UNDERSTANDING CONTRIBUTORS TO INPUT INFORMATIVENESS FOR TENSE
MARKING: OVERLAP AMONG ENGLISH TYPOLOGY, PARENT-TODDLER
INTERACTION STYLE, AND REGISTER

BY

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THESIS

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ABSTRACT

Purpose: The purpose of this study was to better understand the contributors to input informativeness for tense marking, a predictor of child tense marking productivity (Hadley, Rispoli, Fitzgerald and Bahnsen, in press). The contributors explored were parent-toddler interaction style, register, and constraints of English verb typology. **Method:** The participants were 15 parent-toddler dyads. Language samples were collected when the children were 21 months of age. Verbs in child-directed speech were coded for linguistic form (e.g., imperative, modal, copula, etc.). The communicative function of utterances and the form of questions directed toward children were also coded. **Results:** Copula was the most frequent verb form rewarding a +Tense grammar while imperatives were the most frequent verb form rewarding a –Tense grammar. Directives, other-focused descriptives and use of reduced questions were the three variables that overlapped most with input informativeness. **Conclusions:** Understanding how parent-toddler interaction style overlaps with informativeness has implications for family-focused clinical interventions designed to modify characteristics of parents' child-directed speech.

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CHAPTER I

INTRODUCTION

Across languages, children produce verbs without marking them for tense and agreement (finiteness) in contexts that require such marking (Wexler, 1994). Children learning English produce these forms for a longer period of time during early development compared to children learning other languages (Guasti, 2002). Among children learning English, there is also variability in the length of time spent mastering finiteness marking (Rice, Wexler, & Hershberger, 1998). Previous explanations of this variability have focused on factors endogenous to the child such as vocabulary or biological maturation (Rice et al., 1998; Wexler, 2003). An alternative explanation for the changes children undergo in verb form choice is that they analyze adult input with competing grammars, with the grammar most compatible with the language input ultimately rising to dominance (Legate & Yang, 2007; Yang, 2004). For children learning English, the verb forms providing overt evidence for the target +Tense grammar compete with ambiguous evidence as a function of English's typology and because parents vary in the way they use verb forms during parent-child interaction. Differences in the proportion of overt evidence for a +Tense grammar out of all verb forms, or parents' input informativeness for tense in their child-directed speech at 21 months of age, explain significant individual variation in children's early morphosyntactic growth (Hadley, Rispoli, Fitzgerald, & Bahnsen, in press). The current study investigates the interaction between this theoretically motivated variable and stylistic characteristics of parent-child interaction. It is important to understand the overlap between interaction style and input informativeness for tense marking as we consider ways of modifying properties of parent input with the intention of facilitating children's grammatical growth.

CHAPTER II

LITERATURE REVIEW

The current study considers differences in properties of parental input as an explanation for the variability in time children take to resolve the Optional Infinitive (OI) stage (Wexler, 1994). This phenomenon reflects the cross-linguistic observation that children use infinitive verb forms in main clauses (e.g., *Mommy eat apple*) in many different languages. Before marking tense consistently as an adult would, children mark finiteness only some of the time giving rise to the name "optional" infinitive stage.

Although the OI stage has been documented in many languages, children learning some languages show little, if any, period of optionality in tense and agreement marking. Guasti (2002) noted that in Catalan, Spanish and Italian, children rarely use infinitives in main clauses even in their early clauses. Guasti (2002) also described the high frequency of use of non-finite verbs in main clauses in other languages including French, Dutch, Flemish, German and English. These differences mean that children learning languages like Spanish or Italian leave the OI stage much earlier than children learning languages such as English or German do.

Children learning these two types of languages vary in their rate of exit from the OI stage, but they are similar in their sequence of development. Children learning Italian do use nonfinite verbs in main clauses but only briefly. They then progress to almost never using verb forms incorrectly. Children learning English follow this same progression; however, their exit from the OI stage is more protracted, taking longer to use verb forms as an adult would. Thus, children learning all languages in which finite verbs must occur in main clauses follow the same sequence of development just at differing rates.

Some accounts of why English-learning children vary in the amount of time spent in the OI stage focus on factors endogenous to the child as an explanation. One such explanation, the maturational account, states that grammatical properties of language develop just as other biologically timed mechanisms in the body do (Rice et al., 1998; Wexler, 1994). Wexler (2003) explained that "a developmental constraint on the computational system of language … fades out over time" (p. 33). Wexler claimed that children leave the OI stage once the constraint is lifted just like children are able to walk or grow teeth at a certain time determined by their biology. One reason he asserted that learning couldn't account for leaving the OI stage is that all main clauses in the adult input contain finite verbs and that if children were learning from input, they would begin by using these as opposed to the nonfinite forms they do use.

A need exists to determine what contributes to the individual differences observed in rate of development. It is likely that these differences are influenced by a combination of biological, developmental, and environmental factors. Identifying whether specific properties of language input in the language-learning environment influence the child's rate of growth is an important step toward explaining between-child differences for mastering finiteness in English.

The interaction between typology and stylistic variations in the input is the primary focus of this study. To communicate any given message, English allows parents to use multiple verb forms grammatically. It is important to discover how the verb form choices parents have available relate to the forms they ultimately use based on their conversation styles. If some conversational styles lead adults to be more informative for tense marking while others lead adults to be less informative, then intervention could target style as a practical way of increasing the evidence for tense marking in the input children hear. Because input informativeness is already established as a predictor of child growth, clinical goals to increase it are empirically

supported. However, it may not be realistic to ask an adult to avoid particular uninformative linguistic forms such as modals or embedded bare infinitives. A more attainable method of increasing input informativeness may be to provide specific strategies for changing style if an overlap between interaction style and use of linguistic forms is established.

This literature review is organized in the following manner. First, variational learning as an explanation for variation in children's rate of morphosyntactic development will be reviewed. The way the typology of the English language necessarily affects the overt or ambiguous evidence for tense for each verb in the parent input will be summarized. Because some forms are not overtly marked for tense in the English verb conjugation paradigm, children learning English may take longer to learn that tense is a property of English grammar than children learning more richly inflected languages. Next, properties of child-directed speech will be reviewed. The way parents speak to children has been characterized by previous studies with limited correlations discovered between some general parent and child variables. This section will examine more recent findings suggesting that the informativeness for tense in parent input may be a more useful predictor of child growth. Earlier findings can be reexamined in light of this more current theoretically motivated framework with the earlier correlations being accounted for in a new way. The final section will address the relationship between the typology of English and parent-child interaction style. This relationship is important because English typology allows for great variability in how informative input is based on stylistic differences in how parents communicate with their children. Because this variability exists, some parents provide much more evidence than others to their children that tense must be marked in English.

Variational learning

Variational learning provides an alternative explanation for how grammatical abilities develop which could be used to explain differences among languages in rate of growth and differences among children learning English (Legate & Yang, 2007; Yang, 2004). From this theoretical perspective, learning is conceptualized as probabilistic parameter setting and selected via the learning mechanism. Children detect information about finiteness marking from every verb their caregivers use and process these examples through their own grammars. Yang explains that children use statistical learning to track grammatical information in the input. Children attempt to parse the input with different +Tense or –Tense options provided through universal grammar. After a sufficient number of trials of parsing adult input with competing grammars, the grammar that best analyzes the input gradually rises to dominance. If a child selects a –Tense grammar, such as the grammar found in Mandarin, to interpret the input, he would identify unmarked verb forms in the input as examples of how to correctly use verbs in the language heard, thus rewarding the selected –Tense grammar. For example, when a child hears a sentence with a zero-marked verb form, which is possible in English, such as *I want the ball* or a sentence with a deleted tense carrying auxiliary as in *You want the ball?* the child could successfully parse the sentence with the Mandarin-like –Tense grammar. The -Tense grammar would then be rewarded by this successful analysis, which increases the probability that the child will select it to analyze the next sentence received in the input. If a child is learning a language such as English, in which finiteness marking is obligatory, multiple learning trials such as this one would slow morphosyntactic development because a grammar that is incompatible with the target language is rewarded. English is particularly difficult because in addition to zero-marked forms, children hear other bare forms of verbs. First, in English, modals are defective and do not carry

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tense marking despite being finite. This means that any verb phrase beginning with a modal ends with an unmarked verb. Second, children hear bare verbs such as imperatives, which include tense and agreement features but not in a phonologically detectible way. Both of these –Tense rewarding forms sound identical to nonfinite forms. Another time children hear ambiguous evidence for tense marking is in embedded clauses, which require non-finite verbs, as in the verb *go* in the sentence *Look at the car go*. All of these instances keep English learning children in the OI stage longer than if they were hearing verbs that contrasted with nonfinite forms.

Legate and Yang's (2007) theory of competing grammars can be used to explain why children use infinitive forms in main clauses for some time and then eventually mark tense consistently. The early errors that occur in the OI stage can be explained as being the result of the child not having completely eliminated the –Tense grammar. If a child's –Tense grammar is frequently rewarded through ambiguous forms in the input, the probability weight for the +Tense and –Tense grammars remain in competition. Legate and Yang did not extend their hypothesis to explain child production errors, but this remaining competition could explain why a child would be more likely to use this –Tense grammar in his own productions of verb forms. Moreover, the length of time the child spends weighing the competing grammars could be due to the amount of ambiguous and unambiguous information in the input he receives.

To test the competing grammars hypothesis, Legate and Yang (2007) compared child-directed speech in Spanish, French, and English by calculating the proportions in these languages of clear evidence that tense must be marked to ambiguous evidence which could lead a child to think tense marking is optional. The motivation for examining these three languages is that the OI stage in Spanish is relatively brief, the OI stage in English is relatively extended, and the OI stage in French is somewhat intermediate. Legate and Yang proposed that in languages with a

shorter OI stage, evidence of a +Tense grammar, in which tense marking in main clauses is obligatory, is more prevalent.

To investigate whether the typology of a language combined with the frequency of unambiguous and ambiguous evidence for Tense in the language input could account for differences in the length of the OI stage, Legate and Yang (2007) coded verbs forms as either +Tense (+T) or –Tense (-T) based on whether the form used differs phonologically from nonfinite forms. Legate and Yang (2007) found that in the samples examined, Spanish was 80.1% unambiguous, French was 69.8% unambiguous, and English was 52.9% unambiguous.

Spanish and French could be described as morphologically richer than English, but Legate and Yang (2007) called for a more specific description of how these languages differ because a language could be morphologically poor for other features such as number or gender agreement but still provide much information about tense marking. In Spanish, multiple verb forms contrast with each other in both written and phonological forms. These forms, occurring across the person-number paradigm and across tenses, appear frequently enough in child-directed adult speech to give Spanish its high input informativeness. Spanish also has person-number agreement markers on present tense forms, which do not appear on untensed forms, so that these forms too correctly reward a +T grammar. French provides less evidence to children that tense marking is obligatory than Spanish does but still provides more evidence than English-learning children receive.

Spanish is limited in forms that provide ambiguous evidence to the child that tense marking is obligatory. Legate and Yang (2007) considered forms identical to each other to punish a +T grammar. French has more of these identical forms than Spanish does. Despite having conjugated verb forms that differ orthographically, in spoken French some of these forms

sound the same; therefore, Legate and Yang (2007) counted these forms as punishing a +T grammar and rewarding a –T grammar. English has the most identical tensed verb forms of these three languages giving it the lowest percentage of unambiguous forms of the group.

A major strength of Legate and Yang (2007) was taking into account the frequency with which children hear ambiguous or unambiguous evidence by tagging each verb as +T or –T. Simply characterizing the amount of evidence children receive using just the language's typology would be a mistake because each cell in a verb conjugation paradigm will not be used equally. Thus, Legate and Yang captured the fact that typology interacts with the way adults speak, using some cells in the person-number paradigm more than others because of the demands and constraints of parent-child interaction.

In summary, the competing grammars hypothesis predicts that a child learning a language with a typology that makes it easy for parents to provide information about tense marking will spend less time weighing different grammars. A language with obligatory tense marking but with a typology that frequently allows parents to use ambiguous verbs (e.g., English) will keep a child in the OI stage longer.

The contribution of adult input

Just as the variation in typology across languages is able to explain crosslinguistic differences in the amount of time children take to leave the OI stage, variation among parents speaking a single language may explain the differences in the acquisition of tense marking among children learning the same language. Before discussing the variation in informativeness for tense marking in English parental input, a review of previous studies of adult and child grammatical structures is warranted.

To investigate the contribution of individual parents' input on children's acquisition of language, early studies measured language variables in parents of young children at one time and language variables in the children themselves later. In this way, these studies attempted to answer whether any element of parental speech predicted the variables measured in the children's language. These longitudinal studies of the effects of parental input on child language growth considered a variety of parent and child variables, but these choices were not necessarily theoretically motivated. Seemingly any parental variable that might have had an effect on the child was measured without an adequate hypothesis that could be tested.

A consistent finding across early input studies is that maternal use of imperatives was negatively correlated with children's use of auxiliaries in their verb phrases. For example, Newport, Gleitman, and Gleitman (1977) found this type of correlation between maternal data collected when children were 12 to 24 months and child data six months later. Gleitman, Newport and Gleitman (1984) replicated this finding with input directed toward two groups of children, 18 to 21 months and 24 to 25 months, and data collected from those children six months later.

A second trend across these same studies was the finding that mothers' asking of Yes-No questions was positively correlated with their children's use of auxiliaries. Newport et al. (1977) found such a correlation between maternal yes-no questions when children were 12 to 27 months and child auxiliary use when the children were 18 to 33 months. This correlation was replicated with the two age groups in Gleitman et al. (1984). Furrow, Nelson, and Benedict (1979) found that mothers' use of auxiliaries in declaratives and intonation only questions was correlated with child auxiliary use.

