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The role of universal grammar in second language acquisition: An experimental study of Spanish ESL students' interpretation of lexical pronouns

Mary Kathleen Kevari

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THE ROLE OF UNIVERSAL GRAMMAR IN SECOND LANGUAGE ACQUISITION: AN EXPERIMENTAL STUDY OF SPANISH ESL STUDENTS’ INTERPRETATION OF LEXICAL PRONOUNS

A Thesis
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
in
Psychology

by
Mary Kathleen Kevari

June 2000
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Approved by:

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ABSTRACT

An experiment was conducted to test the role of Universal Grammars in second language acquisition. Native Spanish speakers enrolled in English Second Language (ESL) courses were tested on their interpretation of lexical pronouns in English and their native language. Interpretation of lexical pronouns proposes a question regarding the nature of Universal Grammar. Specifically, will the same patterns of language emerge for the second language learners in comparison to native speakers of English? Will ESL participants prefer the same structure of sentences and pronoun interpretation that native English speakers prefer? Thus, are the same mechanisms that are employed in first language used in second-language acquisition? High school students enrolled in beginning and advanced levels of ESL classes served as the participants for this study as well as a group of native high school English speakers for comparative analysis. Results showed that similarities between the native Spanish and English speakers were evident on sentences relating to principles of Universal Grammar. Differences were observed; however it was concluded that these differences could be related to factors involving pragmatics and/or educational experience.
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INTRODUCTION

Since the early debates between Chomsky (1959) and Skinner (1957), linguists and research psychologists have come to question the process of language acquisition. Specifically, what are the mechanisms involved in language learning? From these debates, two different arguments or explanations have surfaced regarding first language acquisition. One theory states that language is a behavior that is learned by children acquiring simple vocabulary and grammar at an early age. Researchers have come to theorize that acquisition of language is learned simply by listening to caregivers and the environment. Furthermore, children learn language by modeling and through positive or negative reinforcement, in a manner similar to how other behaviors are acquired. In contrast to language being learned behaviorally or through environmental factors, other theorists believe that language is due to some mental or biological mechanism that allows humans to speak a language (i.e. learn a grammar). Based on this theory, the human mind is programmed to communicate through language, and humans are genetically predisposed to speak. These two arguments or theories represent the acquisition of language as a nature-nurture debate. In other terms, is language due to nature or nurture, or maybe a combination of them both?
Research has provided a clear examination of the process of first language acquisition (c.f. Chomsky, 1981, 1988; Pinker, 1984). Based on this examination certain issues or questions arise regarding this process such as "how can a child, based on a limited set of data, acquire any human language in a relatively short period of time when the child is placed in an appropriate speech environment?" (Chomsky, 1988). Speculation suggests there must be a mental mechanism that interacts with the environment to help people learn language. Therefore, if language acquisition encompasses nature and nurture, what is the distinction between these two entities (c.f. Chien & Wexler, 1990; Chomsky, 1981, 1988; Gleitman, Landau, & Wanner, 1988; Lust, 1986, 1987)?

In the past twenty years, theories regarding the learnability issues of first language have surfaced. Specifically, Chomsky's (1981, 1988) Principles and Parameters Model and the theory of Universal Grammar have disentangled some of the learnability issues regarding the acquisition of language. These theories provide research psychologists with plausible accounts of how first language is learned; however, in the case of second language acquisition, these theories are still under investigation (Flynn, 1996).

In this thesis, I propose to provide some answers in
regards to the theory of Universal Grammar and its role in second language acquisition by investigating Spanish ESL (English as a Second Language) students' acquisition of lexical pronouns (e.g. 'him' or 'her'). Examining pronouns, or any part of grammar in a second language learning context, allows research psychologists to examine the patterns of preference in grammar, and comparative analysis allows deductive conclusions to be made regarding the theory of Universal Grammar. This thesis will examine ESL students preference regarding the interpretation of lexical pronouns (him and her) in English.

The remainder of this proposal is organized as follows. First, the essentials of the Principles and Parameters Model and the theory of Universal Grammar in relation to first language acquisition are discussed. Second, some current views concerning the role of Universal Grammar in second language acquisition and some empirical results confirming and disconfirming these current views are examined. This is followed by a discussion of specific language principles that affect acquisition of pronouns, and a review of a study by Eisele and Lust (1996), which is the model for the current study. Then, by assuming one of the current views regarding the role of Universal Grammar in second language acquisition, hypotheses concerning Spanish ESL students' acquisition of pronouns are proposed.
Finally, experiments are described which are designed to test the proposed hypotheses.

**The role of Universal Grammar and first language acquisition**

How is language learned? Specifically, what mechanisms (cognitive or environmental) assist humans in learning their native tongue? With time, humans eventually learn language; specifically, we learn the grammar of a language. Children acquiring language begin to speak in grammar as early as the age of two years (Gleitman & Gleitman, 1991). Although their grammar is labeled as telegraphic speech, which is characterized as shortened grammar (i.e. “mommy go” instead of “mommy is leaving”), the speech reflects the data they receive. As children grow, they eventually learn the complete grammar of their language, and thus speak in complete sentences that are understandable to other people who speak their language. To investigate this process, linguists and research psychologists have come to question the origin of these linguistic rules (i.e. grammars), and specifically, how children discover these rules in the absence of formal training (Pinker, 1995).

Children learn to construct an internalized grammar (i.e. learn their native language) by looking for regularities existing in their speech environment. Then, by
deciding on which rules match and do not match, children decide how to use the grammar, learn to distinguish sounds, acquire lexical knowledge, and eventually combine all of the information they receive to make a complete grammar. From this, it would appear that learning a language is a difficult task, especially in the absence of formal training. However, children do learn languages when placed in an environment with the proper stimuli (i.e. speech sounds, words, sentences). For example, any child that grows up exposed to human speech will learn the language (not including deaf children).

In contrast, what are the results of language acquisition for a child that grows-up in an environment without “proper stimuli”? In the past twenty years research has demonstrated the effects of children who are raised in an environment where speech is not practiced, such as the case of Genie. Genie was found at the age of 14 with no language ability. Attempts were made by psychologists to teach Genie language; however, her overall ability was significantly slower than children exposed to human speech (Curtiss, 1977). Children who do not have normal language-learning environments do not learn how to talk or acquire the appropriate vocabulary abilities like children who are raised in “normal” speech environments. In addition, this can also apply to children who have deaf
parents. Overall, children who have experiences like this do not learn their native language as effectively as they could. Is it that these children are cognitively defective in that they lack a mental mechanism related to language learning. Or do they simply not have enough language practice?

Researchers have concluded that brain damage can negatively affect language acquisition; however, the primary factor in the ability to acquire language appears to be related to a critical period (Newport & Johnson, 1991). A critical period refers to when the brain is “ready” to acquire language. There has been much speculation on the specific time frame of a critical period, some proposing that this period ends at age five (Snow & Hoefnagel-Hohle, 1978) and others arguing that certain aspects of language learning are affected at the age of seven (Newport & Johnson, 1991). Cases such as Genie provide evidence that language acquisition is related to a critical period of language learning.

As evident from this discussion, language acquisition is a complicated process that does not seem to be explained by the environment or some type of cognitive process alone. Therefore, there must be some type of interaction that both enlists speech data from the environment and utilizes a mental mechanism that guides a child through language
acquisition. With regards to grammar and other rules that structure language, a mental mechanism must be present in order to explain acquisition. As further noted, genetically predetermined information or knowledge cannot be limited to any particular language, because children are capable of learning any language depending on the environment they are placed in. For example, children of different nationalities who are raised hearing different languages grow up to speak the language they were raised with. Thus, the mental mechanism that allows children to learn language must encompass rules that "fit" into any language, thus the term "language universals."

According to the Principles and Parameters model, language is learned through the interaction of two entities; (1) predetermined knowledge of language and (2) the data children encounter in their speech environment (Chomsky, 1981, 1988). Chomsky named the mental mechanism that is responsible for language activities (i.e. predetermined knowledge of language) as the "language faculty" or "language acquisition device (LAD)." The language information or data that children receive from their environment (mainly from their parents or caregivers) are called "primary linguistic data." Although the language faculty is postulated as a domain-specific module of the human mind and distinct from other modules of the
mind, it is interactive with the other parts of the mind (Chomsky, 1981). Through interacting with the primary linguistic data from a particular speech environment, the language faculty develops into a grammar.

