12
	DR	0.65	1.88	1.34	1.81	1.46	0.81
	CI	0.73	1.12	0.96	1.37	0.37	-0.36
	NCI	0.41	0.46	0.82	0.52	0.37	-0.04
1018	ALL	1.13	1.52	1.05		0.75	-0.39
	DR	1.85	2.24	1.22		1.23	-0.62
	CI	1.33	1.41	0.97		0.56	-0.77
	NCI	0.43	1.09	0.97		0.45	0.02
1019	ALL	0.52	1.08	-0.12	0.86	0.35	-0.17
	DR	1.31	1.62	0.27	1.41	0.31	-1.00
	CI	0.85	0.48	-0.11	0.65	0.45	-0.41
	NCI	-0.34	1.41	-0.51	0.65	0.31	0.65
1020	ALL	-0.40	0.28	0.69	0.29	-0.03	0.37
	DR	0.05	0.62	0.92	0.60	0.18	0.13
	CI	-0.61	0.37	0.25	-0.17	-0.58	0.03
	NCI	-0.61	-0.22	0.78	0.34	0.18	0.79
1021	ALL	0.97	0.32	1.01	0.57	1.28	0.30
	DR	5.45	0.92	2.01	0.56	1.55	-3.90
	CI	0.56	0.65	1.24	0.96	1.55	0.99
	NCI	0.27	-0.88	#	0.18	0.52	0.25
1022	ALL	0.99	0.80	1.34	0.90	0.44	-0.56
	DR	0.85	1.22	1.71	1.79	1.00	0.15
	CI	1.88	0.97	1.62	0.94	0.82	-1.06
	NCI	0.46	0.13	0.80	-0.28	-0.72	-1.17
1023	ALL	0.58	1.90	1.43	1.39	1.09	0.51
	DR	1.53	2.12	1.93	1.92	1.09	-0.44
	CI	0.45	2.12	1.61	1.56	1.09	0.64
	NCI	0.05	1.53	0.84	0.81	1.09	1.04

1024	ALL	1.07	0.60	1.25		0.42	-0.65
	DR	1.59	1.71	1.58		1.18	-0.41
	CI	1.46	0.18	5.11		0.59	-0.86
	NCI	0.45	0.18	0.36		-0.50	-0.95
1025	ALL	0.56	0.24	0.42	1.12	0.49	-0.07
	DR	0.57	0.45	0.76	1.78	1.49	0.92
	CI	0.96	0.05	0.47	1.78	0.27	-0.68
	NCI	0.18	0.19	0.08	0.24	0.02	-0.16

= ID 1001 & Wave 1 and ID 1021 @ Wave 3 do not have NCI observations because all were trimmed for taking beyond 2 sd of those participants' mean RT.

Appendix K: Reaction Time Results by Participant

ID		Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Net Change
1001	ALL	5533.27 (2379.94)	5383.93 (2360.67)	6496.77 (2208.23)	7031.10 (2399.59)	6214.10 (3005.15)	680.83
	DR	5446.13 (2532.63)	5712.33 (1734.36)	6708.57 (2454.95)	8694.25 (2372.64)	5562.80 (3493.92)	116.68
	CI	5765.67 (2399.86)	5967.50 (3113.49)	5901.25 (2377.95)	6069.20 (1990.38)	6938.67 (2346.69)	1173.00
	NCI		3560.00 (958.85)	6946.50 (1803.83)	5188.00	6755.50 (4141.52)	
1002	ALL	3779.42 (1157.39)	4440.88 (1720.97)	4319.21 (1597.77)	4168.00 (1408.3)	3868.08 (1294.6)	88.66
	DR	3078.00 (586.86)	4622.00 (1765.53)	4284.60 (1326.31)	3308.20 (971.58)	4977.50 (1293.54)	1899.50
	CI	4657.67 (1479.79)	3983.00 (1786.62)	4546.33 (2161.63)	4788.00 (1105.79)	3416.00 (787.37)	-1241.67
	NCI	3719.50 (775.03)	4970.50 (1813.26)	3922.67 (1000.17)	4567.67 (2125.46)	3354.50 (1160.46)	-365.00
1003	ALL	4768.64 (1506.04)	4626.39 (1299.84)	4441.35 (1135.85)		4802.07 (1637.94)	33.43
	DR	4550.25 (1292.28)	4701.20 (1477.56)	4316.60 (995.12)		5626.25 (2462.37)	1076.00
	CI	5513.67 (2414.19)	4973.38 (1233.45)	4431.30 (1228.86)		4500.14 (1434.96)	-1013.52
	NCI	4606.00 (1416.55)	3996.40 (1261.43)	4803.50 (1658.17)		4407.67 (505.38)	-198.33
1004	ALL	4594.86 (1078.57)	4978.12 (1860.28)		5356.80 (1353.66)	4170.56 (1482.28)	-424.29
	DR	4445.75 (713.61)	5541.00 (2546.84)		4055.50 (112.43)	3846.86 (800.82)	-598.89
	CI	4984.57 (1322.91)	4753.43 (1450.58)		5466.86 (1268.23)	4826.50 (2093.37)	-158.07
	NCI	3884.33 (462.67)	4527.00 (1554.)		7189.00	3614.00 (1215.36)	-270.33