A problem with previous input studies was their lack of theoretical motivation. One early explanation of how parental input influenced child language growth was that children benefited from the simplistic speech styles of their mothers. An example is Newport et al.'s (1977) choice to examine the effects of simplistic speech. This was problematic because it led the authors to choose global predictor variables in the mothers' speech such as MLU that were unlikely to reveal the effects of maternal speech on specific outcome variables such as child use of auxiliaries. In using maternal measures such as MLU, Newport et al. (1977) chose variables to measure without proper theoretical motivation for how one variable could predict another. Likewise, Furrow et al. (1979) hypothesized that mothers simplified their speech to facilitate communication. The analyses in this study are also troublesome because the authors interpreted certain variables (e.g., Yes-No questions, Deletions) in the mothers' speech as simple only after finding that mothers used more of those types of speech when talking to their children rather than describing what type of speech might be considered simple before running their correlations. Furrow et al.'s (1979) explanation of correlations in a post hoc fashion again showed a lack of consideration of a linguistic theory that could make predictions about linguistic relationships and explain observed phenomena.

Newport et al. (1977) also suggested that children are most influenced by those forms that are most salient in their mothers' speech. They reported that their finding that maternal Yes-No questions predicted the growth of auxiliaries was evidence that children pay attention to forms at the beginning of sentences. Again, the concern with this type of explanation is that it comes after the correlation is revealed; it was not the theoretical motivation for measuring Yes-No questions. These post-hoc analyses are further problematic when they cannot be extended across all of the data. For example, the same study found a negative correlation between

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maternal imperatives and children's auxiliary growth yet in negative imperatives such as "Don't throw," the auxiliary is also at the beginning of the sentence (Newport et al., 1977, p. 138). In reviewing these studies of parental input, Valian (1999) said that studies of this type have found inconsistent effects possibly because of problematic methodology and concluded that the correlations reported in these studies were likely due to chance. Subsequent studies should use theoretically motivated predictor variables.

It is now possible to reexamine the findings from these early studies of parent input in light of the variational learning framework (Yang, 2004; Legate & Yang, 2007). For example, the correlation between maternal Yes-No questions and child auxiliary use could have been caused by the mothers' use of auxiliary DO and BE rewarding the child's +T grammar making the child more likely to use auxiliaries in the future. Furthermore, the negative correlation between maternal imperative use and child auxiliary use is also consistent within the variational learning framework (Newport et al., 1977; Furrow et al., 1979). Without understanding the underlying relationship between –T imperatives and +T auxiliaries, it is not clear why they should be related. However, when considering that maternal imperatives reward a –Tense grammar, delays in the child's entire tense system, including auxiliaries, may be understood.

A recent empirical test of how children make use of the grammatical structures in parental input is described in Hadley et al. (in press). The purpose of this study was to determine if the findings of Legate and Yang (2007) could be replicated within a single language to explain differences in morphosyntactic development for children learning English. Hadley et al. termed the proportion of unambiguous evidence for tense marking provided in child-directed speech "input informativeness." The study tested whether input informativeness for tense marking varied across individual parents and if any existing variation could predict the rate of

morphosyntactic development and grammatical outcomes in children. In Hadley et al.'s sample of 15 parents, mean informativeness was 50.6%, which was similar to the calculation Legate and Yang (2007) carried out on an English sample finding that 52.9% of verb forms are unambiguous. However, the parents' informativeness in Hadley et al. ranged from 33.1% to 69.8% indicating that variation within a single language is possible and significant. Parental input informativeness when children were 21 months explained the largest proportion of variance in children's initial rate of growth and in predicted productivity in tense marking at 30 months beyond what child sex and vocabulary accounted for. The current project investigates how those differences in informativeness for tense marking are related to the styles of interaction these 15 parents use. The input analyses in Hadley et al. (in press) were restricted to linguistic form only, so the potential overlap between verb forms and interaction style remains undetermined.

Interaction of language typology and stylistic variation in caregiver-child interaction

Children will differ in the amount of time they take to master tense marking in part based on the proportion of unambiguous evidence they receive about tense marking being required. Parents will vary in how much evidence of this nature they provide based on the typology of the language they are speaking as Legate and Yang reported, but they will also vary based on the way they talk to their children. To address ways to enrich grammatical input to young children, understanding this interaction between English typology and how adults talk to children is necessary.

The current study will investigate how input informativeness varies as an interaction between English typology and how parents communicate with their children. The investigation into this interaction was prompted by the observation that parents vary in how they use language during interaction with their children, in other words, variation in style. Style as used in this

study refers to the patterns of language use in the context of communicating to children and has implications for the types of verb forms parents use. The patterns emerge because language users vary in register across different communicative contexts. Ferguson (1994) said that regularly occurring communicative contexts "develop identifying markers of language structure" that differentiate the contexts from other situations (p. 21). Differences between how parents talk to their children and how they talk to other adults have been of interest to researchers seeking to determine if child-directed speech plays a role in acquisition. The studies reviewed above provide evidence that differences across parents in verb form use in child-directed speech do matter for individual children. Parents also differ in how they use the register common to child-directed speaking contexts. In other words, adults may vary in use of parent-child interaction style with multiple styles existing across parents. To determine how these differences overlap with input informativeness for tense marking, differences in style must be quantified.

The variation observed in parents' styles of interaction in part comes from their purposes for interacting. One purpose for interacting is to elicit conversation from the child to continue the conversation (cf. Hoff, 2006). Parents will vary in how likely they are to follow the child's lead and continue the current conversation about the child's focus versus directing a child's attention and behavior to something new. Hoff (2006) reported that conversation-eliciting speech has previously been positively associated with grammatical development but pointed out that this could be because of the structures used in these utterances as much as because of the purpose. A second purpose for interacting, directing the child's behavior, has been negatively associated with grammatical development. Hoff (2006) explained that this could be because this style does not encourage conversation and does not occur when the parent and child share a conversational focus.

Parents' styles are likely also influenced by other factors such as education and cultural influences. Hoff (2006) says that North American mothers more frequently talk about objects in the environment than do Asian mothers. It's possible that some North American mothers are influenced by this cultural norm than others are, leading to variability in how frequently they talk to their children about objects. Potentially, the choice of sentence subject parents make has implications for input informativeness for tense marking in English because the typology allows subject-verb agreement marking and tense marking to occur on the same morpheme (i.e., third person singular –*s*).

A third factor affecting parent-child interaction style is the child's developmental level. Hart and Risley's (1995) study of parents with young children showed that parents direct their children's behavior more when the children are less verbal. The child whose amount of language produced is smaller may also be less developmental ready to pick up subtle hints from parents. Hart and Risley (1995) found that parents tend to attempt to guide a child's behavior with indirect suggestions before moving on to more direct requests of the child. They further explained that parents respond to the child based on what the parents think is developmentally appropriate for the child at the time.

Variation in child-directed speech style also derives from register. The style with which parents communicate can be described by the degree of formality they use. In some cases, formality determines whether parents omit or include words in child-directed speech during opportunities when doing so is allowable in the adult grammar. Biber (1994) explained that "linguistic features" such as reduced or deleted forms can differentiate registers (p. 35). If parents reduce questions more when talking to children than they do when talking to adults, it may be a characteristic of the child-directed speech style and parents may vary in the degree to

which they use it. A more formal register should be characterized by more literate questions, which do not omit any words. A parent with a more informal register may communicate in fewer words using shorter utterances.

In summary, not only do styles vary because of a number of influences, but also multiple styles of interaction will contribute to high or low input informativeness. This variation makes it necessary to discover the ways in which these styles may overlap with informativeness. The styles to be coded in this study are comparable to those used in previous studies. These styles address the variation in how frequently parents attempt to change their children's behavior, in what conversational focus parents choose, and in asking questions.

Directive Style

One style of communication some parents exhibit is a directive style. Previous studies have differed in whether parental attempts to direct behavior, attention, or both are considered characteristic of a directive style (cf. Flynn & Masur, 2007). This is because directives can come in the form of encouraging behavior, such as *Try again* or interrupting an action, *Come here* (Pine, 1992). Although some parents are more encouraging while others redirect children to what the parent finds interesting, a characteristic of being directive in general, is frequently using imperatives. Most imperative verbs reward a –T grammar because they are not overtly marked for finiteness. However, prohibitive imperatives (e.g., *don't touch it*) reward a +T grammar because tense is marked on the auxiliary DO.

Indirect Style

A second style of parent-child communication is one in which the parent speaks indirectly yet still attempts to direct the child's behavior or attention. When the parent attempts to lead a child in an activity he or she might say *Let's play over here* or *Should we get more toys*

out? This style of speech is characterized by regular use of modals including, *may, might, would, will, should, shall, can* and *could*. In describing functions of maternal utterances, Hoff-Ginsberg (1986) called such statements "indirect directives" (p. 156). Indirect parents often ask many questions beginning with modals. Because the use of a modal requires an accompanying uninflected verb, children who hear these sentences hear examples of verbs not clearly marked for tense thus their –T grammars are rewarded. Not all utterances with a modal meet the definition for indirect style because many utterances with modals are simply descriptive statements that do not guide a child's behavior or attention. The distinction this study makes between direct and indirect parent utterances differs from Pine's (1992) description of directives, which included utterances beginning with imperatives, modals and *Let's*. The current distinction will be important if, for example, imperatives make up a larger proportion of –Tense verbs than do modals or *Let's* constructions.

Interpersonal Focused Style

Still other parents describe their own and their child's activities. In language intervention, this type of communication has been described as self-talk and parallel-talk. These strategies are intended to provide language enrichment during play activities with children (Girolametto & Weitzman, 2006). When using self-talk, an adult describes what he or she is doing while playing with a child. The strategy includes statements such as *I like the blue bear* and *I see a little one over there*. Parallel-talk comments on what the child is doing and includes statements like *You need more Play-doh* or *You build really well*. The verbs in these particular statements describe either states or habitual activities and agree with either first person (self-talk) or second person (parallel-talk). Because of the constraints of English typology, this means that they are not inflected in a way that informs the child that tense must be marked. However, self-talk and

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parallel talk can also be informative when an adult uses an auxiliary as in *I'm taking a turn*.

Auxiliaries will appear when parents describe actions rather than states. Even though language

interventionists use self-talk and parallel talk as ways to provide good input to support language

development, it's possible that self-talk and parallel talk may not be as helpful for facilitating a

child's rate of grammar acquisition even if they are good strategies for other language domains

such as vocabulary.

Other-focused Style

Parents may also be descriptive while talking about other people or objects in the

environment. These descriptive statements will necessarily have third person subjects. As with

action verbs described under self-talk and parallel-talk, these utterances will be +T. However,

unlike the descriptive statements with first and second person subjects, descriptive statements

with third person subjects and state verbs will still be +T (e.g., *He wants juice*.) Previous

literature supports the possibility that adults could be taught to use the other-focused style.

Oetting and Hadley (2008) recommended structuring intervention tasks to create environments

for the child to mark third person singular tense and agreement by focusing the conversation on

toys. Walsh (2010) introduced the term "toy talk," a strategy clinicians can use to manipulate the

conversation around third-person singular subjects.

Reduced Style

The last parent-child interaction style under consideration is a reduced style. Some

parents, when forming a question through inversion, frequently drop the inverted, tense carrying

question word, i.e., auxiliary DO or BE, or copula BE. When the auxiliary DO is dropped from

such a question, the resulting utterance sounds like an intonation only question *You wanna try?*

These uninformative utterances are uniquely interesting because unlike other uninformative input

such as bare verb forms, modals, etc. these forms are uninformative not because of English typology, but because of a stylistic register the parent has used. When asking such a question, a parent can either include the auxiliary or ask an uninformative intonation only question. However, in early input studies (cf. Gleitman et al., 1984; Newport et al., 1977) this stylistic choice was overlooked and Yes-No questions were coded as such regardless of whether an auxiliary was included.

Likewise, when auxiliary BE is omitted from questions, an uninformative question results, e.g., *You coming?* However, this cannot be interpreted as a grammatical statement with question intonation because *You coming* is not grammatical as a statement. In contrast to questions with dropped auxiliaries, in questions with omitted fronted copulas, e.g., *You hungry?*, no verb form is present. Because no verb form was present providing an opportunity for tense marking information, Legate and Yang (2007) and Hadley et al. (in press) did not code questions with dropped inverted copulas. However, it is anticipated that variation in providing or omitting the copula and the significance of this variation on children's morphosyntactic development will be important to understand.

Influence of style on developmental rate

Because certain verb forms are characteristic of each style, parent-child interaction style could influence developmental rate. Although the four styles of interaction and the reduced question register mainly overlap with -T verbs, they are not equally likely to be associated with less informative input. The directive style, for example, is in large part made up of imperatives, which reward a –T grammar and interrupt conversation by directing the child's attention. By contrast, the indirect style uses many modals, which also reward a –T grammar but may be used by parents with an engaging, conversation-eliciting style. A child needs to be engaged in joint

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attention to acquire a tense system or any aspect of language, but the competing grammars hypothesis predicts that frequent use of modals contributes to less informative input for the acquisition of tense.

To establish which style should be addressed in intervention, it is first necessary to find which verb form is contributing to low informativeness the most by determining which types of –T verbs make up the largest proportion of total –T verbs. Distinguishing the types of –T verbs will reveal whether all or only some of these types of verbs are most strongly associated with input informativeness. For example, empirical evidence suggests that a directive style is associated with slower general language development (Pine, 1992; McDonald & Pien, 1982). This association may be related to properties of the input such as the grammatical properties discussed or to the observation that the directive style does not promote interaction between the child and caregiver. If imperatives contribute the most to the total –Tense verb forms, then parents could be advised to adjust their interaction style to be more engaging and responsive. Intervention that targets changes in interaction style may be a more practical way of reducing –T forms than asking parents to avoid a particular linguistic structure such as imperatives.