According to Chomsky (1981, 1988), Universal Grammar is the initial state of language before any language data have interacted with it. Furthermore, the initial state of Universal Grammar accounts for any “language universals” that assist a child in learning a language. This creates a set of innate universal principles with open parameters that eventually reflect a language. The principles of Universal Grammar are innate, built-in structures of the language (Chien, 1992) which can have different values according to the language to be learned. The Universal Grammar parameters are the values associated with that particular language, such as pronoun interpretation or subject-verb agreement. Thus, in the final state of the language faculty, after interaction with a particular set of linguistic data (i.e. interaction with speech in the environment), parameters have been “fixed” so as to account for the grammar of a particular language. Thus, a child comes to learn and attain proficiency in the first language.

Universal Grammar principles are a part of the biological endowment for human language learning. For
example, universal principles that relate to phrase direction and pronoun interpretation are a part of every known language (Chomsky, 1981). In addition to principles, the parameters of Universal Grammar are syntactic variables associated with the principles. For example, the placement of nouns and verbs can be different across languages. Furthermore, as seen in a later section, a particular language can have a different branching direction. For the most part, Universal Grammar reflects structure related principles that are not learned (Chomsky, 1975).

As noted above, when a child is placed in a certain language environment such as an English speaking family, the child will learn English because the speech data received by the child represent the English language parameters. Through interaction with others the child receives the necessary data to complete his or her grammar. Therefore, under the assumption that the Principle and Parameter model of language acquisition is correct, language acquisition becomes a simple process for any child placed in an environment with speech data. Because principles and parameters work as a map to guide the child to a grammar, children are only required to learn parameters of their language, along with lexical information. For example, children will learn the meaning of words and parametric variations of the language, such as
noun-verb agreement. Structure-related rules of language not evident in the speech data cannot be learned by the child. These principles are assumed to be innate and operate universally across languages. (For a more detailed review, see Chien, 1992).

Current theory and research on Universal Grammar in second language acquisition

Currently, the Principles and Parameters model and the theory of Universal Grammar are the most widely accepted theories regarding first language acquisition. The fundamental question of this thesis is how the theories of Universal Grammar and the Principles and Parameters model explain second language acquisition. Recently, there has been much debate on the role of Universal Grammar in second language acquisition (Epstein, Flynn, & Martohardjono, 1996; Flynn, 1996). The fundamental question regarding these theories relates to the availability of Universal Grammar in second language acquisition. Specifically, is Universal Grammar a continuous language faculty that affects second language acquisition in the same fashion as first language acquisition? There are three theories that attempt to disentangle the role of Universal Grammar in second language acquisition (Epstein et al, 1996). These are reviewed next.
No-Access Hypothesis. One theory of second-language acquisition is the No Access Hypothesis, which claims that Universal Grammar is not available to the second-language learner. Therefore, second-language acquisition must be constrained by other mental mechanisms such as general problem-solving strategies and analogy (Bley-Vroman, 1989; Clahsen, 1988). Evidence in support of the No-Access Hypothesis relates to Lennenberg's (1967) Critical Period Hypothesis. According to this hypothesis, humans have a narrow critical period set aside by nature for acquiring language. According to Lennenberg, the critical period of language coincides with the period of lateralization (i.e., the specialization of language to the left hemisphere of the brain). During the period of lateralization, individuals appear to be the most sensitive to stimuli and their brain functions remain flexible; thus, language acquisition is optimal at this time. After the period of lateralization, the ability for an individual to organize and adjust the physiological demands of verbal behavior quickly declines, making language learning difficult. Proponents of the no-access hypothesis (e.g., Bley-Vroman, 1989; Clahsen, 1988) argue that since Universal Grammar is characterized as a biologically determined component of the human brain, it is subject to the critical period (or the period of lateralization) and thus cannot be activated.
after the critical period. Thus, in regard to second language learning, which traditionally occurs in adulthood, Universal Grammar cannot be the acquisition device for this process due to this "critical period." Furthermore, if Universal Grammar cannot be activated after the critical period, it cannot constrain the second language. Thus, according to the No-Access Hypothesis, second language acquisition must be governed by mechanisms other than Universal Grammar.

Researchers who disagree with the No-Access Hypothesis of second language acquisition base their arguments on evidence that challenges the Critical Period Hypothesis. Penfield and Roberts (1959) suggest that language learning is related to cerebral plasticity, which coincides with Lennenberg's (1967) critical period. However, Snow (1987) suggests that the age of five when lateralization is completed "is not an age in which any sharp discontinuities in language acquisition can be observed" (p. 188). Epstein et al. (1996), based on this new set of evidence, argue that Universal Grammar can be activated after the period of lateralization.

According to the No-Access Hypothesis, second-language acquisition must be acquired without any "internal help." In addition to the Critical Period Hypothesis, Clahsen (1988) and Bley-Vroman (1989) claim that a second language
is acquired through non-linguistic learning strategies such as analogy. By making analogous comparisons between the first language and second language, second language learners subsequently build a grammar for the new language they are acquiring. However, as pointed out by Epstein et al. (1996), this "analogy" approach is not sufficient to explain second language acquisition. Assuming that the analogy approach is correct, one should expect that when there is a mismatch between the surface-string grammaticality properties of the first and second language sentences, the second language learners will make judgments in accordance with the properties compatible with the first language grammar. Surface-string properties represent a type of visual relationship in terms of placement of nouns, pronouns, etc. For example, if a construction is grammatical in the first language but not in the second language, the analogy approach predicts that the second language learner will mistakenly judge the second language construction as grammatical.

However, according to Munnich, Flynn and Martohardjono (1991) and Martohardjono (1991, 1992), second language learners make correct grammatical judgments about second language sentences even when there is a mismatch between the target language and the first language sentences. For example, Martohardjono (1991) conducted an experiment in
which Chinese ESL speakers were tested on English sentences containing wh-words (what, who, why, where). Participants were tested on how to transform sentences such as, "Mary likes who"...into a question...."Whom does Mary like?" Chinese and English have different rules in transforming wh-questions; however, the results indicate that the Chinese participants correctly rejected the ungrammatical English wh-questions and accepted the correct examples. Thus, despite the language differences, ESL learners were capable of learning the new language rule for transforming wh-questions, even though these two languages have different rules in transforming wh-questions. In summary, Epstein et al. (1996) concluded that the No-Access Hypothesis does not adequately account for second language acquisition.

Partial-Access Hypothesis. A second theory related to Universal Grammar in second language acquisition is the Partial-Access Hypothesis, which claims that Universal Grammar is only partially available to the second language learner. According to this theory, parametric properties that characterize the first language can be acquired in the second language. However, properties in the second-language that are unknown to the first language cannot be acquired. This hypothesis helps to explain the difficulties that second-language learners have when
acquiring a new language that differs from their first-language. Thus, according to the Partial-Access theory, second-language properties are learned by non-linguistic devices such as problem solving strategies, similar to that predicted by the No-Access Hypothesis. However, the partial-access hypothesis argues that first language changes the core grammar of Universal Grammar, making acquisition of second language constrained by the first language. Thus, any principle employed by first language acquisition will manifest itself in second language acquisition because the principles and parameters that assisted first language acquisition become Universal Grammar. Thus, first language learning principles and parameters govern any further language learning. As noted above, this hypothesis creates a problem for the second language learner when the parameters are not the same as the first language. The study by Martohardjono (1991), mentioned above, demonstrates the example between English and Chinese acquisition. Chinese speakers learning English should not be able to learn wh-movement constraints because this does not exist in their native language; however, the results indicate that this is not the case. ESL Chinese speakers are able to learn most of the wh-movement constraints.

In addition to this claim by the Partial-Access
Hypothesis, parameters that differ from the first language should not be learned either. According to Schachter (1989) only second language principles that are congruent to the first language can be learned. Thus, when the languages differ in parameters, second language acquisition becomes impossible because Universal Grammar is now represented by the first language principles and not a system of universals that allow acquisition of all languages. Theoretically, this hypothesis seems to be somewhat logical because languages like Spanish and English are very similar and acquisition of Spanish as a second language when the person is a native English speaker is not such a difficult task. However if the second language was Chinese or another language that significantly differs in syntax, acquisition would be more difficult if not impossible for an English speaker to acquire.

However, recent evidence has emerged regarding new parameter settings in second language acquisition when the parameter values are different from the first. Several studies (Flynn, 1983; 1987; 1991; 1993; Flynn & Martohardjono, 1992; 1994) provide evidence to account for new parameter settings across languages. For example, Flynn (1983; 1987; 1991) found that Japanese speakers trying to learn English are able to gradually acquire new parameters relating to a universal grammar principle.
referred to as head-direction or branching direction.