1005	ALL	3875.32 (1196.28)	4273.88 (1295.16)	4454.46 (1238.14)	3720.81 (726.76)	3904.57 (1078.43)	29.26
	DR	3426.57 (748.81)	3701.83 (988.32)	3664.80 (1171.42)	3526.57 (684.21)	3652.00 (1120.07)	225.43
	CI	3859.67 (923.2)	4420.83 (1574.89)	5490.67 (1291.01)	3934.14 (865.91)	4148.00 (595.68)	288.33
	NCI	4414.50 (1730.8)	4911.50 (1177.12)	4622.40 (879.41)	3654.00 (152.74)	3838.67 (1954.37)	-575.83
1006	ALL	4839.10 (1825.78)	4182.20 (1239.61)	5122.33 (1439.48)	4286.80 (1552.59)	3738.81 (1275.61)	-1100.29
	DR	4260.00 (1582.99)	3922.60 (1237.14)	4943.14 (1523.39)	3275.00 (586.07)	3198.43 (629.52)	-1061.57
	CI	4938.57 (2451.84)	3928.33 (1115.65)	5071.60 (1212.04)	4950.50 (1886.91)	3836.00 (1455.45)	-1102.57
	NCI	5495.17 (1242.96)	4887.50 (1466.76)	5373.67 (1720.96)	4556.00 (1474.2)	4441.50 (1526.11)	-1053.67
1007	ALL	5587.68 (1618.48)	5362.00 (1759.11)	5011.71 (1269.92)	5690.67 (1888.84)	4675.20 (1870.91)	-912.48
	DR	4914.75 (1309.21)	4868.67 (2113.02)	4754.71 (1323.16)	5554.75 (2341.56)	4426.40 (1180.83)	-488.35
	CI	6381.00 (1777.49)	6595.00 (1158.24)	5033.29 (1145.61)	5574.75 (1502.63)	5245.14 (2340.58)	-1135.86
	NCI	5266.67 (1426.44)	5460.80 (1493.16)	5561.00 (1739.75)	5949.17 (1725.97)	3760.00 (1652.38)	-1506.67
1008	ALL	5448.07 (1592.78)	4925.64 (1666.74)	3765.54 (1530.11)	4702.00 (1439.41)	4932.05 (1641.98)	-516.02
	DR	6297.67 (2035.76)	4663.22 (1696.74)	5253.67 (2478.8)	4998.75 (2182.64)	4681.71 (1786.04)	-1615.95
	CI	5028.25 (928.17)	5560.83 (1082.16)	3118.00 (405.8)	4945.50 (1577.88)	4599.00 (1206.65)	-429.25
	NCI	3709.00	4718.57 (2086.11)	3788.33 (1618.27)	4260.67 (701.63)	5467.86 (1901.43)	1758.86