Also important in determining which style to target for intervention is how much variability exists within each style. For example, a style predicted to be helpful in morphosyntactic acquisition such as a style characterized by a strong focus on third person singular subjects may have significant variability. If it is the case that some parents frequently use this style, then it seems possible that parents who infrequently use that style could be taught to increase uses of helpful types of utterances. Discovering this variability is also important to future interventions. It may be easier to change a style with significant variability.

Understanding how language typology interacts with the way adults speak to children is essential to understanding how to modify language input during intervention. Speech-language pathologists commonly think of some styles of interaction as forms of communication that facilitate language development. These recommended forms such as self-talk and parallel talk often include many modals and –T first person and second person forms (Girolametto & Weitzman, 2006).

In summary, the proposed study is a follow-up analysis to Hadley et al. (in press). The purpose of this study is to explore the overlap between overt and ambiguous verb forms with stylistically motivated parent input variables. Although the –Tense measure used in Hadley et al. (in press) proved to be a predictor of child outcome variables, it is possible that the coding scheme created by Legate and Yang (2007) overlaps in significant ways with differences in parent-child interaction style. The proposed study will investigate the relationship between typology and five new variables based on parent-child interaction style and register: directive, indirect, interpersonal focused descriptive, other-focused descriptive and reduced. If parents are using particular linguistic structures more frequently because their interaction style is leading them to do so, then significant relationships between input informativeness and interaction style may be observed. It is predicted that the directive style and the reduced style of question asking will both be negatively correlated with input informativeness and positively correlated with the –Tense component, in particular. In contrast, it is possible that the other-focused descriptive style will be positively associated with input informativeness and the +Tense component. The other two styles, interpersonal-focused and indirect, may not be strongly associated with input informativeness because they are characterized by the use of both +Tense and –Tense forms. The following questions will be addressed:

1) How do parents vary in their use of +T and –T subcategories of input informativeness?

2) How do parents vary in their use of styles of interaction?

3) How do style variables relate to input informativeness and its individual +Tense and –Tense components?

CHAPTER III

METHODOLOGY

Archival Database

The current project used archival data from the spontaneous language samples of toddlers

and their caregivers who participated in previous studies of children's sentence production and

grammatical development (Rispoli, Hadley & Holt, 2008, 2009) and parents' input

informativeness (Hadley et al., in press). When the children reached 30 months of age, parents

filled out a *MacArthur-Bates Communicative Development Inventory* to ensure that the children

were typically developing.

Archival language samples were available from when the children were 21, 24, 27, and

30 months of age. At each time point, audio recordings were made on two different days.

Children and their primary caregivers participated in naturalistic free play with a standard set of

toys in a lab playroom. The parents were instructed to talk and play with their children as they

would at home. A research assistant (RA) who observed from a corner of the room took notes

then later transcribed the child and parent utterances for the study of child sentence production

(Rispoli et al., 2008, 2009). One of the two sessions was randomly chosen for measures of child

morphosyntactic growth. When an alternate session was available (13 of 15 dyads), that session

was used to determine parent input informativeness. The other session was used in order to

ensure that the parental input was not influenced by the child's language abilities because if the

parent and child samples were taken from the same session, the parental input could be a

response to the child's speech. Trained transcribers added codes to each verb form in the adult

input indicating whether the verb provided evidence that tense marking was obligatory or

optional in English. These codes were added following the procedures of Legate and Yang (2007).

Participants

The participants for the current study were the same 15 parent-child dyads who met the selection criteria of Hadley et al. (in press). The participant selection criteria for that study were as follow: (a) child had a 21 month language sample, (b) parent was a native English speaker, and (c) child was not using tense marking morphemes at 21 months. The dyads consisted of 7 boys and 8 girls, 13 mothers and 2 fathers. Of the 20 parent-child dyads in Rispoli et al. (2008, 2009), 5 were excluded in Hadley et al. (in press). Three of the children were marking tense at 21 months of age, thus the beginning of morphosyntactic growth for these children could not be observed. One had a primary caregiver who spoke a language other than English and one child did not begin the study until 24 months of age.

Procedures

The current study used the same 30-minute portions of adult input that were previously used in Hadley et al. (in press). Refer to Rispoli et al. (2008, 2009) for parent transcription reliability details. Only spontaneous, complete and intelligible child-directed utterances were used. Non-spontaneous reading of books and singing of routine songs were not included because these utterances are not reflective of the parents' individual speech styles. Abandoned or incomplete utterances were not included. This was not because children cannot learn from the verb forms included in them, but because coding decisions become more challenging and potentially unreliable when utterances are incomplete. Partially unintelligible utterances were also excluded. Because reliable transcription for these utterances cannot be guaranteed, coding

decisions are likewise compromised. Lastly, adult-directed utterances were not included insofar as these utterances made up a negligible portion of all utterances in these language samples.

Parent Input Coding

All samples were previously coded for input informativeness following Legate and Yang's (2007) coding scheme for English verbs (Table 1). All verb forms in the parents' child-directed, spontaneous, complete and intelligible utterances were coded as +T or –T. Input informativeness was calculated as the proportion of +T forms over total verb forms [+T/(+T + -T)] (Hadley et al., in press).

In the current study, the +T and –T verb form coding was further decomposed into the subcategories originally proposed by Legate and Yang (2007), as well as additional categories identified by Hadley et al. (in press). Legate and Yang's (2007) original subcategories included verb forms based on English typology. The –Tense forms were *past tense* (no change irregulars)*, present tense* (all but third person singular)*, modal* and *bare*. The +Tense forms were *past tense* (regular and irregular), *third person singular present tense* (regular and irregular), *copulas* and *auxiliaries*. The additional subcategory codes from Hadley et al. (in press) were *ambiguous* (when auxiliary *BE*, *HAVE*, or *DO* has been omitted, and questions with omitted auxiliaries and subjects)*,* and *bare* (e.g. bare infinitives and imperatives). See Appendix D.

The spontaneous language transcripts were converted into the CHAT transcription format, the transcription format of the CHILDES Project (MacWhinney, 2000). The –Tense subcategory codes were entered on a dependent tier (i.e., %tmn). The examples of –T forms in Legate and Yang's (2007) coding scheme reflect English typology, so they are always uninformative when they are used. For example, if a parent wanted to describe the current state of the child by using the subject *you* and a state verb, the verb form was necessarily

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uninformative. By contrast, the Hadley et al. addition of Ambiguous subcategories represented a different way that parents could be uninformative. These subcategories were assigned when overt tense marking did not appear in a sentence by option rather than by a typological constraint of the language. For example, a parent could have said *Do you want more?* (+T) or *You want more?* (-T). Although the function of both questions is the same, a stylistic register determined the coding of the verb. Hadley et al. (in press) also coded telegraphic utterances as a subcategory of –T. These utterances are also uninformative because of a stylistic register option and not because of English typology. The second dependent tier, %tplus, consisted of the +Tense subcategories as originally identified by Legate and Yang (2007): *past tense*, *3ps present tense*, *copula* and the auxiliaries *BE, DO*, and *HAVE*.

A third dependent tier was added to code parent utterances for interaction style (i.e., %style). Codes for parent interaction style were based upon the function of each statement and the form of each question. These sentence level codes served as an additional independent variable to examine the relative independence or overlap between the linguistically motivated and stylistically motivated coding schemes. For each utterance, a decision was first made about whether the function of the utterance was consistent with any of the four function based styles. See Figure 1 for a coding decision tree for determining utterance function. The interaction styles were based upon whether the utterances directed the child's attention or behavior, described the state/action of the speaker/listener or something/someone else. Statements that neither directed nor described did not receive a code. Utterances that directed a child's attention or behavior received either a "direct" code or an "indirect" code based on the manner of the parent's direction. Declarative clauses that described actions, states, or attributes received either an "interpersonal focused descriptive" code or an "other-focused descriptive" code based on the

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subject that was being described. If the utterance was a question, the first determination made was whether it was grammatically reducible. If the question was reducible, the presence or absence of an auxiliary or copula was coded. See Figure 2 for a coding decision tree for determining question form. See Appendix B for more detailed coding procedures.

To ensure accuracy of style codes, after style coding, a second pass checking all parental utterances was completed. Next, computerized checks in CLAN (Computerized Language Analysis) ensured that all child-directed utterances meeting the definition of one of the style codes received a code (MacWhinney, 2000). A second check of each code was performed to confirm that each code applied was done so correctly. When codes were omitted or an incorrect code was found, these errors were corrected.

Overlap was expected between the –Tense subcategories from the Legate and Yang (2007) coding scheme and each of the four function-based interaction styles and the form of question register. For example, modals clearly contribute to an indirect interaction style and imperatives contribute to a direct interaction style. However, there are also ways in which the two coding schemes were non-overlapping. That is, imperative verb forms could have been coded –Tense (e.g., *Come here*) or +Tense (e.g., *Don't touch that*) in Hadley et al. (in press). This was also true for the interpersonal focused and other-focused styles, which included utterances with both +T and –T coded verbs. Having each utterance coded for interaction style along with having verbs coded for informativeness allowed us to see how much overlap or independence existed between the interaction styles and the measure of informativeness.

Reliability

Reliable transcription of verb forms was ensured through independent reliability (*M*=86% reliable) and consensus when reliability over 80% was not achieved (Hadley et al., in press). For

reliability of –T and +T subcodes, the author performed independent reliability on two complete transcripts. The comparison between the codes for the first transcript resulted in Cohen's kappa of .960 for –T forms and 1.00 for +T forms. Cohen's kappa for the second transcript was .878 for –T utterances and 1.00 for +T forms. The lower kappa for –T verbs on the second transcript was due to this parent having higher than average informativeness (i.e., 66%), using only 50 –T verb forms in 30 minutes for which 4 disagreements occurred.

To determine inter-coder reliability for style codes, a second coder was trained to complete an independent coding pass on all utterances produced by two randomly selected parents. See Appendix C for training materials. Codes assigned by the author and independent coder were compared, resulting in Cohen's kappa of .920 and .957. The author and independent style coder discussed differences in coding and changes were made to the original coding in one instance in which the author had coded in error and in three instances in which the author had omitted a code from utterances which should have been coded.

Measures

The first set of variables was based upon the prior coding for input informativeness in Hadley et al. (in press). Specifically, the current study used the frequency of each type of –Tense and +Tense verb forms, the frequency of all –Tense verb forms, and the frequency of all +Tense verb forms. In addition, input informativeness, or the percentage of all +Tense verb forms out of all total verb forms from Hadley et al. was used in the current analyses.

The second set of variables reflected parent interaction style. Each style was a separate variable because unlike verb forms that contribute to –T, the types of styles cannot be added together. The codes from the interaction style coding scheme were converted into quantitative variables as follows. Frequency counts for the total number of utterances were obtained from

Hadley et al. (in press). The total number of reducible questions and the total number of each

function based style code in the input sample were computed using CLAN. The directive style

was then calculated by dividing the number of utterance coded as directive by the total number

of utterances. The indirect style was quantified in the same manner. The two descriptive styles

were reported as the percentage of interpersonal and other-focused utterances out of all

utterances used. Lastly, the percentage of the reduced style was determined by dividing the

number of questions with an absent copula or auxiliary by all reducible questions.

CHAPTER IV

RESULTS

The purpose of this study was to examine the variability in the linguistic forms and

interaction styles parents use and how these forms and styles interact with input informativeness

for tense marking. Three questions were addressed. Question 1 focused on variation in parents'

uses of the -T and +T subcomponents of input informativeness. Question 2 examined the

variability in the parent-child interaction styles the parents used. Question 3 explored how

typology and style relate to input informativeness and its components.

Variation in uses of -T and +T verb forms

The first question addressed how much variability exists across parents in their uses of -T

and +T verbs forms, total verb forms, and input informativeness (see Table 2). Parents' mean

number of coded verb forms was 249.40 verbs. Mean input informativeness (i.e., +Tense forms

divided by all coded verb forms) was 50.6%. Their uses of +T verb forms ranged from 57 to 210

($M =127.53$, $SD = 45.415$) whereas uses of –T verb forms ranged from 56 to 202 ($M =121.87$,

$SD = 35.631$).

Table 3 provides variability and descriptive statistics for the –Tense subcategories,

including the means and standard deviations for each code. Across –T forms, the most

commonly used forms were imperatives ($M = 45.07$, $SD = 20.44$), modals ($M = 23.27$, $SD =$

13.86), ambiguous forms ($M = 22.53$, $SD = 9.70$), and 1st/2nd person present tense forms ($M =$

15.67, $SD = 7.35$). The distribution of imperative use differs from other –T forms in that it is

negatively skewed whereas the distributions of parents' uses of modals, ambiguous forms, and

1st/2nd person present forms are positively skewed (see Figure 3 for imperative distribution).

Because there was variation in the number of verb forms parents produced in 30 min, it was important to determine whether each of the subcategories was related to total verb forms. Some verb forms may occur more in English on average, so a parent who talks more will use more of those forms. Other verb forms may not naturally occur frequently. These forms could demonstrate high variability when talkativity is considered through dividing each form by total verb forms used by parent. Spearman rho non-parametric correlations were used to determine the relationship between each form and the total number of verbs forms used because with a sample size of 15, the influence of outliers can produce spurious relationships. Table 4 shows the relationships between the four most frequent –T forms and the number of total verbs forms. Both modals and first/second person forms were significantly positively correlated with the total number of verb forms ($r = .631$, $p = .012$ and $r = .660$, $p = .007$, respectively). Imperatives and ambiguous forms did not relate to the total number of verb forms. Together, these results indicate that the number of modals and first/second person forms increase as a parent talks more, but imperatives and ambiguous forms do not necessarily do so. Figures 4-7 illustrate the relationships between total number of verb forms and imperatives, modals, 1st/2nd person present and ambiguous forms, respectively.