Head direction, or branching direction, refers to the ordering of structure in terms of the noun or noun phrase (main clause) in a sentence, especially in relation to an adverbial phrase (subordinate clause). Overall, languages differ in terms of phrase construction (Stowell, 1981). For example, consider the two sentences:
(1) The worker called the owner when the engineer finished the plans.
   (Right-Branching)
(2) When the engineer finished the plans, the worker called the owner.
   (Left-Branching)

The subordinate clause "when the engineer..." is either to the left or right of the main clause "The worker called"... in each sentence. In (1) the subordinate clause "when the engineer" is to the right of the main clause. This is referred to as right-branching. In (2), the subordinate clause "when the engineer" is to the left of the main clause. This is referred to as left-branching. In general, head-direction or branching direction refers to the structure or ordering of the main clause and subordinate clause within a complex sentence. Branching direction, in general, is a universal language property. As shown, different values (left vs. right) characterize
each language.

Japanese and English sentences are different in their head-direction parameter. English sentences reflect right-branching direction due to the arrangement of the sentence (e.g. noun phrase before verb phrase). In contrast, Japanese sentences reflect the opposite, or left-branching direction. Therefore, parameter settings regarding head direction (placement of the noun and the verb) are reflected in different languages such as English or Japanese. These differences represent how principles and parameters of a language dictate the grammar of a language. Furthermore, it represents how principles such as head-direction are innate to language learning (Chomsky, 1959). Thus, testing language differences, specifically the acquisition of such rules as head direction in a second language context, allows researchers to test the role of Universal Grammar.

Flynn (1983, 1987) tested Japanese speakers at different levels of proficiency enrolled in ESL courses on their preference for sentences that differed in head-direction. Two types of sentences were presented, which corresponded to head-initial parameters (right-branching), as in English, or head-final parameters (left branching), as in Japanese. Flynn argued that if the sentences that correlated with the Japanese structure (left branching)
were preferred more than the English type of sentences, it
could be concluded that first language parameters were
constraining the acquisition of English for the native
Japanese speakers. Thus, the ESL learners were not
acquiring the new language as the Partial-Access theory
would predict. However, if the Japanese ESL group did not
show any preference for head-final sentences, it could be
concluded that first language does not constrain second
language acquisition or that Universal Grammar is available
to the second language learner, and thus the partial-access
theory would not be supported.

Results indicated that in early stages of acquisition
of ESL for Japanese speakers, no preference was
demonstrated among the sentences that differed in head-
direction. Flynn interpreted this as second language
learners “knowing” the difference between the two languages
and being in the process of acquisition or “figuring out
the language.” However, in later stages of acquisition,
Japanese speakers preferred head-initial sentences (which
correlated to English) over head-final sentences.
According to Lust (1986), head-direction is one of the
first parameters established in young children’s language.
Thus, it appears that regardless of the time of
acquisition, parameters can be relearned and Universal
Grammar is adaptable and available to the second language
learner.

**Full-Access Hypothesis.** From this evidence, a third hypothesis emerges concerning the role of Universal Grammar and second language acquisition, called the *Full-Access Hypothesis* (Epstein et al., 1996). Unlike the Partial-Access Hypothesis, this theory postulates that first language does not change the core structure of Universal Grammar. Thus, Universal Grammar in its entirety must remain available to the second language learner. Furthermore, parameters that differ from the first and second language can be learned by the second language learner. Most importantly, language principles are learned through Universal Grammar and not general learning strategies.

**Language acquisition of pronouns**

From the Principles and Parameters Model we can understand that all languages have similar and different aspects. Languages are similar in that all have nouns and verbs; however, in terms of the structure of nouns and verbs, languages can be different. Thus, when acquiring a second language it is necessary to learn both lexical items (words and meaning) and grammar (structure) of the new language. For example, verbs may not follow the nouns or pronouns in all languages as they do in English. In addition, pronouns in English sentences can refer to the
noun (e.g. John, Mary) in the sentence, but in Chinese this is not always grammatically correct. Therefore, investigating the structure of language, especially in the acquisition of a second-language context, allows researchers to test how second language learners interpret the differences between their native language and the new language they are learning. The difference in the structure and interpretation allows a test the role of Universal Grammar.

Next, I will briefly review some Universal Grammar principles and parameters, especially as they relate to pronouns, and specify the similarities and differences between English and Spanish. This distinction will provide the necessary understanding for the proposed experiments of this thesis.

As explained earlier, the principle of head or branching direction refers to the main clause of a sentence ("The worker" in Sentence 1) in relation to a subordinate clause ("When the engineer"...). As noted above, different languages have different rules or structures regarding head-direction, and this principle is an innate language characteristic. Furthermore, it has been speculated that children use knowledge related to head-direction to interpret pronouns (Epstein et al., 1996). In complex sentences, such as example (1) and (2) noted above, the
adverbial or subordinate clause can occur either to the right or to the left of the noun phrase or main clause. Consider Spanish sentences (3) and (4);

(3) El Raton Mickey esta escondido debajo de la mesa, mientras come una banana.
   Mickey Mouse is hiding under a table, while eating a banana.

(4) Mientras come una banana, El Raton Mickey esta escondido debajo de la mesa.
   While eating a banana, Mickey Mouse is hiding under a table.

Spanish, like English, can be characterized as a right-branching language. In sentence (3), the subordinate clause "while eating a banana" is embedded to the right of its main clause "Mickey Mouse" (right-branching). In sentence (4), the subordinate clause is embedded to the left of the main clause (left-branching).

In addition to the ordering of clauses in a sentence, another important feature is the pronoun of the sentence and its interpretation. In general, the study of the relation between pronouns and their antecedents is referred to as pronoun anaphora. Pronouns are interpreted according to structure-related principles of Universal Grammar (Eisele & Lust, 1996). Specifically, Binding Principles govern specific rules for interpreting pronouns (Cobbett,
An example of this is Binding Principle C, which is specific to pronoun interpretation, and states that pronouns that dominate names cannot refer to those names (see Lust, 1986).

Furthermore, Binding Principles carry concepts which in turn determine the interpretation of the pronoun. One of these concepts is c-command. Generally, c-command refers to a type of complex structural relation that determines interpretation, especially in terms of proper nouns and pronouns which are specific to Binding Principle C (Radford, 1988). C-command also refers to a type of dominance in sentences and specifies which words have relationships or co-refer nouns and pronouns together (Aitchison, 1992).

By definition, a node (X) "c-commands" another node (Y) whenever the following occurs:

a) the first branching node dominating (X) also dominates (Y),

b) (X) does not dominate (Y), and

c) (Y) does not dominate (X).

When these conditions are satisfied, then c-command occurs. Understanding the principle of c-command is best explained by a tree diagram. Consider sentence (5) in Figure 1.
In this sentence "He" c-commands both "David" and "John's brother". In (5), the node for "He" is (NP1), which is dominated by (S1). In moving down the tree (S1) is also above both "John's brother" (NP2) and "David" (NP4). Thus, (S1) has a type of structural dominance over the names, and condition (a) of c-commanding is satisfied. Additionally, "He" (node NP1) does not have direct dominance over "David" or "John's brother", (nodes NP2 or NP4) and thus condition (b) is satisfied. Furthermore, neither "John's brother" nor "David" command dominance over "He" because these nodes are located farther down in the tree in relation, and therefore condition (c) is satisfied. This is the essence of c-command, or dominance over other segments in the sentence.

In this example, "he" can not refer to "John's
brother” or “David.” This is because “He” c-commands both names in the sentence, thus blocking a co-reference interpretation based on Binding Principle C. C-command and Binding Principle C reflect the process of linking nouns and pronouns together in a specified order to interpret a particular sentence. In this sentence, due to c-command principle, “he” must refer to another person.

In terms of the sentences presented in this paper and the concepts of Universal Grammar, a similar example can be explored. For example, consider sentences (6) to (9);

(6) While Mary is riding a bike, she is carrying a backpack.

(7) While she is riding a bike, Mary is carrying a backpack.

(8) Mary is riding a bike while she is carrying a backpack.

(9) She is riding a bike while Mary is carrying a backpack.

Interpreting sentences (6), (7), or (8) is potentially confusing because in each sentence it is unclear if “she” refers to “Mary” or “she” refers to another person. Thus, a co-reference or disjoint interpretation could be given for each sentence. A co-reference interpretation infers that “she” and “Mary” are the same person. A disjoint interpretation refers to “she” and “Mary” being different
people. Other factors not evident in the sentences, such as pictures or other types of information, would be needed to determine how to interpret sentences (6), (7) and (8).

However, considering sentence (9), it is clear that a disjoint interpretation is the only grammatical possibility. This sentence implies that someone else (not "Mary") is riding a bike. Thus, sentence (9) does not require additional information to assist in the interpretation. This is because sentence (9) adheres to a concept of dominance and c-command. Specifically, in this sentence "She" c-commands "Mary", and therefore requires a disjoint reference. To see this, let's examine the tree diagram of sentence (9) in Figure 2.