1009	ALL	3918.29 (1377.1)	2988.24 (993.1)	3575.27 (1172.15)	2536.75 (464.21)	3211.54 (971.11)	-706.75
	DR	4225.25 (1292.1)	2797.67 (1212.73)	3568.50 (1160.75)	2607.00 (563.67)	3491.14 (1019.92)	-734.11
	CI	3648.50 (1354.35)	3109.17 (1068.5)	3215.67 (960.31)	2570.00	2737.50 (1097.55)	-911.00
	NCI	3230.00 (2339.11)	3071.80 (770.93)	4308.00 (1658.39)	2344.50 (371.23)	3181.00 (115.97)	-49.00
1010	ALL	3564.75 (1163.58)	4023.79 (1051.3)	3783.94 (975.7)	3194.86 (1160.57)	2914.64 (881.45)	-650.11
	DR	3151.63 (903.43)	3397.43 (1086.22)	3586.78 (788.55)	3009.90 (1465.13)	3403.86 (1065.65)	252.23
	CI	4224.67 (1409.33)	4084.00 (800.12)	3422.40 (1196.57)	3398.43 (1013.25)	2808.00 (799.1)	-1416.67
	NCI	3829.80 (1378.42)	4694.33 (910.86)	4679.50 (650.78)	3279.80 (731.04)	2605.22 (680.47)	-1224.58
1011	ALL	2562.56 (771.97)	2872.00 (449.71)	2537.80 (786.76)	2964.18 (445.27)	2580.39 (400.43)	17.83
	DR	2445.57 (823.63)	2855.60 (443.26)	2314.80 (271.57)	3040.75 (565.12)	2317.44 (246.57)	-128.13
	CI	2455.00 (856.96)	2780.00 (553.9)	2499.13 (753.17)	2907.00 (346.32)	2875.88 (362.29)	420.88
	NCI	2855.40 (669.87)	3184.00 (25.46)	3250.00 (1767.77)	2809.00	2583.00	-272.40
1012	ALL	2792.00 (874.6)	3114.25 (672.46)	3027.04 (921.19)	3714.09 (973.69)	3083.21 (804.63)	291.21
	DR	2791.50 (1087.32)	3142.43 (795.9)	2928.56 (771.61)	3878.71 (843.98)	2891.29 (677.2)	99.79
	CI	2886.00 (886.67)	3236.44 (713.27)	3003.40 (1118.65)	3112.80 (814.66)	3116.40 (1110.46)	230.40
	NCI	2558.00 (367.24)	2790.00 (231.25)	3251.60 (887.01)	4524.17 (757.41)	3227.71 (323.13)	669.71

1013	ALL	3256.91 (896.97)	3469.64 (859.08)		3427.95 (1098.32)	3908.13 (676.97)	651.22
	DR	3286.50 (1270.41)	3838.00 (1006.95)		2526.20 (512.39)	3517.75 (742.03)	231.25
	CI	3030.00 (287.77)	3405.50 (921.36)		3445.88 (1178.4)	4430.67 (252.4)	1400.67
	NCI	3397.50 (966.27)	3041.25 (592.94)		4051.57 (945.04)	3902.00	504.50
1014	ALL	9887.81 (3626.37)	7127.00 (3751.51)	5900.07 (2108.57)	5578.53 (1913.42)	7049.11 (3376.62)	-2838.70
	DR	9590.29 (3792.9)	7729.33 (2414.24)	5204.33 (1906.48)	4807.71 (2024.4)	6001.75 (2192.59)	-3588.54
	CI	11716.80 (3407.1)	5116.00 (1912.63)	5891.00 (2344.71)	6665.00 (458.48)	7779.83 (2517.73)	-3936.97
	NCI	8122.25 (3400.7)	7933.33 (7144.7)	7306.67 (2096.96)	6005.80 (2099.63)	8047.75 (6124.02)	-74.50
1015	ALL	6288.94 (3951.48)	5483.31 (2819.05)	6215.58 (4030.68)	5071.69 (2788.06)	6479.45 (3831.73)	190.51
	DR	6523.57 (4194.47)	5133.71 (3635.)	3614.25 (1544.82)	5470.67 (2879.32)	6009.11 (4228.22)	-514.46
	CI	6689.86 (4333.49)	5117.33 (1533.95)	7497.17 (4315.58)	4824.20 (3306.28)	6445.86 (2806.61)	-244.00
	NCI	4064.50 (2137.58)	7031.00 (3107.71)	7573.50 (6149.71)	4493.50 (2484.07)	7596.50 (5218.08)	3532.00
1016	ALL	3128.82 (1024.19)	2258.93 (506.68)		3062.00 (374.72)	3635.25 (682.52)	506.43
	DR	4946.50 (188.8)	2005.80 (563.95)		2877.33 (280.9)	3766.50 (846.86)	-1180.00
	CI	2560.33 (632.15)	2264.17 (395.65)		3320.67 (355.22)	3664.25 (510.55)	1103.92
	NCI	3375.67 (856.58)	2567.50 (528.49)		2812.50 (218.68)	3183.50 (491.44)	-192.17