Finally, to understand the contribution of each –T subcategory to input informativeness for each parent, the frequency of each subcategory was divided by the total verbs used. This way of characterizing variability is an alternative to comparing variability in frequency for each verb form. The total number of verbs forms used is important to consider because a parent who uses many imperatives relative to the total verb forms in their other utterances would be less informative compared to a parent who uses the same number of imperatives but frequently uses other verbs forms as well. Comparing only the frequencies of forms could also make a parent

who uses more of one form appear to better exemplify a particular style predicted to overlap with that form. For example, a parent who uses modals more frequently than other parents do may just be talking more since it is the case that modals are related to talkativity. Forms that are highly correlated with talkativity will appear similarly variable whether raw frequencies or proportions are considered because their frequencies increase as talkativity increases. By contrast, the variability among use of imperatives and ambiguous forms is better captured using proportions than frequencies because talking more does not necessarily increase their frequency of use.

Figure 8 illustrates the variation in parents' proportional use of the four most frequent –Tense subcategories. The line in the center of each boxplot indicates the median number of times that verb form was used. The edges of the boxes indicated the upper and lower quartiles. Thus for each boxplot, 25% of parents used that verb form more than the value of the top edge of the box. The whiskers extend to the maximum and minimum values of uses for each form excluding outliers. Outliers are indicated by circles beyond the whiskers. Outliers are relative to the difference between the top and bottom edges of the boxplot, or, the interquartile range. An outlier is 1.5 interquartile ranges above or below the boxplot. The outlier above the ambiguous boxplot corresponds to a parent, M01, who used an ambiguous verb form for 26% of all verb forms. For the proportion of ambiguous verbs forms, 1.5 interquartile ranges above the third quartile equals 21.6% of verbs. When characterized as the proportion of all verb forms, the range of parents' use of imperative verb forms (4%-31%) was greater than the other frequent –Tense subcategories.

Table 5 provides descriptive statistics for the +Tense subcategories, including the means and standard deviations for each verb form. Among the +Tense forms, copula was used most frequently ($M = 64.00$, $SD = 26.08$) followed by auxiliary DO ($M = 28.80$, $SD = 13.31$), auxiliary

BE (*M* = 16.53, *SD* = 7.95), 3rd person singular present (*M* = 9.67, *SD* = 6.74) and past tense (*M* = 7.53, *SD* = 3.852). See Figure 9 for variability in use of the +Tense subcategories.

Spearman Rho correlations were run to determine the relationship between talkativity and each of the five +Tense subcategories most closely related to the tense productivity score (see Table 6). Figures 10-14 illustrate these five relationships. The correlation between copula frequency and total number of verbs used was high at 0.865 (*p* = .001). The more parents talk, the more they use copula forms. The relationships between both auxiliary DO and auxiliary BE to total verb forms were moderately high (*r* = .630, *p* = 0.012) and high (*r* = .535, *p* = 0.040), respectively. However, no relationship existed between third person singular present tense use and talkativity or past tense and talkativity. This indicates that of these five +T verb forms, third person singular and past tense did not increase as a parent talked more.

To compare variability across parents in proportional use of +Tense forms, each form was divided by the total number of verbs used for each parent. The means and ranges of proportional use of copula and auxiliary DO were greater than the means and ranges of auxiliary BE, third person singular present tense, or past tense proportional use (See Figure 9). Although the proportional use of third person singular was rare, one outlier was observed for this verb form. Parent F08 used third person singular verbs 11% of the time. Another parent, M17, used more third person singular verbs than F08 did, but these forms only made up only 7% of this parent's total verb forms falling below the cut-off value for outliers (i.e., 8.8%).

Variation in Parent-Child Interaction Style

The second question asked how parents varied in their uses of the four utterance functions and by the form of questions asked. When combined, the four functions (i.e., direct directives, indirect directives, other-focused descriptives, interpersonal focused descriptive),

made up about half (i.e., 54%) of what parents said; the rest of utterances did not serve one of these functions including exclamations, single words and fragments (e.g., *cool*, *ok*, or *that bear*). Questions that did not describe or direct also received no function code (e.g., *What color is this?*). Across the individual parents, the range of utterances accounted for by the four function codes ranged from 40% to 68%.

The most frequently used utterance function was other-focused descriptive ($M = 60.87$, $SD = 30.43$) followed by interpersonal focused descriptives ($M = 49.27$, $SD = 15.38$), direct directives ($M = 45.13$, $SD = 20.72$), and indirect directives ($M = 23.07$, $SD = 11.79$) (see Table 7). Other-focused descriptive utterances were so frequent because the style included many types of utterances. This style included utterances with the function of describing actions (e.g., *She found a lid*; *Horsie's eating*), attributes such as location (e.g., *It's cold*; *Bear's right here*), or labeling a third person referent (e.g., *That's Ernie*). It also included questions that described a third person subject in one of these ways (e.g., *Is that a fireman?*; *Is he getting you?*; *What noise does a piggy make?*). Although other-focused descriptives had the highest mean use, only six of the 15 parents used more other-focused descriptives than interpersonal ones. A few parents who focused on third person subjects much more than interpersonal subjects caused the mean for the group to be higher than the mean of interpersonal focused descriptives used. Direct directives had a higher mean than indirect directives because most of the parents (i.e., 10) used direct utterances to change their children's attention or behavior.

As a proportion of all parent utterances, more utterances were other-focused descriptive than any other function ($M = 18.32\%$ of parent utterances, see Table 8). Interpersonal focused descriptives, on average, made up 15.11% of all parent utterances, followed by direct directives ($M = 13.7\%$) and indirect directives ($M = 6.82\%$).

Figure 15 illustrates the variability in how frequently each style was used as a proportion of total utterances. Interpersonal descriptives were less variable than other-focused descriptives and direct directives were more variable than indirect directives. The high median of direct directives and indirect directives indicates that some parents used these forms less than average whereas most parents used them more frequently.

Spearman rho correlations were used to characterize the relationships between the frequency of each utterance function or form and talkativity (see Table 9). Recall that for question 2, number of utterances rather than number of verbs was used as a measure of talkativity because function codes were applied at the level of the utterance. The relationship between indirect directives and talkativity was moderately high ($r = .536$, $p = .035$). The relationships between the frequencies of both other-focused descriptives and interpersonal focused descriptives with talkativity approached significance ($r = .504$, $p = .055$, $r = .477$, $p = .073$, respectively). The use of direct directives and reduced questions did not share relationships with talkativity. In other words, as parents talked more, uses of indirect directives increased significantly, but uses of direct directives and reduced questions did not.

The form of reducible questions parents asked was also considered. The mean number of reduced questions was 16.07 ($SD = 9.03$, Tables 10-11). This number is relatively low because it only included questions that remain grammatical after the tense carrying morpheme is deleted. Wh- questions and intonation only questions are not grammatically reducible. The mean number of questions asked that were of the reducible type was 35.5 ($R = 13$ to 61). Parents ranged from 6 to 42 uses of reduced questions with all but one parent reducing 23 or fewer questions. Parents asked full questions, retaining the inverted tense marking morpheme, a mean of 20.13 times. On average, just less than half of questions that could have been reduced were ($M = 45\%$, $R = 15\%$

to 91%). There was no correlation between percentage of questions asked and number of reducible questions asked indicating that variability in reduction is present regardless of how likely a parent is to ask questions. One parent, M01, was an outlier for both frequency and proportion of reduced questions. This parent asked 42 reduced questions and 4 full questions, reducing 91% of the time. In contrast, the remaining 14 parents on average reduced 41.55% of the time, asking about 14 reduced questions and 21 full questions.

Interaction between typology and parent-child interaction style

The third question asked what relationship exists between input informativeness and its subcategories and both the function of child-directed utterances and the form of child-directed questions. Table 12 provides correlations between the frequency of use of each function-based style with –T and +T. The subcategory –T shared a relationship with one style, direct directives ($r = .752$, $p = .001$). Utterances coded as being direct directives are almost all imperatives, which reward a –T grammar. The frequency of +T forms was correlated with two styles. A significant relationship existed between other-focused descriptives and +T ($r = .838$, $p < .001$). This style included third person copula, which occurred frequently in the input the children received. A third correlation was between +T and indirect directives ($r = .738$, $p = .002$). This style included utterances with varying verb forms including modals and auxiliaries.

Table 13 provides correlations between each style and input informativeness. The styles are proportions calculated for each parent by dividing the frequency of each style by the total number of utterances. To explore the relationship with input informativeness, proportions of styles were used because informativeness is a proportion of +T verb input to total input. Therefore, both measures account for differences in how much each parent talked. Two function styles were correlated with input informativeness: direct directives ($r = -.782$, $p = .001$) and

other-focused descriptives ($r = .721$, $p = .002$). The form of questions was also related to input informativeness with the percentage of reduced questions sharing a high negative correlation with informativeness ($r = -.711$, p = .003). The correlations between informativeness and direct directives and reduced questions are negative as predicted because these two styles are made of input that rewards a –T grammar. Other-focused descriptives are mostly +T forms and are positively correlated with input informativeness. No predictions were made concerning styles relating to each other; however, proportional use of direct directives was positively related to the percentage of reduced questions asked ($r = .682$, $p = .005$) and the proportional use of direct directives was negatively related to the proportional use of other-focused descriptives ($r = -.521$, $p = .046$).

CHAPTER V

DISCUSSION

This study investigated the overlap between English typology and parent-child interaction styles and how both typology and style relate to input informativeness. A need exists to better understand variation in how parents communicate with children because parents vary in input informativeness, a typology based predictor of child morphosyntactic development. The study expanded on Hadley et al. (in press), a replication of Legate and Yang (2007), by coding whether verbs rewarded a +Tense grammar or a –T grammar in a single language, English. The current study reported the frequencies of the verb forms that contributed to these subcategories of input informativeness, how they varied across individual parents, and how this variation could result from stylistic differences in communication. The frequencies across verb forms varied greatly among parents who used different verb forms to achieve similar communicative functions. A tendency to use a particular style to communicate a given function led some parents to use one form much more frequently than another.

The first research question examined variability in use of verb forms in English typology. Copula was the most frequent form. Of the most frequent –T verb forms, the proportion of first/second person and modals were related to talkativity while the proportion of imperatives and ambiguous forms were not. Instances of these related forms may also increase for other parents as they talk more. Of the five +T forms most closely relating to the tense productivity score, proportional copula, auxiliary DO and auxiliary BE were related to talkativity but proportional third person singular and past tense were not. Parents did not use third person singular and past tense more as they talked more, which suggests that to increase uses of these

forms, parents would have to consciously change features of their communication with their children.

The second question investigated variation in parent child interaction styles, which were based on the functions of utterances and the form of reducible questions. Parents' mean use of other-focused descriptives was greater than their mean use of interpersonal focused descriptives, direct directives, or indirect directives. This is not surprising given that the other-focused descriptive style is largely made up of copula, the most frequent verb form, which is often used in the third person singular form *is* or contracted *'s*. Except for indirect directives, none of the four function based styles or the proportion of reduced questions were related to talkativity when considered as proportions of all utterances. Indirect directives were only marginally significant. Therefore, it is possible for an individual parent to have a tendency to use one style more than others for reasons other than talking more. The styles may not be related to talkativity because the four style codes accounted for only 54% of utterances. As parents talk more, they may be using more fragments and statements that neither direct nor describe.

The final question investigated how style related to input informativeness. The three predictions made about the relationships between style and informativeness were supported by the results of the study. Direct directives were positively related to –T because this style was mostly imperatives which reward a –T grammar. Second, other-focused descriptives were related to +T and informativeness because English typology calls for overt tense marking on verbs agreeing with third person singular subjects including lexical verbs and copula, which was abundant in utterances of this style. Third, reduced questions were negatively related to input informativeness because they lack tense carrying copula and auxiliaries. Reduction of questions was viewed differently in this study from other uninformative input. In this study, reduction was

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operationalized as being optional and not needing to occur in any context unlike the other styles, which were seen as being constrained by English typology. The percentage of reduced questions did not relate to –T because when considered by frequency, reduced questions were not common.

Predictions could not be made about the remaining styles. Indirect directives as a style could not be predicted to relate to informativeness because the style is so variable in the linguistic forms it comprises. As expected, there are many ways to be indirect so utterances frequently included both +T and –T forms. For example, indirect directives could include a modal or an auxiliary DO as in *Do you want to try now?* Interpersonal descriptives were not predicted to have a strong relationship to +T or –T because verb forms that reward both +T and –T grammars could serve this function.

Unexpected relationships among styles also emerged. Direct directives shared a moderate negative relationship with other-focused descriptives, indicating that parents who use direct directives as a greater proportion of utterances spend proportionately less time describing toys or other objects in their children's environments. Hart and Risley (1995) reported that directives needed in the course of caring for a toddler (e.g., *Put on your shoes)* occur across different types of families but that in families of lower socioeconomic status, less time is spent on other types of language in addition to these directives. It is possible this negative correlation arose from some parents using directives but very few other-focused descriptives. A second unpredicted relationship was a positive correlation between reduced questions and direct directives. Parents who use many utterances of these two types seem to take frequent, short conversational turns and use interpersonal focused reduced questions as a way to comment on and influence their children's behavior (e.g., *You wanna try?)*

The results of this study shed light on what factors contribute to input informativeness for tense marking and how three significant style variables and English verb forms work together to make up overall informativeness. Higher informativeness can be achieved through using more other-focused descriptives and fewer direct directives and reduced questions.