Figure 2. Tree Diagram of Sentence (9)

```
NP1
   \-- V
       \-- NP2
           \-- Comp
               \-- S2
                   \-- NP3
                       \-- VP
                           \-- DET
                               \-- N

NP1
```

She is riding a bike while Mary is carrying a backpack.

As shown, the node above "She" (NP1) is dominated by S1. The node S1 also dominates the node above "Mary" which
is further down the tree. But NP1 does not directly dominate NP3, the node for "Mary". In turn, moving up the tree, the node above "Mary" (S2) does not have dominance over "She." Thus, based on Binding Principle C and c-command, "she" and "Mary" cannot be co-referenced.

Abstract structural principles of Universal Grammar, such as the concept of c-command and Binding Principle C, allow for a disjoint interpretation in appropriate sentences. Overall, the embedded structure of a sentence determines how pronouns are interpreted. Universal Grammar, as previously noted, refers to universal principles and parameters governing the interpretation of language. The concepts that assist humans in understanding their language are sometimes "not clearly presented in the input data" (Chien, 1992, p. 315), as shown from sentence (5) and (9). In addition, language or grammar reflects embedded structural categories which represent "conditions" of language. Furthermore, these conditions of learning can be characterized as unknown or innate to acquisition (Chomsky, 1975; 1988). Based on this, language learners can only acquire complex concepts such as lexical information and parameters of their language. Concepts such as branching direction, c-command, and Principle C are assumed to be innate and not evident to the language learner. As discussed, children learn language from simply
being exposed to it. Complicated structural rules of interpretation such as those represented by sentence (9) are not evident to the learner (Chien, 1992).

According to Chomsky (1981), interpretation of pronouns in English and Spanish obey the same rules. Thus, a Spanish sentence similar to sentence (9) would also be interpreted as a disjoint reference. In addition to the structural rules acting upon pronoun interpretation, there appear to be other factors influencing children. Specifically, children tend to interpret pronouns based on linear precedence. Linear precedence refers to children "liking" co-reference interpretations for sentences like (6) and (8). Sentences (6) and (8) represent forward pronoun placement in that the pronoun follows the noun. In English, for example, children prefer forward anaphora. That is, children prefer a co-referential relationship for pronouns which follow the proper noun in a sentence. This preference is even stronger in English-speaking adults. The tendency to prefer pronoun relationships based on a linear precedence refers to "directionality effects." Directionality effects have been replicated in one study (Lust, 1986).

Interpretation of directionality effects suggests several explanations. One explanation is that directionality effects do not adhere to structure-dependent
rules. Under this assumption, directionality effects contradict the theory of Universal Grammar because directionality effects represent visual surface-string order versus rules, such as c-command and other binding principles (Eisele & Lust, 1996). Furthermore, Universal Grammar-related rules are based on the principle that some language learning is related to innate concepts/rules not evident in the sentence structure, like sentence (9). However, some theorize that directionality effects are related to Universal Grammar (Lust, 1986 & Eisele & Lust, 1996).

**Eisele and Lust (1996) study**

Now that Universal Grammar, principles, parameters, and results from various studies have been discussed, it is important to consider a study conducted by Eisele and Lust (1996). In this study, children between the ages of 3 and 7 were tested on sentences and pictures, and whether or not the pictures reflected the meaning of the sentences. Examples of sentences used in the experiment are presented in 10-13, which are similar in structure to sentences 5-8.

10) **Left-branching (forward)**

   When Big Bird held the apple, he touched the pillow.

11) **Left-branching (backward)**

   When he held the apple, Big Bird touched the pillow.

12) **Right-branching (forward)**
Big Bird held the apple, when he touched the pillow.

(13) Right-branching (backward)

He held the apple, when Big Bird touched the pillow.

Sentences 10-13 reflect differences in branching direction (right or left) and the direction of the pronoun (forward anaphora is when the pronoun follows the noun, while backward anaphora is when the pronoun precedes the noun). Similar to sentence (9), the grammatical interpretation of sentence (13) is that “he” is not “Big Bird.” As previously noted, interpretation of this is due to structure-related Universal Grammar principles such as c-command; specifically, because “he” comes before “Big Bird” and “he” “c-commands” the antecedent (Eisele & Lust, 1996). Therefore, sentence 13 reflects a disjoint interpretation. In contrast, sentences 10, 11 and 12 can be interpreted as co-reference (“he”=Big Bird) or a disjoint reference (“he” is not Big Bird) because the pronoun does not simultaneously c-command the antecedent preceding the noun.

Eisele and Lust (1996) presented corresponding pictures with each of the sentences. Examples included a picture of Big Bird holding an apple and touching a pillow, or a picture of Big Bird holding an apple and Cookie Monster touching a pillow. Because of the ambiguity in
sentences 10-13, the picture should affect the interpretation of these sentences. Pictures represented two conditions; (1) co-reference and (2) disjoint conditions. Co-reference pictures depicted one cartoon character such as “Big Bird” engaging in two different activities simultaneously. Disjoint pictures depicted one character engaged in an activity while a second character was engaged in another activity.

The purpose of the Eisele and Lust (1996) study was twofold: to test Universal Grammar principles related to pronoun interpretation across different age ranges of children, and to test methodological issues relating to language studies in children. Methodological issues are important in regard to studies involving children because they provides verification of children’s attention to the task. For example, children may not pay attention to the task or might be distracted by the cartoon pictures. If so, valid results would be difficult to obtain. Based on this practical issue, Eisele and Lust implemented a truth-value-judgment design in their experiment. This type of task includes some questions in which an obvious “no” response is appropriate. If the child answers “no” to these questions it can be inferred that the child is paying attention to the task. This ensures that the children's full knowledge of grammar is being measured.
Eisele and Lust (1996) were able to predict several things regarding interpretation of pronouns in children’s first language. First, if Universal Grammar principles are operating, then pronoun interpretation for sentences similar to (13) would be interpreted as a disjoint reference regardless of the picture presented. Sentences 10-12 should be interpreted as either co-reference or disjoint depending on the picture presented. In other words, children’s interpretation should adhere to structure related Universal Grammar principles. In addition, Eisele and Lust predicted that children’s grammar between the ages of 3 and 7 would bear “no qualitative” difference if Universal Grammar is operating. If children’s grammar at the ages tested is similar and mirrors adult grammar, continuous language principles can be concluded. Continuous language principles refer to quantitative differences in language development versus qualitative distinctions of grammar patterns or preferences.

The notion of continuous language development and/or principles adheres to the idea that language develops over time and distinctions between children and adults reflect quantitative entities (i.e. lexical items and grammatical knowledge) instead of distinct patterns of grammar. Typically, cognitive theories such as those proposed by Piaget suggest that development changes over time and the
changes reflect distinct stages in cognition. An example would be the difference between pre-operational and concrete operational stages of learning. In contrast, development of language is more continuous, without occurring in discrete stages.

Eisele and Lust (1996) also discussed the issue of directionality effects and how this may interfere with pronoun interpretation and their predictions of pronoun interpretation between adults and children. Directionality effects refer to the tendency of young children to interpret sentences with pronouns following the noun as a co-reference interpretation; and interpreting pronouns that precede nouns as a disjoint reference. Research has suggested that children go through a phase in which all pronouns following the noun must refer to that noun.

Results confirmed Eisele and Lust’s predictions regarding pronoun interpretation. Specifically, children and adults interpreted sentences similar to (13) as a disjoint reference. Thus, Universal Grammar principles appeared to dictate pronoun interpretation. In relation to directionality effects, co-referential interpretations were preferred by both children and adults, specifically for sentences in which the pronoun followed the name. In addition, children preferred disjoint relationships when
the pronoun preceded the noun. However, adults differed on this in left-branching sentences in which pronouns preceded the noun, such as sentence (12). Under these circumstances, adults preferred co-referential interpretations while children preferred disjoint interpretations. Although this difference was not significant, Eisele and Lust concluded that some pragmatic difference might explain this difference. In general, directionality effects were more pronounced with age. In comparing children’s judgments across ages with adults judgments, preference for co-referential interpretations were more pronounced with age. Despite the one difference there appeared overall to be a similar pattern of results between the group of children to the adults. According to Eisele and Lust, this pattern suggests a continuous pattern of language development.