1017	ALL	5648.00 (2153.46)	4902.05 (2515.59)	4682.63 (1351.37)	3985.95 (1382.7)	4264.94 (1817.04)	-1383.06
	DR	5808.43 (2817.48)	4023.78 (1665.09)	4603.14 (1348.56)	3706.89 (1554.98)	3604.00 (1631.24)	-2204.43
	CI	5438.25 (1740.96)	6249.86 (3557.32)	4442.00 (1477.71)	4269.00 (1465.76)	3726.00 (1191.67)	-1712.25
	NCI	5727.29 (2158.82)	4519.50 (792.61)	5122.50 (1487.66)	4035.40 (1050.26)	6125.75 (1646.3)	398.46
1018	ALL	8012.70 (3586.47)	6866.63 (3955.22)	5968.50 (3291.96)		6012.67 (3939.83)	-2000.03
	DR	7586.22 (4413.26)	6147.14 (5443.4)	6690.00 (2499.28)		5881.29 (5180.82)	-1704.94
	CI	9325.71 (3098.94)	7486.40 (1113.23)	6075.20 (5143.58)		6602.25 (3291.42)	-2723.46
	NCI	6674.50 (1833.84)	7351.00 (3891.6)	4996.00 (2096.93)		5653.00 (2691.77)	-1021.50
1019	ALL	2473.67 (536.39)	2404.45 (501.07)	2800.94 (514.87)	2397.48 (754.5)	2714.40 (716.6)	240.73
	DR	2685.75 (661.57)	2214.78 (312.17)	2629.57 (341.71)	1979.22 (770.29)	2648.20 (1072.62)	-37.55
	CI	2187.43 (353.5)	2377.40 (504.82)	2579.40 (362.23)	2551.71 (894.27)	2773.20 (751.18)	585.77
	NCI	2576.00 (237.67)	2711.50 (644.7)	3377.75 (568.37)	2781.00 (186.24)	2721.80 (269.6)	145.80
1020	ALL	5223.09 (2302.49)	5070.73 (1603.69)	4493.45 (1643.45)	3898.00 (2403.12)	3283.57 (1516.83)	-1939.52
	DR	5612.00 (3287.67)	4979.40 (1524.53)	3650.40 (867.5)	4291.40 (3485.17)	2213.67 (360.72)	-3398.33
	CI	4264.00 (1595.32)	5008.75 (1816.59)	5784.00 (2583.77)	4438.50 (2219.61)	5638.00	1374.00
	NCI	5534.00 (664.65)	5423.00 (2493.26)	4902.00 (1804.71)	3136.00 (430.81)	3568.67 (1470.23)	-1965.33