Reinterpretation of previous studies

The results of this study converge well with some previous research but also offer new explanations for other findings. First, both Newport et al. (1977) and Gleitman et al. (1984) found a negative relationship between maternal use of imperatives and child auxiliary use. Newport et al. (1977) and Gleitman et al. (1984) additionally found a positive correlation between maternal yes-no questions and children's auxiliary use. Neither study stated that only questions with an overtly included auxiliary or copula were part of the predictor variable. Furrow et al. (1979) drew somewhat finer distinctions among different question types. They also did not quantify yes-no inversion questions with auxiliary deletion (reduction), but they did look at yes-no inversion questions and non-inversion questions with auxiliary deletion (intonation only). They found the same positive relationship between child auxiliary use and maternal declaratives and intonation only questions that the Newport, Gleitman and Gleitman studies found with undifferentiated maternal yes-no questions. Even those questions in which an auxiliary was deleted were positively correlated with child auxiliary use.

These results are difficult to interpret because Furrow et al. grouped deletion questions with intonation only questions, which are sometimes informative. Intonation only questions can be informative if a third person singular subject is used with a lexical verb or if a non-inverted copula or auxiliary is used. Therefore, the positive relationship between these questions and child

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auxiliary provision could have resulted from the questions in the parent variable being more often +T than -T.

The authors of the previously described studies explained that children make use of simple or salient input and pay attention to the beginnings of utterances (cf. Newport et al., 1977; Furrow et al., 1979). A more parsimonious explanation of earlier correlations is that -T input slows the development of the tense system for the child. The fact that reduced questions include an ambiguous verb form could explain the delay in children's use of auxiliaries. Hadley et al. (in press) proposed that after a child "apprehends" that tense can be marked in the language he is exposed to, the competition between –T and +T forms eventually fades. Frequent exposure to any combination of –T forms such as verbs in reduced questions or in imperatives slows the entire process beginning with apprehension. In the case of auxiliary use being a child outcome measure, previous studies may have failed to notice delays in the entire tense marking system with earlier developing forms such as copula and third person singular also being slower to emerge. Rispoli, Hadley and Holt (2010) reported that for most children, auxiliary BE emerges later than copula BE although they share the same phonetic forms. These similarities in the sequence in which children produce tense morphemes suggest that they develop as a system. If the +T grammar is not apprehended, the child will not progress to marking tense. In previous studies that examined maternal use of imperatives, the presence of an imperative may have delayed apprehension because a child needs relatively more +T examples to first recognize that tense is marked in the language.

Future studies attempting to make predictions about child auxiliary use or grammatical development in general based on parent use of yes-no questions must make clear important details. First, they should specify whether auxiliaries are used in the questions. Next, recall that

in the early studies, modals and the auxiliaries BE and DO were collapsed together. Because modals reward a –T grammar and non-modal auxiliaries reward a +T grammar, it is important that the current study distinguished between the two types. The Newport, Gleitman and Gleitman studies also did not distinguish between yes-no questions that included an auxiliary at the beginning and those that did not. Since the explanation of their finding was that children pay attention to the beginnings of utterances, this point is critical. If the maternal yes-no question variable in the early studies actually captured maternal auxiliary use then it too could have predicted child auxiliary use in the view of VLM.

Research Implications

The coding process and results of this study raised issues that should be considered in future work. First, the optionality in reduction of questions could be further explored. The current study operationalized reducible questions as those that are grammatical in the adult input when they are reduced or full. However, optionality in some cases may depend on the communicative function of the question. In certain contexts, intonation only questions seem more felicitous than full questions, such as when a parent is expanding on a very short or partially unintelligible child utterance. See Appendix E for examples of these questions taken from the current study and a discussion of contexts in which they arise.

The results of this study can be examined from multiple theoretical views. Hoff and Naigles (2002) distinguished between views such as Legate and Yang's (2007), which focused on the data provided, and the perspective that communicative functions in conversation are what is important to the child learning grammar. The results of the current study could be explained through a view that sees conversation as a delivery mechanism of data. Legate and Yang created a refined data coding system using linguistic theory to propose differences in how helpful

varying verb forms are. Hoff (2006) focused on the information parents provide in the context of conversation. The conclusions of the current study are that increased amounts of conversation provide more data for the child, but differences in the quality of the data can be influenced by parent interaction style because interaction styles overlap differently with +T and –T verb forms. However, the quality of the data in terms of whether it rewards a +T grammar does not always correspond directly to the quality of the interaction. For example, Hoff (2006) explained that when parents use imperatives to direct their children's attention or behavior they are changing the conversational focus, which breaks down joint attention. However, sometimes when parents use a directive they are encouraging the continuation of an ongoing behavior which means the conversational focus is shared (Pine, 1992; Flynn & Masur, 2007). Legate and Yang's (2007) description of imperatives as –T holds regardless of the communicative function the parent intended because children learn from individual trials in the input. If children use statistical tracking to process incoming data, the characteristics of the data are critical to understand, as well as the way that styles of communication may increase or decrease particular types of data in the input.

Further investigation into the role of copula is also warranted. Copula was the most frequently used verb form, but parents used it in different sentence contexts that should be quantified. Some parents used copula in a mainly referential way as in *That's a boy* leading to *it's* or *that's* being the most common forms of those including a copula. By contrast, other parents used copula for predication as in *The boy is ready*, which may be more useful to the child learning English especially when elaborated noun phrases are used because they expose children to lower frequency nouns and adjectives. The early age at which children use copulas contracted to pronominal forms in addition to errors such as *That's fit* suggest that these sequences may be

unanalyzed and used as a rote form. If this is the case, then lexical noun phrase (NP) subjects in the input should be more beneficial for children's analysis of the copula. In the future, variation in copula use in child directed input should be quantified as a function of lexical NPs and pronominal NPs. Parents who contract copulas frequently in referential contexts may have high levels of informativeness, but such input may not be as helpful for learning.

Clinical Implications

The current study also holds implications for clinical practice. Some characteristics of parent-child interaction style are likely to be able to predict child grammatical outcome because they overlap with input informativeness, a known predictor of child outcome. The results show that style varies and overlaps with informativeness. These findings support the claim that input has a primary role in grammatical development. Understanding how a construct like style overlaps with a typology based predictor could make input modification more achievable for clinicians and parents without requiring them to keep particular linguistic structures in mind while modeling language for children.

Caregivers and clinicians could be taught to increase informativeness with an explicit emphasis on style rather than on typology. This type of explicit instruction on modifying style as a way to change typology is possible because the results of this study revealed how style and English typology overlap. Importantly, the way style and typology overlap is likely to differ crosslinguistically (cf. Hadley et al., 2010). For speakers of English, the following stylistic modifications are recommended and hypothesized to support children's grammatical development because of their relationship to input informativeness: talking about the toys (promoting other-focused style), giving the toy/item a name (promoting a more literate

communication style), and asking full questions to keep the conversation going (decreasing reduced style).

To increase informativeness, the use of toy talk is recommended (Oetting & Hadley, 2008; Walsh, 2010). Toy talk consists of two strategies: talk about the toys and give the toy/item its name. Toy talk is similar to the language modeling strategies of self-talk and parallel talk because they model adult utterances for children and determine the conversational focus (Girolametto & Weitzman, 2006). However, toy talk encourages adults to talk about the toys and other agents in the environment, increasing the use of third person subjects in contrast to *I* (self-talk) and *you* subjects (parallel-talk). Shifting the conversational focus towards other referents, not just the speaker/listener, could replace utterances that are interpersonal focused descriptive with utterances that are other-focused descriptive. This could be beneficial given that interpersonal focused descriptives were not related to informativeness, but other-focused descriptives were. Increasing the amount of +T forms in the input is only part of increasing input informativeness; decreasing the number of –T forms also contributes to increased informativeness. Recall that the frequencies of past tense and third person singular were not associated with talkativity but were positively related to informativeness. Thus, to increase the frequency of these two +T forms in the input, parents and clinicians will need to talk differently, not just more. A clinician could create opportunities for completed actions with the toys to increase uses of past tense -*ed*.

In a recent study, Walsh (2010) demonstrated that in 20 min of instruction in toy talk, college students significantly increased their use of third person subjects and decreased their use of second person subjects. In addition, the majority of participants also increased their informativeness substantially. If parents could be taught to use this descriptive style more

frequently through toy talk instruction, they would add to their instances of using +T verbs and likely replace -T utterances that would have directed rather than described. Future research is needed to determine whether parents can learn to use toy talk in authentic parent-child interactions and maintain this style of language use over time.

Clinical training in use of toy talk must be clear that being other-focused and informative does not necessarily provide input that children are able to make good use of. As observed informally in the current study, parents frequently labeled objects in the play setting *That's a ...* and asked their children to name objects using *What's that?* Although frequent use of these referential statements and questions can result in higher levels of input informativeness, this type of input is not hypothesized to be as useful for children's analysis of the constituent structure of sentences. Use of toy talk is intended to increase the use of lexical noun phrase (NP) subjects relative to pronominal subjects. The use of lower frequency vocabulary and more elaborated subject NPs reflects a more literate style of communication which could be beneficial for children's grammatical development. Future research needs to determine whether use of 'give the toy/item its name' significantly increases the number of lexical NP subjects, and whether this type of input modification explains individual variation in children's rate of grammatical development.

Finally, Girolametto and Weitzman (2006) recommend teaching parents how to ask questions to encourage turn taking. This strategy is intended to promote parent child verbal interaction. When instructing parents on this strategy, clinicians could also explain the differences between full and reduced forms of questions. If the use of full questions were encouraged, parents might use yes-no questions including copulas and auxiliaries more often. Use of the copula/auxiliary should be possible every time a request for information is made. This

change could be very significant for parents who frequently use reduced questions because for every reduced question that is replaced with a full question, a –T form has been removed from the input and replaced with a +T form. Thus, this minor modification to parent input has the potential to affect informativeness substantially.

Focused changes in the use of some styles should have a greater impact on informativeness because the four styles and one register coded in this study did not all relate to informativeness. Changing use of interpersonal focused descriptives and indirect directives would not be an effective way of increasing informativeness because these styles were composed of –T and +T forms. Decreasing the use of a negatively related style such as direct directives and increasing the use of the positively related style other-focused descriptive could improve informativeness. Incidentally, the styles relating to informativeness had higher coding reliability because judgments on some utterances were difficult to make with the less related styles. For example, some indirect directives seemed to describe the second person subject and some descriptives seemed to suggest an action. Given the challenge in interpreting whether the intention of the speaker was to describe or direct behavior, further investigation of these unrelated styles is likely to be difficult and does not appear warranted at this time.

The results of this study have revealed the overlap between parent-child interaction style and input informativeness for tense marking in English. Input informativeness is a predictor of child tense productivity outcome, yet increasing input informativeness by teaching parents about typology is not likely to be practical. Therefore, the new information about style and informativeness overlap is a valuable way to indirectly improve the input children receive. Since recent work has shown that informativeness can be changed through brief intervention, the overlap revealed in this study can guide researchers and clinicians in developing new

interventions for increasing informativeness beyond strategies already in place. Future work is needed to explore the prospect that children's grammatical growth could be accelerated as a result of style modifications. This possibility is promising given our understanding of both informativeness as a predictor of child outcome and of success in modifying adult input.

CHAPTER VI

TABLES

Table 1

Coding Scheme for English Verb Forms (from Hadley et al., in press)

	[- Tense]	[+ Tense]
Past tense	No change irregulars (e.g., *hit, put*)	All the rest (e.g., *jumped, ate*)
Present tense	All the rest	Third person singular (e.g., *likes, has*)
Modals	All (e.g., *can, can't, should*)	
Copula		All (e.g., *is, are, was*)
Auxiliaries		
BE	Ambiguous (e.g., __ *you coming*?; *where __ you going?*)	Overt (*are you coming? You're feeding the baby.*)
HAVE	Ambiguous (i.e., *I __ gotta go. I __ better go.*)	Overt (*He/'has gotta go. Have you finished?*)
DO	Ambiguous (e.g., __ *you want some*? *__you put it in there*?)	Overt (e.g., *do you want some*? *He doesn't like peas.*)
Bare stem	Ambiguous (e.g., *want more*?) Telegraphic / ungrammatical (*baby need a nap.*) Serial verbs (*go get your shoes.*) Bare infinitives (*let's put them on. You made me put them on.*) Imperative/affirmative (*put your shoes on*; *let's put them on.*)	Note: prohibitions are +T (e.g., *don't touch that.*)

Table 2

Descriptive Statistics for +Tense and –Tense Frequencies

	-T verb forms	+T verb forms	Total coded verb forms
F05	160	210	370
F08	56	108	164
F13	140	134	274
F16	128	80	208
F17	127	141	268
F18	143	86	229
F19	134	169	303
M01	115	57	172
M04	75	173	248
M06	141	105	246
M08	88	112	200
M11	114	81	195
M13	104	154	258
M16	101	107	208
M17	202	196	398
Minimum	56	57	164
Maximum	202	210	398
Mean	121.87	127.53	249.40
SD	35.631	45.415	67.117

Table 3

Descriptive Statistics for –Tense Forms

	Imperative	Modal	Ambiguous	1st/2nd Person Present	Bare	Let's	Telegraphic	3rd person plural present
F05	46	43	22	21	17	7	2	2
F08	7	26	11	8	3	0	0	1
F13	51	29	34	18	4	0	4	0
F16	48	26	23	15	9	0	6	1
F17	70	14	19	13	5	1	2	3
F18	60	19	34	6	15	1	8	0
F19	37	38	14	33	6	2	0	4
M01	44	9	44	14	2	1	1	0
M04	21	14	12	13	10	5	0	0
M06	70	19	27	13	7	1	2	1
M08	31	10	26	8	5	3	2	3
M11	61	7	10	8	14	6	3	5
M13	33	13	27	19	4	2	1	5
M16	20	26	19	21	10	2	1	2
M17	77	56	16	25	16	7	1	4
Minimum	7	7	10	6	2	0	0	0
Maximum	77	56	44	33	17	7	8	5
Mean	45.07	23.27	22.53	15.67	8.47	2.53	2.20	2.07
SD	20.44	13.86	9.70	7.35	5.01	2.50	2.27	1.83

Table 4

Non-parametric Correlations for –Tense Subcategories Frequencies and Talkativity[a]

		Modals	Ambiguous	First/Second Person	Total Verb Forms
Imperatives	r	.099	.176	-.004	.404
Modals	r		-.134	**.635***	**.631***
Ambiguous	r			-.028	.004
First/Second Person	r				**.660****

Note. *Correlation is significant at the 0.05 level, ** at the 0.01 level (2-tailed).
[a]Talkativity in these analyses was operationally defined as proportion of all verb forms.