Hypotheses of current study

Eisele and Lust’s (1996) study provides information regarding children’s and adults interpretation of pronouns. Based on the results we can infer that there are no significant differences in pronoun interpretations between children and adults. Thus, interpreting pronouns reflects continuous principles of language development. If Universal Grammar is continuous and Universal Grammar
operates in a second language learning context, then one can expect to find similar patterns of second language learners of English and children's patterns from Eisele and Lust's study. The basic question is: if Universal Grammar reflects a Full Access relationship to second language acquisition, will native Spanish speakers in ESL courses demonstrate a similar pattern of interpretation despite the presentation of the pictures? In adopting the full access hypothesis, which states that Universal Grammar is available to the second language learner, it is predicted that ESL students from beginning and advanced classes will be able to make similar judgments regarding the test sentences as children learning English at the comparative levels.

It can be predicted that in early stages of acquisition, Spanish speakers who are learning English as a second language will perform similarly on a truth value judgment task as native speakers of English. This hypothesis assumes that the same mechanisms employed in first language will be available to the adult when learning a second language. Thus, a similar pattern of performance among the ESL speakers of English and native English speakers should emerge. (1) Specifically it is predicted
that ESL participants will prefer a co-reference interpretation in right-branching forward sentences, and prefer a disjoint interpretation to right-branching backward sentences. (2) ESL participants will also prefer a co-reference more than a disjoint interpretation in left-branching forward sentences. (3) ESL participants should differ however, in their interpretation of left-branching backward sentences. Specifically, beginning ESL participants will prefer more disjoint interpretations and advanced ESL participants will prefer more co-reference interpretations, similar to the pattern between English speaking children and adults.

METHODO

Participants

Participants were native English speaking and native Spanish speaking students (enrolled in an ESL program) from a Southern California High School. Twenty speakers (10 females and 10 males) were tested in English for this experiment for the purpose of comparative analysis and replication of Eisele and Lust's (1996) results. These participants were not fluent in any other language than English and were not enrolled in any ESL program. ESL participants consisted of 40 speakers (20 female and 20
male) and were tested on their interpretation of pronouns. Of the 40 participants, 20 speakers were enrolled in an advanced level of the ESL program and 20 students were enrolled in a beginning level ESL course.

Materials

Materials used in this experiment consisted of test booklets containing sentences, and pictures of cartoon characters engaged in activities reflecting those sentences. Two test booklets (Spanish and English) were compiled for this experiment. Each test booklet consisted of two sections of pictures and sentences. Each section contained 16 pictures and corresponding sentences.

The test sentences presented contained two clauses; a main clause and a subordinate clause. The test sentences were varied according to two variables; (1) left-branching or right-branching and (2) forward or backward pronoun direction. This combination created four types of sentences, illustrated in 13-16 below.

(13) Left-branching (forward)

While Donald Duck is climbing a ladder, he is holding a basket.

Mientras el Plato Donald esta subiendo la escalera, el esta sosteniendo un canasto.

(14) Left-branching (backward)

While he is climbing a ladder, Donald Duck is
holding a basket.

Mientras el está subiendo la escalera, el Plato Donald está sosteniendo un canasto.

(15) Right-branching (forward)

Donald Duck is climbing a ladder, while he is holding a basket.

El Plato Donald está subiendo la escalera, mientras el está sosteniendo un canasto.

(16) Right-branching (backward)

He is climbing a ladder, while Donald Duck is holding a basket.

El está subiendo la escalera, mientras El Plato Donald está sosteniendo un canasto.

As can be seen from (13) to (16), each sentence contained one main subject NP (Noun Phrase) and one subordinate phrase starting with "while". The subject NP's were either proper names (Donald Duck) or pronouns (he). The relative positions of the proper name and pronoun determined the anaphora direction of the sentence (either forward or backward). In the forward case [(e.g. (13) and (15)] the pronoun followed the name (Donald Duck, then he). In the backward case [(e.g. (14) and (16)], the pronoun
preceded the name (he, then Donald Duck).

The test pictures presented related to the sentences with each picture containing two cartoon characters. Two variables relating to the pictures were manipulated. The first variable was the aspect of co-reference vs. disjoint reference. One type of picture depicted a co-reference context in which a cartoon character was simultaneously engaging in two different actions while the other cartoon character was not doing anything. The other type of picture will depicted a disjoint reference context in which one character engaged in an action and the other character engaged in another actions. Thus, if the participant replied "yes" to the co-reference picture, the participant believed that the pronoun co-referred with the name mentioned in the sentence. If the participant replies "yes" to the disjoint reference picture, the participant was believed to disjoint the pronoun and not refer the pronoun to the name mentioned in the sentence.

In addition, some pictures presented did not depict the sentence. This allowed for obvious "no" responses. Furthermore, this allowed for the "truth" of the response to be calculated. For example, a picture may be shown with Donald Duck riding a bike. However, the sentence presented
may read, "Mickey Mouse is riding a bike." This combination would be interpreted as a "no" response.

Design

The design of this experiment is a 3x2x2x2 factorial design. The first variable is related to the groups of participants being tested. As previously noted, two of the groups were ESL participants (beginning and advanced) and the third group consisted of English-speaking participants not enrolled in an ESL program. The second independent variable has two conditions which are related to the characters in the test pictures: co-reference or disjoint. The third and fourth independent variables are related to the test sentences to be manipulated. The third variable is branching direction (left or right branching) and the fourth variable is anaphora (forward or backward). With regard to the second, third, and fourth variables, 8 different types of sentence-picture pairs were generated:

1) Right-branching forward co-reference
2) Right-branching forward disjoint reference
3) Right-branching backward co-reference
4) Right-branching backward disjoint reference
5) Left-branching forward co-reference
6) Left-branching forward disjoint reference
7) Left-branching backward co-reference
8) Left-branching backward disjoint reference
Procedure

Three experimenters assisted in the collection of these data. Two of the experimenters were native Spanish speakers who examined ESL students on their interpretation of pronouns in Spanish. The other experimenter was a native English speaker who tested the native Spanish and native English speakers in English. Each experimenter was rigorously trained to present the sentences to avoid any confounding demand characteristics.

ESL participants were tested in Spanish and in English. Each Spanish-speaking participant was tested in two different test sessions by the experimenters. One session was given in English by a native English speaking experimenter, and the other session in their native language of Spanish given by a native Spanish speaking experimenter. The order of the two tests (English and Spanish) was counterbalanced across participants. English speaking participants were tested in English.

Each participant was tested in an empty classroom by one experimenter. Participants were presented with a series of sentences and pictures relating to the sentences. Participants were asked to respond to the picture and decide if the picture and sentence accurately depict each other. The participant were asked to respond with a “yes” or “no” response. First, a training section was
implemented so that participants understood the task. A set of simple training items were presented prior to the test batteries to ensure comprehension of the testing procedures. This involved viewing a picture of cartoon characters engaging in tasks and listening to a sentence that correctly depicted or did not correctly depict the picture. During the training section incorrect answers were corrected and repetition of items were allowed as many times necessary. In order to control the participants possible preference to replying "yes," the training section consisted of filter picture pairs which induced an obvious "no" response. During the training section the participants were frequently reminded that some answers were "yes" and "no." The training sentences and the testing sentences did not overlap in major syntactic structure or lexical content. Participants were asked to judge if the sentence depicted the picture by replying "yes" or "no."

In the test section, two test batteries which totaled 32 items were presented to the participants in a random order. The test sentences in each battery were also arranged in a random order. During the testing phase, incorrect responses were not corrected and the items were not repeated more than twice, unless the experimenter was sure that the participant was not paying attention. A
paper-pencil recording sheet was used to record the data. A truth value judgment task was adopted to test the validity of the participants' response. Two types of conditions were tested in relation to the pictures to verify that the participants were accurately judging the "truth" of the picture and the match between the sentence. This aspect of the design was adopted from Eisele and Lust (1996). In the True-Subject Predicate condition the character named in the sentence was the character carrying out the action in the predicate. For example, if a sentence similar to (13) was presented, the picture depicted Donald Duck climbing a ladder. In the False-Subject Predicate condition a character other than the one named in the sentence was carrying out the action in the picture. For example, if a sentence similar to (13) was presented, a picture depicted Mickey Mouse climbing a ladder. As previously noted, this type of sentence would demand a "no" response. This design feature of the study works in that participants should be able to judge the "truth" of the sentence in order to accomplish the task, which is independent of anaphora relation in the sentence.

RESULTS

It was clearly evident to the researcher that participants, overall, were able to judge the truthfulness
of the task. Because of this, only participants' responses to the True-Subject Predicate condition, and not the False-Subject Predicate condition, were included in the analysis. Results were analyzed according to the percentage of times a participant replied "yes" to the picture, indicating that the picture was consistent with the sentence. A "no" response indicated that the participant believed that the sentence did not match the picture.