1021	ALL	5555.29 (3236.49)	3722.07 (2404.31)	3880.55 (1581.27)	3285.69 (1874.54)	3862.56 (1337.99)	-1692.74
	DR	4100.10 (2044.64)	3095.71 (1873.11)	3884.57 (1974.69)	3080.50 (2391.45)	4314.75 (1524.12)	214.65
	CI	7152.75 (4399.08)	4642.67 (2998.98)	3873.50 (732.01)	2635.50 (756.28)	3541.75 (1396.08)	-3611.00
	NCI	8276.00 (3027.18)	2583.00		4859.67 (2450.79)	3337.00	-4939.00
1022	ALL	4883.95 (1899.68)	4167.38 (1933.55)	6692.88 (3056.07)	7082.21 (2754.79)	5573.08 (1936.62)	689.13
	DR	5435.83 (2830.89)	3437.33 (1252.22)	7654.29 (3400.71)	6302.00 (2474.53)	5331.17 (2188.13)	-104.67
	CI	5041.67 (1399.77)	4881.00 (2509.3)	5306.83 (1958.54)	8523.80 (3146.36)	5384.67 (1663.48)	343.00
	NCI	3701.25 (722.82)	4573.50 (2400.63)	7089.50 (3752.29)	6116.00	8155.00	4453.75
1023	ALL	4182.47 (1625.79)	4175.23 (1224.34)	4957.84 (1824.15)	5667.00 (1276.76)	5346.69 (1897.57)	1164.22
	DR	3481.88 (1319.16)	3638.38 (1258.58)	4621.25 (1667.15)	5539.00 (1597.88)	4827.40 (2267.68)	1345.53
	CI	4533.80 (1098.02)	4350.13 (1067.67)	5451.86 (2420.35)	5776.40 (1344.36)	4247.75 (732.7)	-286.05
	NCI	5144.50 (2383.37)	4657.83 (1301.04)	4766.50 (918.32)	5740.67 (714.73)	7094.75 (935.87)	1950.25
1024	ALL	4867.67 (1414.31)	3142.59 (957.4)	3879.09 (1457.9)		3763.81 (979.36)	-1103.85
	DR	5066.78 (1658.06)	2961.33 (688.7)	3849.50 (2078.92)		4050.00 (1128.51)	-1016.78
	CI	4358.71 (1036.75)	3688.00 (1581.49)	3863.30 (1102.27)		3527.50 (880.49)	-831.21
	NCI	5221.80 (1480.38)	3005.00 (776.04)	3977.75 (1064.25)		3328.00 (475.18)	-1893.80

1025	ALL	5437.75 (2032.64)	6421.53 (2839.23)	4195.80 (1913.33)	4887.77 (2606.22)	5701.94 (2585.45)	264.19
	DR	5918.20 (1993.07)	5362.83 (2867.61)	3931.83 (1957.77)	4587.44 (2516.17)	5267.25 (2408.87)	-650.95
	CI	5939.43 (2376.14)	6920.00 (2640.47)	4623.20 (2301.82)	4277.44 (2003.43)	6175.00 (3424.6)	235.57
	NCI	3959.25 (427.75)	7293.20 (3134.78)	4057.50 (1778.17)	6936.75 (3602.01)	5980.00 (2344.01)	2020.75

Appendix L: Distribution of Time Reported Across Practice Variables

TSTUDY

ID	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Mean
1001	0.75	1.50	1.83	1.83	1.83	1.55
1002	2.75	2.17	2.00	4.00	2.00	2.58
1003	0.50	0.67	7.00		1.00	2.29
1004	2.25	2.00		1.17	7.00	3.10
1005	2.50	5.00	4.00	6.67	7.50	5.13
1006	1.00	0.50	1.50	1.50	1.00	1.10
1007	1.50	2.00	3.33	2.00	2.67	2.30
1008	1.50	0.67	1.50	0.00	1.00	0.93
1009	1.75	2.00	2.33	2.17	1.00	1.85
1010	1.00	1.00	1.50	1.33	1.33	1.23
1011	0.00	0.67	1.00	0.67	1.00	0.67
1012	1.50	1.67	3.00	2.50	2.00	2.13
1013	2.00	2.00		2.00	9.00	3.75
1014	2.50	1.67	1.00	0.67	1.67	1.50
1015	2.00	1.33	1.33	0.56	0.67	1.18
1016	1.50	0.67		2.00	0.17	1.08
1017	4.00	4.00	2.33	4.33	5.00	3.93
1018	3.50	2.00	3.00		2.33	2.71
1019	0.50	0.67	1.00	0.33	0.33	0.57
1020	5.00	4.67	3.33	6.00	5.00	4.80
1021	5.00	4.67	8.00	10.00	6.67	6.87
1022	1.00	0.33	2.00	2.33	2.67	1.67
1023	0.75	1.00	0.67	0.33	0.50	0.65
1024	2.50	2.17	4.00		2.33	2.75
1025	5.00	2.33	6.00	2.83	3.33	3.90
Mean	2.09	1.89	2.80	2.51	2.76	2.41
<i>sd</i>	(1.44)	(1.35)	(2.07)	(2.41)	(2.49)	(1.57)
Range	0.00-5.00	0.33-5.00	0.00-8.00	0.00-10.00	0.17-9.00	0.57-6.87