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Table 5

Descriptive Measures for +Tense Forms

	Copula	Auxiliary DO	Auxiliary BE	3rd person singular present	Past tense
F05	127	59	9	9	6
F08	37	30	15	18	8
F13	79	29	17	5	3
F16	38	22	9	2	6
F17	60	27	22	13	18
F18	48	12	12	4	10
F19	77	36	35	10	7
M01	39	13	3	2	0
M04	81	51	17	14	10
M06	48	24	16	9	7
M08	62	20	14	8	8
M11	42	12	16	5	6
M13	71	36	29	10	8
M16	48	30	13	8	8
M17	103	31	21	28	8
Minimum	37	12	3	2	0
Maximum	127	59	35	28	18
Mean	64.00	28.80	16.53	9.67	7.53
SD	26.08	13.31	7.95	6.74	3.85

Table 6

Non-parametric Correlations for +Tense and Talkativity[a]

		Auxiliary DO	Auxiliary BE	Third person Singular	Past tense	Total Verb Forms
Copula	r	**.676**[**]	.449	.443	.139	**.865**[**]
Auxiliary DO	r		.421	**.691**[**]	.163	**.630**[*]
Auxiliary BE	r			**.657**[**]	.365	**.535**[*]
Third person Singular	r				**.562**[*]	.424
Past tense	r					.104

Note. *Correlation is significant at the 0.05 level, ** at the 0.01 level (2-tailed).
[a]Talkativity in these analyses was operationally defined as proportion of all verb forms.

Table 7

Descriptive Measures for Parent-Child Interaction Style Frequencies

	Interpersonal Focused Descriptive	Other-focused Descriptive	Direct Directives	Indirect Directives
F05	64	94	42	48
F08	27	70	7	8
F13	65	59	53	33
F16	51	33	50	12
F17	51	67	66	14
F18	44	39	65	14
F19	85	70	34	39
M01	29	20	48	16
M04	55	45	19	23
M06	58	31	73	22
M08	31	62	34	16
M11	40	38	62	14
M13	41	86	32	27
M16	53	58	19	21
M17	45	141	73	39
Minimum	27	20	7	8
Maximum	85	141	73	48
Mean	49.27	60.87	45.13	23.07
SD	15.38	30.43	20.72	11.79

Table 8

Descriptive Measures for Parent-Child Interaction Style Proportions

	Interpersonal Focused Descriptive	Other-focused Descriptive	Direct Directives	Indirect Directives
F05	.14	.21	.09	.11
F08	.12	.31	.03	.04
F13	.19	.17	.15	.09
F16	.16	.10	.16	.04
F17	.14	.18	.18	.04
F18	.11	.10	.16	.03
F19	.25	.21	.10	.12
M01	.11	.08	.18	.06
M04	.18	.15	.06	.07
M06	.20	.11	.26	.08
M08	.13	.25	.14	.06
M11	.15	.14	.23	.05
M13	.11	.23	.09	.07
M16	.18	.20	.07	.07
M17	.10	.32	.17	.09
Minimum	.10	.08	.03	.03
Maximum	.25	.32	.26	.12
Mean	.15	.18	.14	.07
SD	.04	.08	.06	.03

Table 9

Correlations between Frequency of Utterance Function/Reduced Questions and Talkativity[a]

		2	3	4	5	Number of Utterances
1 Direct Directives	r	.019	-.207	.136	.126	.363
2 Indirect Directives	r		.500	**.638**[*]	-.016	**.546**[*]
3 Other-focused Descriptives	r			.120	-.326	.504
4 Interpersonal focused Descriptives	r				-.065	.477
5 Reduced Questions	r					.092

Note. *Correlation is significant at the 0.05 level, ** at the 0.01 level (2-tailed).
[a]Talkativity in these analyses was operationally defined as proportion of all utterances.

Table 10

Descriptive Measures for Question Forms

	Minimum	Maximum	Mean	SD
Full with auxiliary	2	31	13.73	8.66
Full with copula	1	12	6.40	3.36
Ambiguous reduction	1	24	6.80	5.86
Auxiliary reduction	2	18	8.20	4.26
Copula reduction	0	2	.33	.62
Telegraphic reduction	0	5	.73	1.39
Reduced questions	6	42	16.07	9.03
Percent reduced	.15	.91	.4488	.19

Table 11

Number of Reducible Questions Asked by all Parents

	Full Questions[a]	Reduced Questions[b]	Total Reducible Questions[c]	Percent Reduced
F05	24	18	42	43%
F08	22	6	28	21%
F13	30	20	50	40%
F16	19	23	42	55%
F17	22	14	36	39%
F18	11	18	29	62%
F19	34	6	40	15%
M01	4	42	46	91%
M04	26	8	34	24%
M06	11	15	26	58%
M08	11	19	30	63%
M11	7	6	13	46%
M13	43	18	61	30%
M16	24	15	39	38%
M17	14	13	27	48%

[a]Full questions include questions with an auxiliary or copula present.
[b]Reduced questions include ambiguous, auxiliary, copula and telegraphic reductions.
[c]Total Reducible Questions includes all full and reduced questions.

Table 12

Correlations for Style Frequencies and -Tense/+Tense Frequencies

	-Tense Verb Forms	+Tense Verb Forms
Direct Directives	**.752****	-.158
Indirect Directives	.454	**.738****
Other-focused Descriptive	.123	**.838****
Interpersonal Descriptive	.474	.458

Note. **Correlation is significant at the .01 level (2-tailed).

Table 13

Correlations for Style Proportion and Informativeness

		Indirect Directives	Other-focused Descriptive	Interpersonal Descriptive	Percentage of Reduced Questions	Input Informativeness
Direct Directives	r	-.139	**-.521***	-.057	**.682****	**-.782****
Indirect Directives	r		.300	.493	-.254	.261
Other-focused Descriptive	r			-.225	-.454	**.721****
Interpersonal Descriptive	r				-.336	.050
Percentage of Reduced Questions	r					**-.711****

Note. *Correlation is significant at the 0.05 level, ** at the 0.01 level (2-tailed).
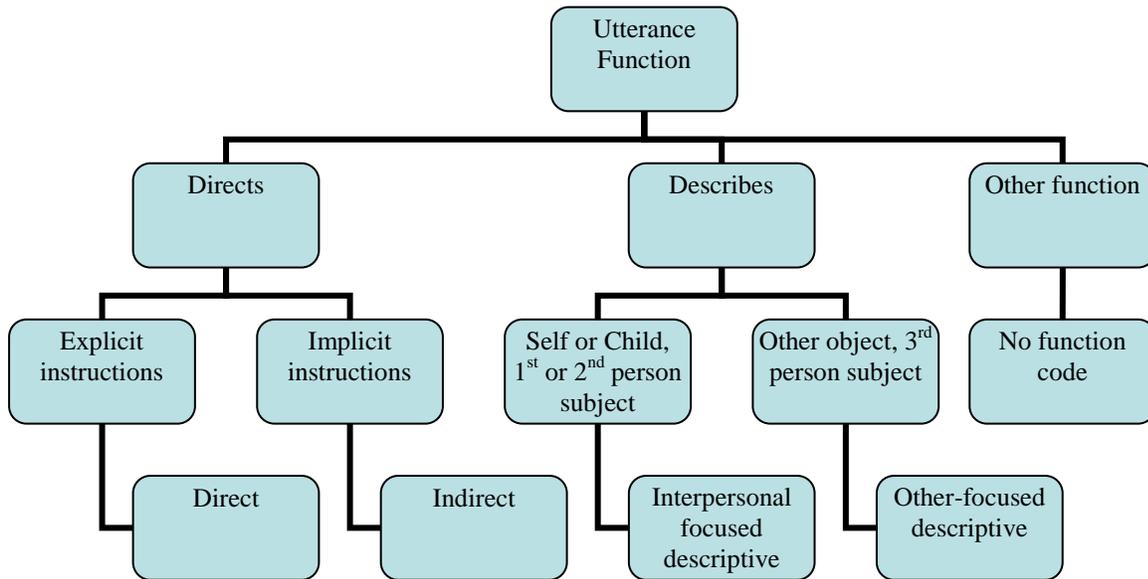
FIGURES