The data were treated to a 3 (ESL beginning, ESL advanced, and English only group) x 2 (branching direction) x 2 (pronoun direction) x 2 (co-reference or disjoint) ANOVA. The variable of GROUP is a between subject variable, and refers to the three language groups. The variable of DIRECTION refers to where the main and subordinate clauses are placed within the sentence (left or right branching). The variable of ANAPHORA refers to the placement of the pronoun in the sentence, either following or preceding the noun (forward or backward). Finally, the variable of PICTURE refers to the type of picture being presented, which either had a co-reference or disjoint reference depiction. The variables of DIRECTION, ANAPHORA, and PICTURE are all within-subjects variables.

Table 1 lists the means for each group and for each condition, along with the means from the adult group in Eisele and Lust (1996, Table 2) for comparison.
Table 1
Mean Scores across Language Groups by Sentence-Picture Condition

<table>
<thead>
<tr>
<th></th>
<th>Eisele &amp; Lust</th>
<th>English</th>
<th>Advanced ESL</th>
<th>Beginning ESL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adults (1996)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>COREFERENCE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>1.89</td>
<td>1.95</td>
<td>1.89</td>
<td>1.84</td>
</tr>
<tr>
<td>Forward</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>1.67</td>
<td>1.89</td>
<td>1.42</td>
<td>1.58</td>
</tr>
<tr>
<td>Backward</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>1.61</td>
<td>1.89</td>
<td>1.74</td>
<td>1.58</td>
</tr>
<tr>
<td>Forward</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>0.44</td>
<td>0.89</td>
<td>0.89</td>
<td>1.47</td>
</tr>
<tr>
<td>Backward</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>DISJOINT</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>0.67</td>
<td>0.05</td>
<td>0.21</td>
<td>1.00</td>
</tr>
<tr>
<td>Forward</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>1.50</td>
<td>0.58</td>
<td>1.74</td>
<td>1.42</td>
</tr>
<tr>
<td>Backward</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>0.78</td>
<td>0.05</td>
<td>0.58</td>
<td>0.95</td>
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<tr>
<td>Forward</td>
<td></td>
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<tr>
<td>Right</td>
<td>1.83</td>
<td>1.47</td>
<td>1.84</td>
<td>1.47</td>
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<tr>
<td>Backward</td>
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</table>

The means range from 0 to 2 because all participants responded to two questions in each condition. Each response was tabulated based on how the participant answered, with a “yes” response given one point and a “no” response given zero points. Therefore, means closer to 2 indicate the participants agreed that both of the sentences matched the picture and responses closer to 0 indicated that participants felt that the sentences did not match the picture.
Comparisons with Eisele and Lust (1996)

Eisele and Lust’s (1996) adult group responses, which involved English speaking subjects, can be compared to the English control group from this experiment. Not surprisingly, responses by the English control group were the most consistent with Eisele and Lust’s adult group in comparison with the ESL learners. For the most part, responses tended to be in the same direction for both groups. Specifically, when forward pronouns in left and right branching sentences were presented with a coreference depictions, then both groups agreed that the sentence matched the picture. In turn, when forward pronouns, either left and right branching, were presented with disjoint pictures, both groups interpreted the sentences as not matching the picture.

However, backward sentences produced a different pattern of results. Left branching sentences presented with a disjoint style picture were interpreted differently by the English group and Eisele and Lust’s adult group. The English group generally interpreted the sentence as not matching the picture (M=.58). In contrast, Eisele and Lust’s adult group generally interpreted the sentence as matching the picture (M=1.50). However, this was the only pattern of results that differed between the two studies for both groups.
Comparing the three language groups

There were significant differences between the three language groups, \( F(2, 54) = 7.78, p < .01 \). Post-hoc analysis revealed that the English group significantly differed from both of the ESL groups, but that the beginning and advanced ESL groups did not significantly differ from each other. The English group tended to accept fewer of the sentences (\( M = 1.08 \)). The beginning ESL group accepted more of the sentences (\( M = 1.41 \)) while the advanced ESL group also tended to accept the sentences as well (\( M = 1.28 \)).

The more interesting findings involve the sentence variables, and how they interacted with GROUP. For example, pronoun ANAPHORA had a significant effect on subjects' responses. Participants had a greater tendency to accept forward sentences (i.e. the pronoun following the noun) than backward sentences, \( F(1, 54) = 25.36, p < .001 \). The GROUP x ANAPHORA interaction was non-significant, indicating that this effect did not differ between the three language groups, \( F(2, 54) = 1.80, p = .18 \).

The type of PICTURE also significantly affected participants' responses, \( F(1, 54) = 46.75, p < .001 \). Not surprisingly, sentences presented with a co-reference type of picture (one character engaged in two actions), yielded
more acceptance responses than when the sentence was presented with a disjoint type of picture (two characters engaged in separate actions). This result was also consistent with Eisele and Lust (1996). However, a significant interaction between PICTURE and GROUP was also observed, $F(2,54)=5.84$, $p<.01$. For all groups, when co-reference style pictures were presented, the participants tended to accept the co-reference interpretation. In turn, the groups tended to accept disjoint type of pictures with less frequency. However, the English group accepted the fewest disjoint sentences ($M = .51$) while the advanced ESL group ($M = 1.09$) and the beginning ESL group ($M = 1.21$) tended to accept more of the disjoint interpretations. Post-hoc analysis revealed that the English group significantly differed from the two ESL groups, but that the advanced ESL and beginning ESL group did not significantly differ from each other.

There was also a significant two-way interaction between PICTURE and ANAPHORA, $F(1,54)=137.88$, $p<.001$. Forward sentences presented with co-reference style pictures yielded the strongest response, with participants agreeing that the sentence matched the picture ($M=1.81$). In turn, when forward sentences were presented with
disjoint style pictures, participants strongly tended to reject the sentence as matching the picture (M=.47). But when backward anaphoric sentences were presented, participants tended to agree that the sentences matched both types of pictures. In fact, participants actually favored disjoint pictures (M=1.42) more than co-reference pictures in the backward condition (M=1.35).

Furthermore, a significant three-way interaction between ANAPHORA x PICTURE x GROUP was observed, F(2,54) =11.51, p<001. Post-hoc analysis revealed that the English and advanced ESL groups did not significantly differ, but both significantly differed from the beginning ESL group. For all three language groups, forward sentences with co-reference type of pictures yielded the most acceptance responses. However, when a sentence with a forward pronoun was presented with a disjoint style picture, English speakers almost universally interpreted the sentences and pictures as not matching (M=.005). The ESL advanced group accepted more of the disjoint sentences with forward pronouns (M=.40) in comparison to the English group, while the beginning ESL group tended to answer with both “yes” and “no” responses fairly evenly (M=.98). In contrast, the backward condition did not produce extreme differences in
responses among the groups. In fact, participants tended
to accept the sentence and picture when presented with both
co-reference and disjoint pictures. However, the English
group and beginning ESL group favored co-reference pictures
over disjoint pictures, while the advanced ESL group
favored disjoint pictures.

The variable of DIRECTION did not have as strong an
effect on the participants responses as the other
variables. With regards to the main effect of DIRECTION,
there were no significant differences between left and
right branching sentences in how the participants responded
to the test sentences, F(1,54)= 1.41, p=.24. In addition,
there was no significant interaction between DIRECTION and
GROUP, F(2, 54)=0.09, p=.91, or between DIRECTION and
ANAPHORA, F(1,54)=0.73, p=.40. The 3-way DIRECTION x
ANAPHORA x GROUP interaction was also non-significant,
F(2,54)=2.54, p=.09.

However, there was a significant interaction between
DIRECTION and PICTURE, F(1,54)=35.61, p<.001. Co-reference
style pictures tended to be accepted in both left and right
branching sentences, with left branching sentences more
accepted than right branching sentences (M=1.76 vs. 1.41).
However, in disjoint pictures, left branching sentences
were accepted less than right branching sentences (M=.83 vs. 1.05). This two-way interaction differed between the three language groups, resulting in a significant three-way interaction between DIRECTION x PICTURE x GROUP, F (2,54) = 5.52, p<.01. All groups tended to accept co-reference interpretations, with the trend stronger for left-branching than for right branching sentences. But the language groups differed in their acceptance of disjoint pictures. Post-hoc analysis revealed that the largest differences were between the English and beginning ESL groups. English speakers tended not to accept disjoint pictures in left and right branching sentences. However, advanced ESL participants displayed differences in accepting left and right branching sentences in disjoint style pictures. In left branching sentences, the advanced ESL group tended to answer both "yes" and "no" to the sentences and pictures (M=.975), while right branching sentences resulted in an acceptance (M=1.21). The beginning ESL group tended to accept disjoint responses, and the mean response was the same for left and right branching sentences (M=1.21).