TPRODUCE

ID	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Mean
1001	0.21	0.11	0.11	0.00	0.00	0.09
1002	0.00	0.00	0.08	0.06	0.06	0.04
1003	0.00	0.33	0.00		0.00	0.08
1004	0.00	0.11		0.00	0.00	0.03
1005	0.00	0.00	0.00	0.00	0.00	0.00
1006	0.25	0.33	0.67	1.67	3.33	1.25
1007	0.00	0.06	0.00	0.00	0.00	0.01
1008	0.00	0.00	0.08	0.00	0.00	0.02
1009	0.25	0.11	0.50	0.00	0.17	0.21
1010	0.00	0.00	0.00	0.00	0.00	0.00
1011	4.50	0.00	0.33	0.17	0.00	1.00
1012	0.00	0.00	0.00	0.00	0.00	0.00
1013	0.00	0.00		0.00	0.00	0.00
1014	1.50	1.33	0.50	0.00	0.00	0.67
1015	0.21	0.17	0.00	0.00	0.03	0.08
1016	0.04	0.00		0.00	0.00	0.01
1017	0.38	0.50	0.11	0.33	0.08	0.28
1018	0.50	0.17	0.25		0.67	0.40
1019	0.25	0.17	0.00	0.11	0.67	0.24
1020	0.00	0.00	0.00	0.00	0.00	0.00
1021	0.08	0.33	0.17	0.00	1.00	0.32
1022	0.00	0.00	0.06	0.00	0.03	0.02
1023	0.00	0.00	0.00	0.00	0.25	0.05
1024	0.00	0.00	0.00		0.00	0.00
1025	0.00	0.08	0.08	0.08	0.08	0.07
Mean	0.33	0.15	0.13	0.11	0.25	0.19
<i>sd</i>	(0.92)	(0.28)	(0.20)	(0.36)	(0.69)	(0.32)
Range	0.00-4.50	0.00-1.33	0.00-0.67	0.00-1.67	0.00-3.33	0.00-1.25

TRECEIVE

ID	Wave 1	Wave 2	Wave 3	Wave 4	Wave5	Average
1001	0.00	0.00	0.33	0.67	0.83	0.37
1002	0.08	0.00	0.06	0.00	0.08	0.04
1003	0.17	0.00	0.00		1.33	0.38
1004	0.00	0.00		0.00	0.00	0.00
1005	0.00	0.50	0.00	0.00	0.00	0.10
1006	0.00	0.17	0.00	0.11	0.11	0.08
1007	0.25	0.17	0.17	0.17	0.17	0.18
1008	0.00	0.00	0.00	0.00	0.00	0.00
1009	0.00	0.00	0.00	0.00	0.00	0.00
1010	0.00	0.00	0.00	0.00	0.00	0.00
1011	1.25	0.33	0.11	0.19	0.11	0.40
1012	0.00	0.00	0.00	0.00	0.00	0.00
1013	0.00	0.33		0.00	0.00	0.08
1014	4.00	0.00	0.17	0.00	0.00	0.83
1015	0.00	0.00	0.00	0.00	0.00	0.00
1016	0.00	0.00		0.00	0.00	0.00
1017	0.50	0.11	0.08	0.06	0.67	0.28
1018	1.00	0.17	0.00		0.00	0.29
1019	0.25	0.33	0.00	0.06	0.08	0.14
1020	0.00	0.00	0.00	0.00	0.00	0.00
1021	1.00	0.00	0.67	0.11	6.67	1.69
1022	0.00	0.00	0.06	0.00	0.03	0.02
1023	0.00	0.00	0.00	0.00	0.00	0.00
1024	0.00	0.00	0.00		0.00	0.00
1025	0.00	0.17	0.00	0.00	0.25	0.08
Mean	0.34	0.09	0.07	0.06	0.41	0.20
<i>sd</i>	(0.84)	(0.14)	(0.15)	(0.14)	(1.34)	(0.37)
Range	0.00-4.00	0.00-0.50	0.00-0.67	0.00-0.67	0.00-6.67	0.00-1.69

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