Figure 1. Utterance Function Coding Decision Tree
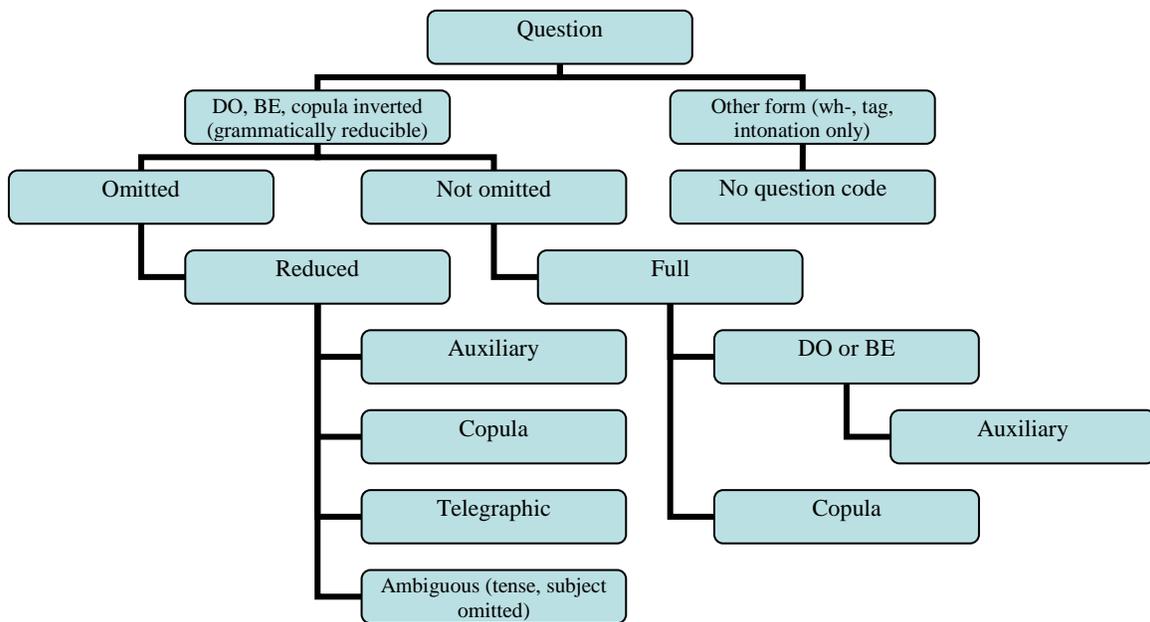
Figure 2. Question Form Coding Decision Tree
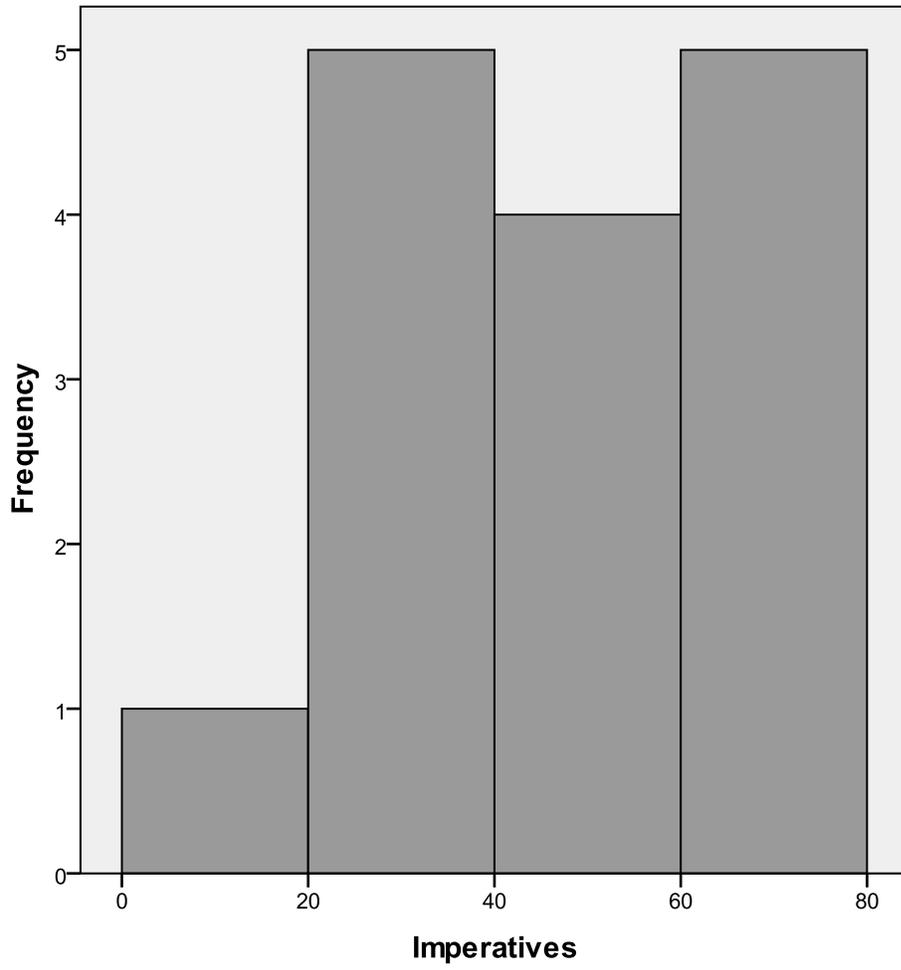
Figure 3. Imperative Frequency Histogram
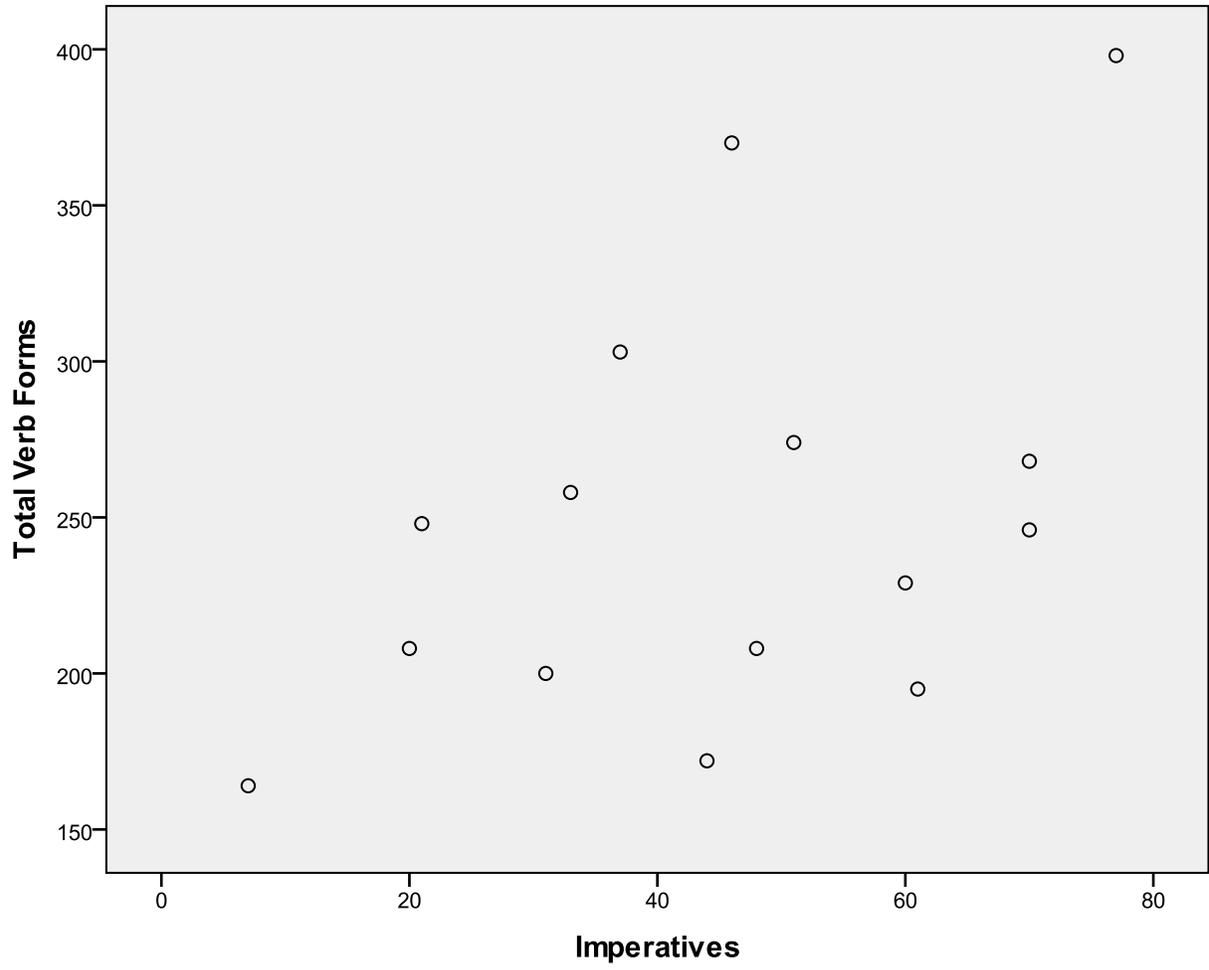
Figure 4. Imperative frequency and talkativity
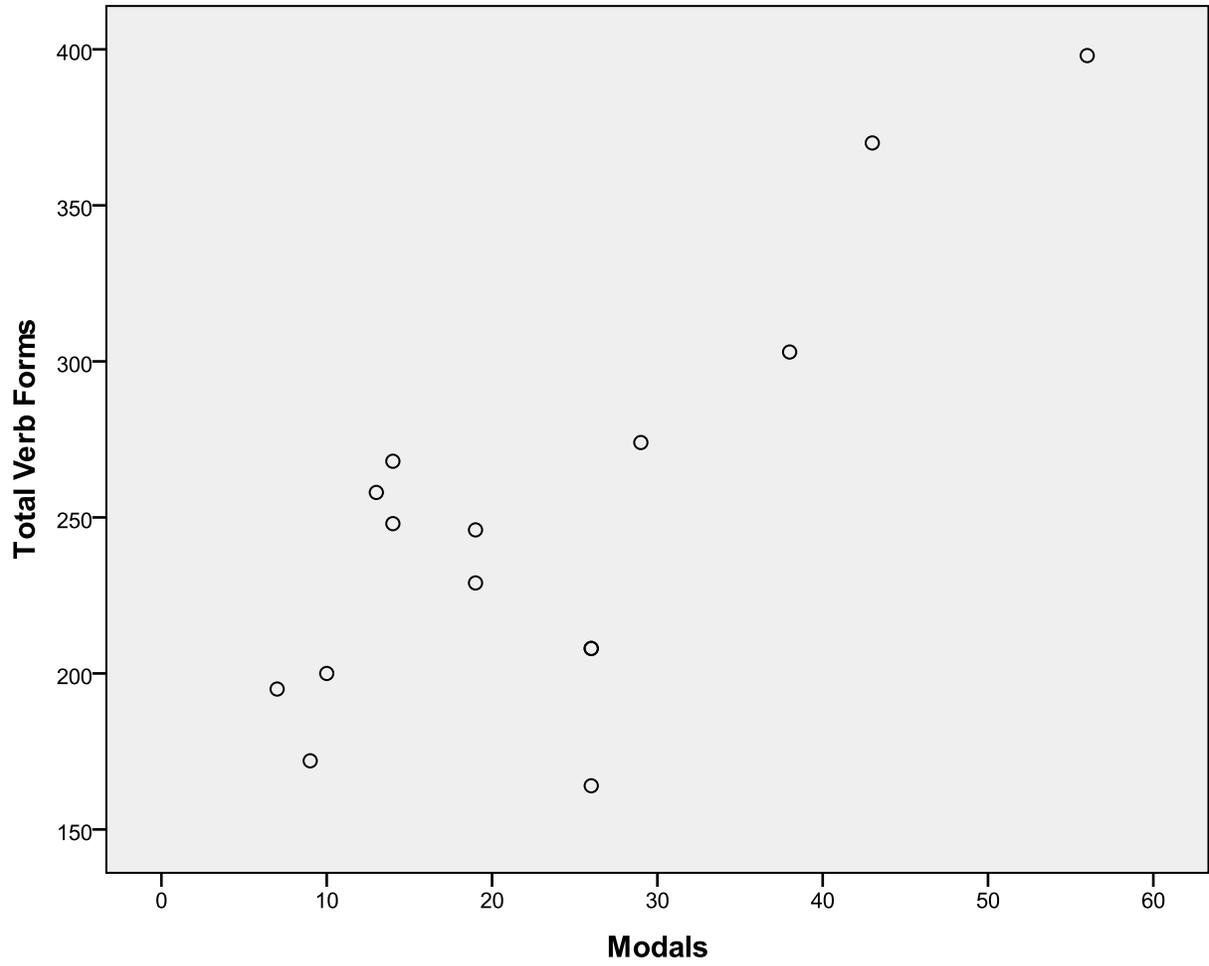
Figure 5. Modal frequencies and talkativity
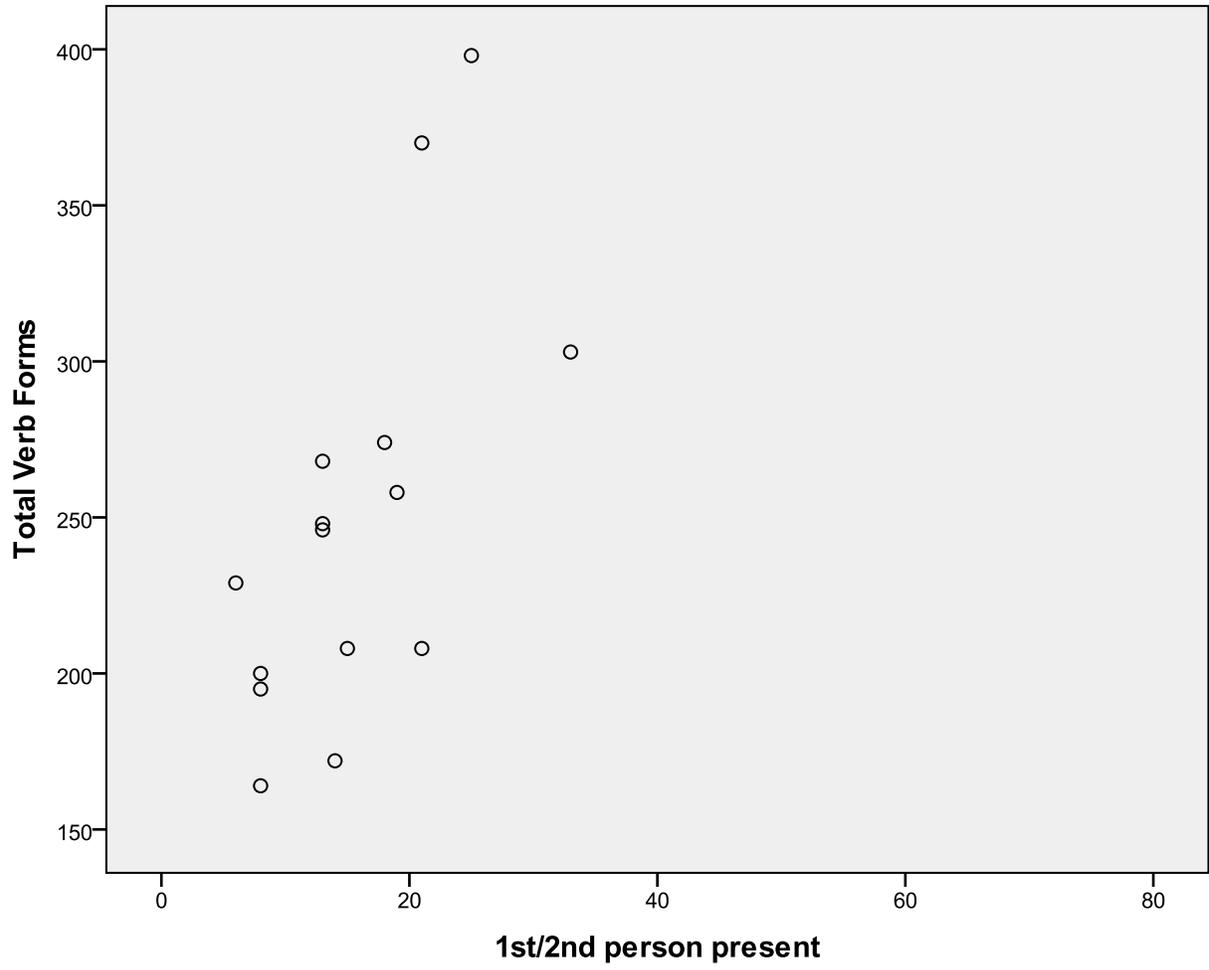
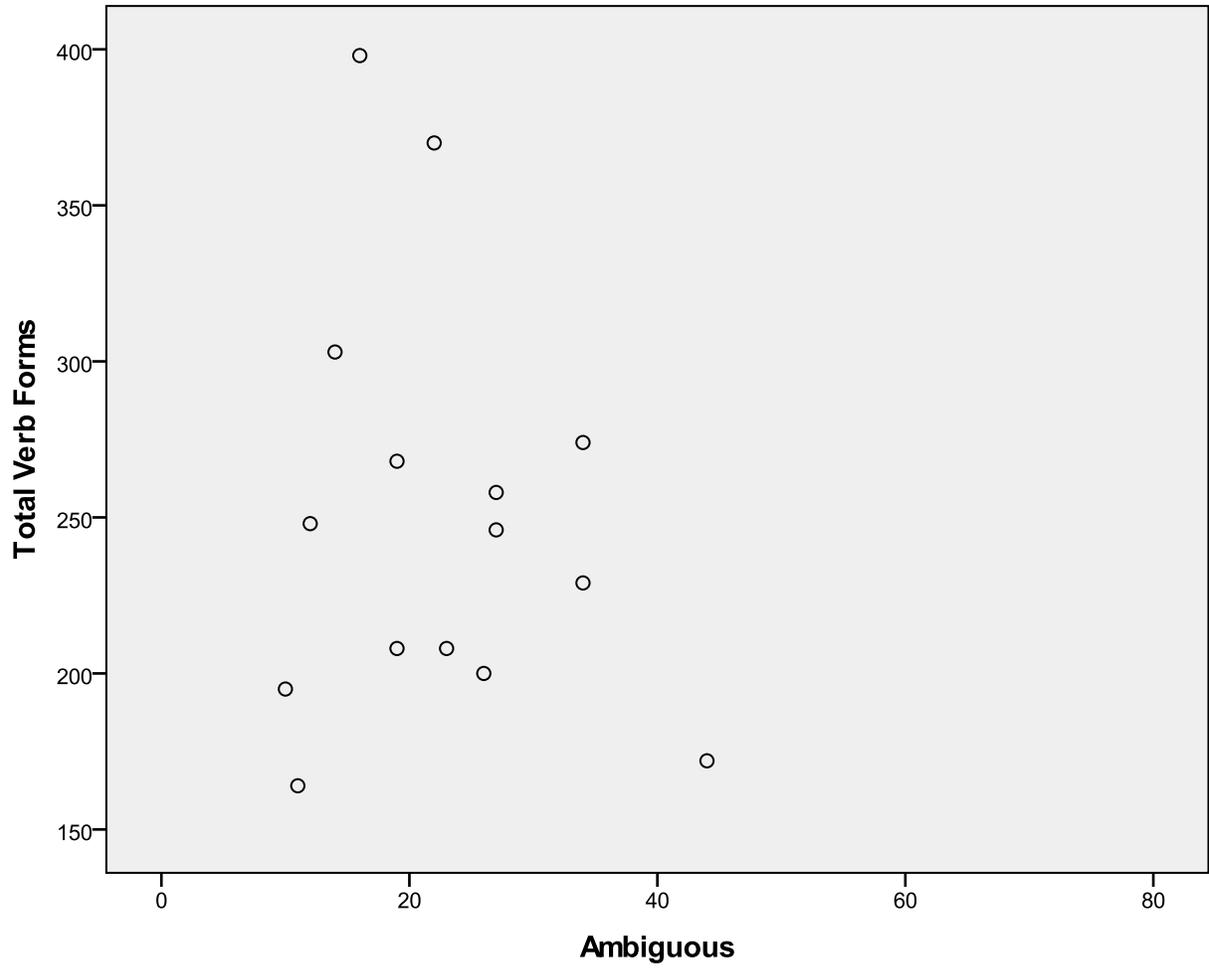*Figure 6.* 1st and 2nd person present tense frequencies and talkativity