Finally, a significant three way interaction was observed between DIRECTION x ANAPHORA x PICTURE, F(1,54)=7.17, p< .05. As stated in the introduction, a sentence
similar to (9) can only be interpreted as a disjoint reference, while both interpretations (co-reference or disjoint) are acceptable for other sentence conditions depending on the picture presented. Results showed that for forward pronouns, both left and right branching sentences were accepted more with a co-reference picture, and few acceptance responses when presented with a disjoint picture. However, this pattern was very different for backward pronouns. When a backward right branching sentence (which is consistent with sentence (9) from the earlier example) was presented with a co-reference type of picture, subjects tended to indicate that the sentence did not match the picture. But when the sentence was presented with a disjoint picture, participants agreed that the sentence matched the picture. A significant four-way interaction between, DIRECTION x ANAPHORA x PICTURE x GROUP, F (2,54)=6.62, p.<.01 was also observed, indicating that there were differences in this three-way interaction across the three language groups.

DISCUSSION

The purpose of this research was to test concepts of Universal Grammar and their existence in a second language
learning context. From earlier discussion, English and Spanish entail similar parameters relating to branching direction, which consequently affects pronoun interpretation. Therefore, these two language groups should reflect similar patterns of interpretation and, as predicted, a full-access hypothesis should be observed. An additional purpose was to replicate a previous study by Eisele and Lust (1996) by comparing English speakers' language patterns in their experiment with patterns observed in the current study. In the Eisele and Lust experiment participants included native English speakers consisting of both children and adults and all participants were monolingual. All other procedures were identical to the current study with the exception of the inclusion of the ESL groups in the current study to test Universal Grammar related principles in a second language learning context.

In comparing Eisele and Lust's adult group to the English control group in this study, the English group performed similarly to Eisele and Lust's adult group on all conditions except one. Not surprisingly, Eisele and Lust's adult group and the native English group in this experiment interpreted the sentences congruently among the sentence variables involving branching direction and anaphora. As can be seen in Table 1, Eisele and Lust found that for left
and right branching forward sentences, subjects accepted co-reference pictures, and tended to reject disjoint pictures. The English control group in the current study did the same. Thus, both groups were observed to demonstrate the same pattern of results on these conditions, although the English control group more strongly rejected the disjoint sentences in comparison to the Eisele and Lust adult group on both the left and right branching conditions ($M=0.005$).

Consistent with Universal Grammar related principles, right branching backward sentences were predicted by Eisele and Lust to be interpreted as disjoint. Again, both Eisele and Lust’s adult group and the English control group reflected an identical pattern of interpretation. Both groups rejected the picture and sentence as matching when the sentence was presented with a co-reference picture. Additionally, when the picture depicted a disjoint interpretation, both groups accepted the sentence and picture as matching, consistent with structure-dependence related rules.

Overall, patterns of sentence interpretation between the Eisele and Lust adult and English control group were similar on most conditions; however, one exception was observed. Left branching backward sentences presented with disjoint pictures were rejected by the English control
group (M=0.58), similar to Eisele and Lust's child groups. Eisele and Lust's adult group accepted the sentence (M=1.50) as did both of the ESL groups in this study. It is unclear as to why this was the only pattern of results that was inconsistent with Eisele and Lust's adult group.

In examining the mean scores from Table 1, the English control group tended to reject all of the sentences when presented with disjoint pictures (except for right branching backward condition, which was consistent with Universal Grammar principles). It is possible that the English control group did not "like" the disjoint picture condition and immediately interpreted the sentence as not matching the picture (although a co-reference interpretation is grammatically acceptable).

Eisele and Lust also found this pattern of results in two of their children groups. As explained previously there are "two types" of backward sentences, right branching backward (sentence 9) and left branching backward (sentence 7). Eisele and Lust found that children and adults preferred disjoint interpretations for both types of sentences, even though a co-reference interpretation is grammatically acceptable for the left branching backward type. Eisele and Lust term this result as a "directionality effect." In their usage a directionality effect refers to the tendency for children to interpret sentences based on
pronoun direction alone. Thus, forward pronouns are interpreted as co-reference and backward pronouns as disjoint. For example, in left branching sentences, children tend to interpret the sentence as disjoint even though a co-reference is grammatically feasible.

Although some researchers argue that directionality effects do not coincide with structural rules of Universal Grammar, they appear to be evident in children acquiring English. To some degree directionality effects were also observed in the present experiment. For example, the ESL groups tended to interpret left branching backward pronouns as matching, even though the English group tended to reject the condition. The English group responses on this condition were not congruent with the ESL groups or Eisele and Lust.

Despite the exception of this one condition, we can generally infer successful replication of the present experiment concerning the English control group. Furthermore, the English control group data can be used as a sufficient comparison to the ESL language groups. Several hypotheses were predicted to examine the relationship between ESL learners' and the English control group patterns of interpretations, and these predictions were basically derived from Eisele and Lust's study. In general, this experiment hypothesized that the English control and
ESL groups should exhibit no qualitative difference because Universal Grammar related principles and parameters. In other words, if second language learning reflects a full-access hypothesis, then we should expect to find similar patterns of pronoun interpretation between the English and Spanish language groups.

The following specific predictions were made: (1) Right branching backward sentences, which follow Universal Grammar principles of structure dependence, should be interpreted by all three language groups as disjoint; (2) right branching forward sentences should be interpreted as co-reference by all groups; and (3) there were specific differences predicted between the two ESL groups involving left branching backward sentences. These were predicted to be similar to the differences between Eisele and Lust's child groups. Specifically, beginning ESL participants were predicted to prefer more disjoint interpretations, similar to young children, while the advanced ESL group was predicted to prefer co-reference interpretations, similar to the Eisele and Lust's adult group.

With regards to the first hypothesis, right branching backward sentences, when presented with disjoint pictures, were interpreted by the English control (M=1.47) and ESL groups (M=1.65) as the sentence and picture matching; i.e., a disjoint interpretation. When the same sentence was
presented with a co-reference picture, the English (M=0.89) and advanced ESL (M=0.89) groups rejected the sentence and picture as not matching. Both sentence interpretations are consistent with Universal Grammar principles relating to concepts of c-command. However, beginning ESL learners tended to accept this condition (M=1.47) instead of rejecting it.

With regards to the second hypothesis, when right branching forward sentences were presented with a co-reference picture, both of the ESL groups as well as the English control subjects accepted the sentence and picture as matching. However, when the sentence was presented with a disjoint picture, the English control group and the advanced ESL group tended to reject the sentence. The beginning ESL group also rejected the picture more than they accepted it, but tended to answer more equivocally (M=.95). Overall, the beginning ESL group tended to accept more of the sentences in general, compared to the other two groups.

These two hypotheses relating to right branching sentences were largely confirmed. All groups generally interpreted these sentences, however, the beginning ESL group did not always interpret the sentences according to structural rules. Thus, in a second language learning context Universal Grammar principles were mostly observed
on sentence types which commanded particular interpretations.

Different patterns of interpretations were also predicted between the ESL groups for left branching backward sentences. The ESL beginning group was predicted to prefer disjoint interpretations, while the advanced ESL groups were predicted to prefer co-reference. However, contrary to expectations, both groups tended to answer that both disjoint and co-reference sentences matched the picture; i.e., there were no differences observed in this condition. Although this hypothesis was not confirmed, beginning ESL learners did respond to the condition similarly to the adults in Eisele and Lust’s study. As previously noted, the English control group tended to reject this sentence, which was not consistent with Eisele and Lust’s data.

The third hypothesis was based on Eisele and Lust’s observed difference between the child and adult groups. Left branching backward sentences were interpreted by children (3 to 7 years of age) as disjoint while adults preferred co-reference interpretations. As previously noted, Eisele and Lust concluded that directionality effects may be the reason as to why this type of interpretation occurred. Qualitative differences found in left branching sentences were concluded to result from
other factors, including directionality effects, and not principles of Universal Grammar.

It was hypothesized that a generalization could be made from Eisele and Lust's child groups to the beginning ESL group. Due to the fact that both groups could be considered as beginners, a similar pattern of prediction was predicted. This hypothesis was not confirmed, which suggests that generalizations from children to adults, especially across languages, may not be viable due to other factors besides universal language principles. For example, differences between children and adults can be a result of pragmatics. Pragmatics refers to the study of the situated uses of language (Chierchia & McConnell-Ginet, 1991), or, "how speakers use language in ways which cannot be predicted from linguistic knowledge" (Aitchison, 1992, p.9). Pragmatics, exemplified in one way by the use of pictures in this study, may have affected this particular result. It is possible that the beginning ESL group relied very heavily on the pictures for language cues. Due to their unfamiliarity with English, the beginners may also have been relying on outside cues, such as their cultural experience. This is consistent with the idea that language learning is not only dependent on innate principles but pragmatic features as well, especially for beginners.

Eisele and Lust (1996) discuss pragmatics as a tool
used in language learning. They also report that their child groups may not know this language tool due to their age. It is a reasonable assumption that the ESL learners' in this study have acquired some form of pragmatic knowledge or cognitive skill that aids them in language learning. This in turn may have resulted in some other type of interpretation, which could have led to the differences. Overall, it appears as though from a second language learning context, further study may be a necessary concern concerning pragmatics.

Another factor explored in this thesis was the notion of continuous language principles. Continuous language principles refer to language acquisition across any language group as being consistent in terms of patterns of preference, especially on sentences adhering to principles of Universal Grammar. Specifically, on sentences like (9), a specific interpretation should be demonstrated across the groups despite their language differences (i.e. Spanish vs. English). A similar pattern would reflect that language acquisition is generally continuous, even if specific differences exist. Thus, principles of Universal Grammar such as the concept of c-command or Principle C should remain intact. Other sentences that do not adhere to rules of Universal Grammar merely reflect preferences in a language, like directionality effects. However, in
examining an entire set of data, comparisons between all of the conditions would appear to be an important factor, especially when concluding that a set of data from a language group is continuous.

The data set in the present experiment do, in fact, reflect a trend of continuous language principles, although all mean scores were not exact. Significant differences were observed between language groups in some cases, but the differences occurred on only a few sentence conditions and not those related to Universal Grammar. Furthermore, the significant differences observed were not necessarily qualitative differences. Hypotheses relating to principles of Universal Grammar for the most part were intact. Right branching backward sentences were interpreted as disjoint by all of the three language groups when presented with a disjoint picture. However, the beginning ESL group did not respond accordingly when a co-reference picture was presented. This was the only result that was not consistent with principles of Universal Grammar.

Qualitative differences were observed in one instance between the English and advanced ESL group. As previously stated, the English control group rejected backward left branching sentences, while the ESL groups (and Eisele and Lust's groups) accepted them. Despite this one exception, the advanced ESL group and the English control group tended
to answer similarly even though all mean scores were not exact. In fact, fewer significant differences were observed between these two groups.

In examining the beginning ESL group and the English control group, more significant differences were observed. However, there appeared to be two qualitative differences. As stated, the English control group rejected backward left branching sentences while the beginning ESL group accepted these sentences. Also, the beginning ESL group accepted backward right branching sentences when presented with a co-reference picture while the English control group rejected the sentence. On two other conditions (forward left and right branching) the beginning ESL group tended to answer equivocally versus rejecting or accepting.

Overall, a comparison of the groups revealed a pattern of responses along a well-defined continuum. Specifically, English subjects differed from beginning ESL subjects, with advanced ESL subjects usually in between. For instance, comparison of mean scores on all conditions relating to forward right branching sentences revealed a consistent pattern in that all of the groups accepted the sentence. Specifically, the English group interpreted forward right branching sentences presented with co-reference pictures as matching (M=1.89). The advanced ESL group also interpreted the sentences as matching, however not as often (M=1.74).
Additionally, the beginning ESL groups interpreted the sentence as matching (M=1.58), however not as often as their ESL counterpart.

Another example demonstrating this point comes from forward left branching sentences presented with disjoint pictures. The English group interpreted the sentence and picture as not matching. Similarly, the advanced ESL group rejected the sentence and picture as matching, although not as strongly as the English group. As before, the beginning ESL group tended to answer equivocally on the condition. Again, this pattern of results reflects a trend in that the English group gave consistent responses to the sentences as either matching or rejecting. The advanced ESL group tended to follow the English group responses, however not as strongly. Their answers tended to reflect mean scores that were in the middle of the English and beginning ESL group. Lastly, the beginning ESL group tended to interpret both “yes” and “no” to some of the conditions which may have reflected not knowing the answer. In general, the beginning ESL group tended to be more accepting of disjoint pictures.

Continuous language principles were also observed in Eisele and Lust’s data. Although, Eisele and Lust found significant differences in their data, such as for left branching backward sentences, their hypotheses relating to
Universal Grammar were confirmed. The child and adult groups interpreted sentences like (9) as disjoint. More importantly, no qualitative restructuring of sentence interpretation was observed on sentences similar to (9). Eisele and Lust also found trends in their data. For example, responses to the test conditions were either accepting or rejecting the sentence (with the exception of backward left branching) for all of the language groups. However, like the data in the present experiment, not all mean scores were identical and some showed significant differences. Still, Eisele and Lust concluded that principles of Universal Grammar were intact from the child to adult groups. Other sentence conditions [other than sentence (9)], particularly those not adhering to Universal Grammar related principles, did not appear to affect the conclusion because the interpretations were not a result of innate language principles. As previously noted, other predictions for the other sentences were related to directionality effects and pragmatic effects replicated in a previous study (Lust, 1986).

In this experiment, we make the same argument. Interpretations relating to Universal Grammar principles were satisfied by all three language groups. Yes, significant differences were observed on some test conditions; however, these hypotheses were not related to
principles of Universal Grammar and/or innate language principles. The other conditions were not hypothesized to be predicted according to Universal Grammar related principles. A difference was predicted for the beginning ESL group; however, that was related to a difference observed between the children and adult in Eisele and Lust's data which was also related to a pragmatic effect. Thus, principles of Universal Grammar relating to c-command and Principle C were not violated in a second language learning context, and support can be given to the hypothesis of continuous language patterns, especially those relating to Universal Grammar.

Although continuous language principles predict that language learning is related to Universal Grammar, we speculate that other variables influenced acquisition in this task. For instance, factors relating to social learning, educational experience, learning strategy, response to the demand characteristics of the task, response to the pictorial cues, or intelligence may also be operating in this study. As mentioned previously, the beginning ESL group tended to be more accepting of the two types of pictures, and in general tended to accept sentences rather than reject. It is possible that pragmatics were a factor in this result. In terms of other factors relating to the outcome of the experiment,
information regarding strategies or pragmatics was not gathered following the experiment. Researchers may want to explore these factors in future research.

Additional support for this can be given from the third hypothesis not being confirmed. Pragmatics may have led to the beginning ESL group responding similarly to the advanced ESL and English group. Overall, continuous language principles may not be the best or only way to describe performance in a second language context. The idea of continuous language learning principles may be best applied to monolingual learning, such as studied by Eisele and Lust. Data from the Eisele and Lust experiment demonstrated important patterns and theories regarding language acquisition; however their data were derived from one language group. As a result, their participants' patterns of acquisition reflected a clearer pattern of language learning.

In conclusion, the data in this experiment reflected similar interpretations in sentences adhering to Universal Grammar related principles. Principle C and c-command structural rules were observed for the most part on backward right branching sentences. From this we can conclude that the full-access hypothesis was supported. However, it should be noted that this experiment did not test differences in language parameters, and therefore the
full-access hypothesis can only be partially supported. Concurrently, it is possible that the no-access hypothesis could also be supported in that ESL participants may have been using a type of pragmatic or other problem-solving mechanism in the task. Demand characteristics, may also have influenced their responses to the conditions. For instance, the beginning ESL participants who reported difficulty with English may have responded differently to the sentences depending on the experimenter administering the task (Spanish or English native speaking). Beginning ESL participants' may have felt more comfortable with the Spanish speaking experimenter or felt intimated by the English experimenter which may have affected their responses.

In other sentence conditions, such as left branching backward sentences, differences were observed between the three language groups. Specifically, the English group rejected this sentence and the ESL groups accepted the sentence and picture. However, these sentences were not constrained by Universal Grammar, and therefore their interpretation was not constrained. This result may have reflected differences in preference that were possibly related to pragmatics, such as the educational background of the participants, familiarity with testing, or English fluency. This also poses the question of directionality
effects, especially for left branching backward sentences. This appeared to be evident on this condition; however, directionality effects are still being debated by researchers.

Overall, not all of the hypotheses were confirmed in this study, which illustrates that predictions regarding language interpretation can be problematic. Predictions stemming from theories of Universal Grammar do not allow deviation or differences between two different languages, which can entail differences in culture, general aptitudes, and/or educational systems. As suggested by Eisele and Lust, experimentation with pragmatics appears to provide more answers than questions. We suggest that differences should be cited on general pattern interpretation of related principles or specific language rules, not just broad comparisons between two languages.
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