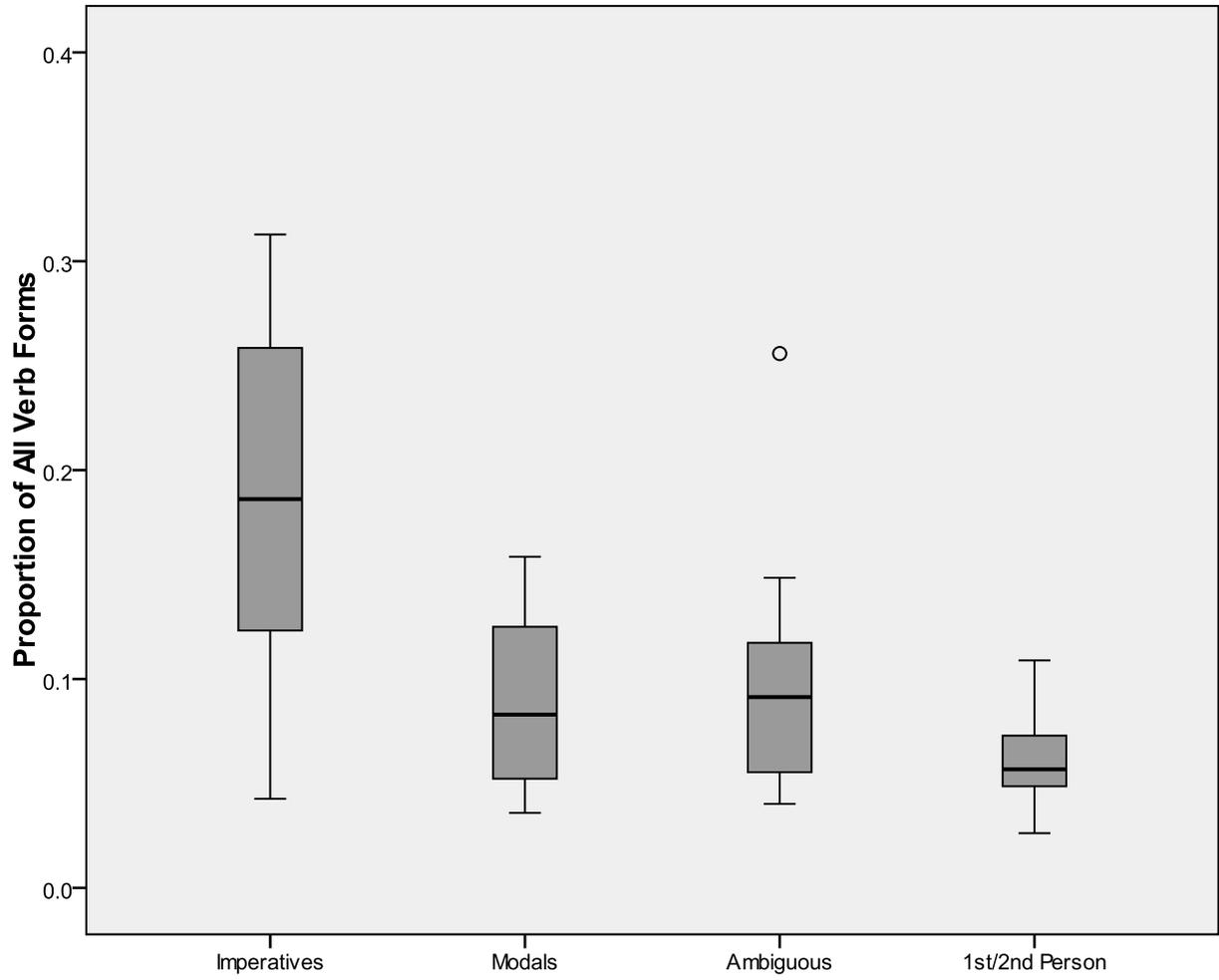*Figure 7.* Ambiguous verb form frequencies and talkativity

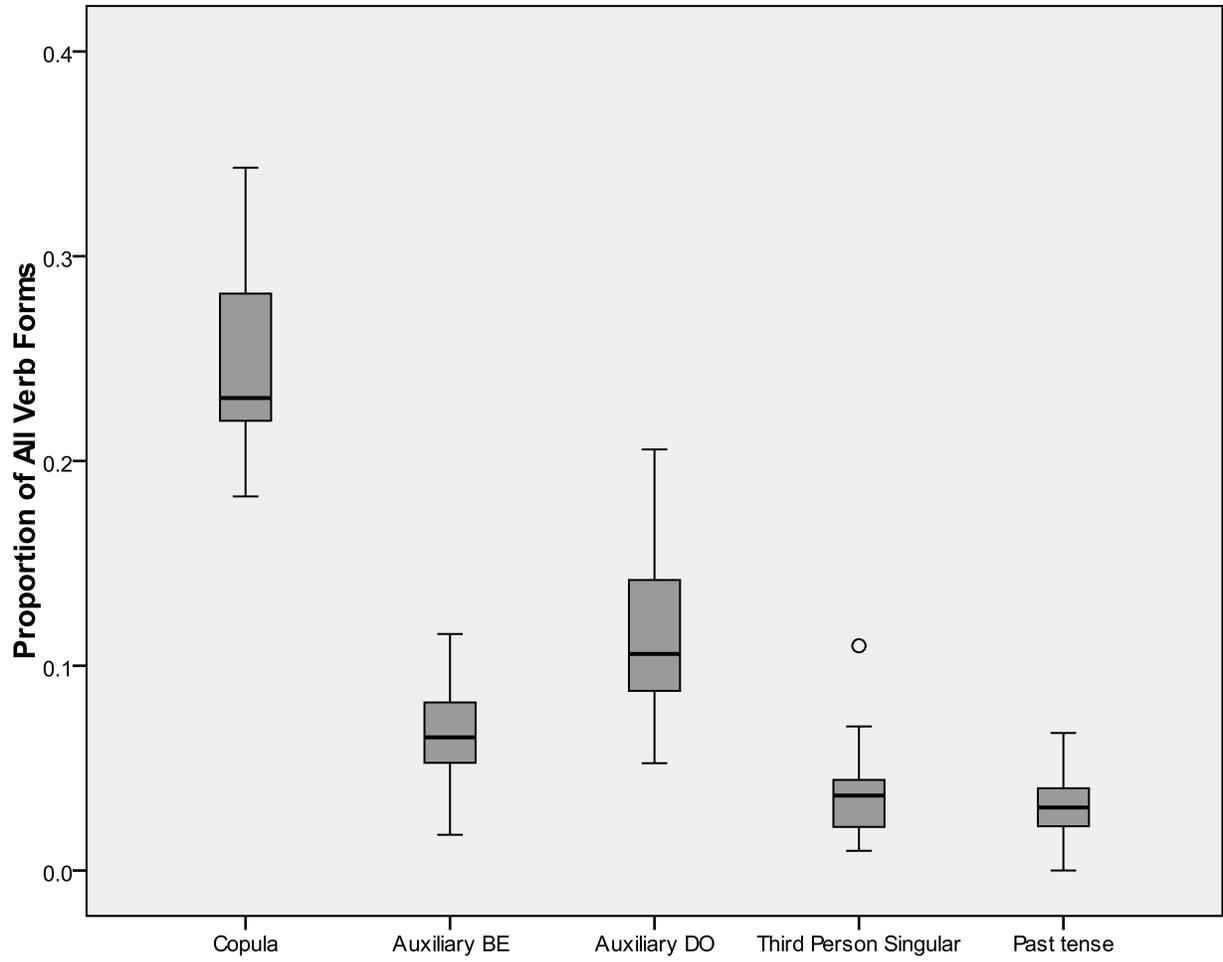*Figure 8.* Proportion of most frequent –T forms to talkativity relative to total verb forms

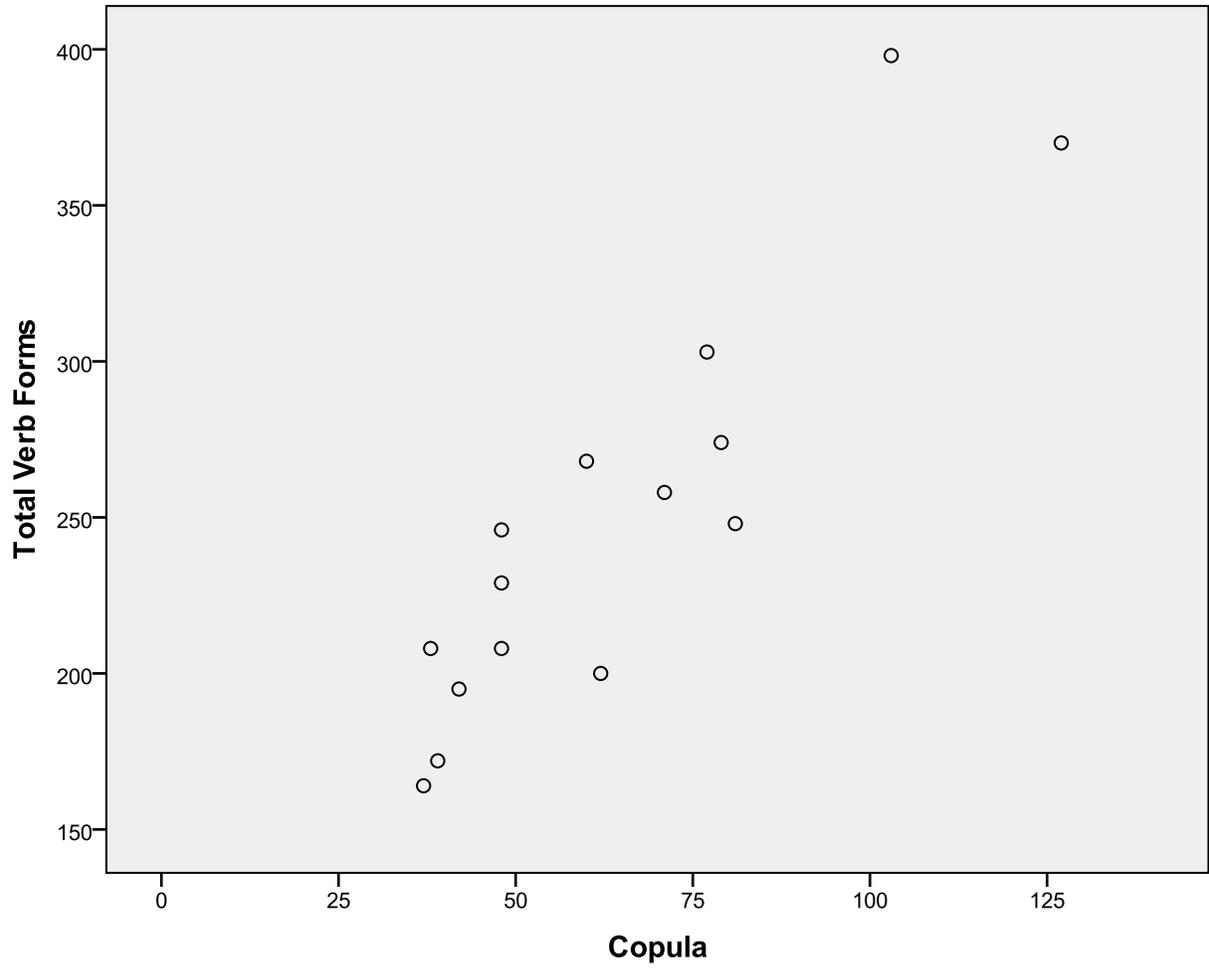*Figure 9.* Proportion of +Tense forms to talkativity relative to total verb forms
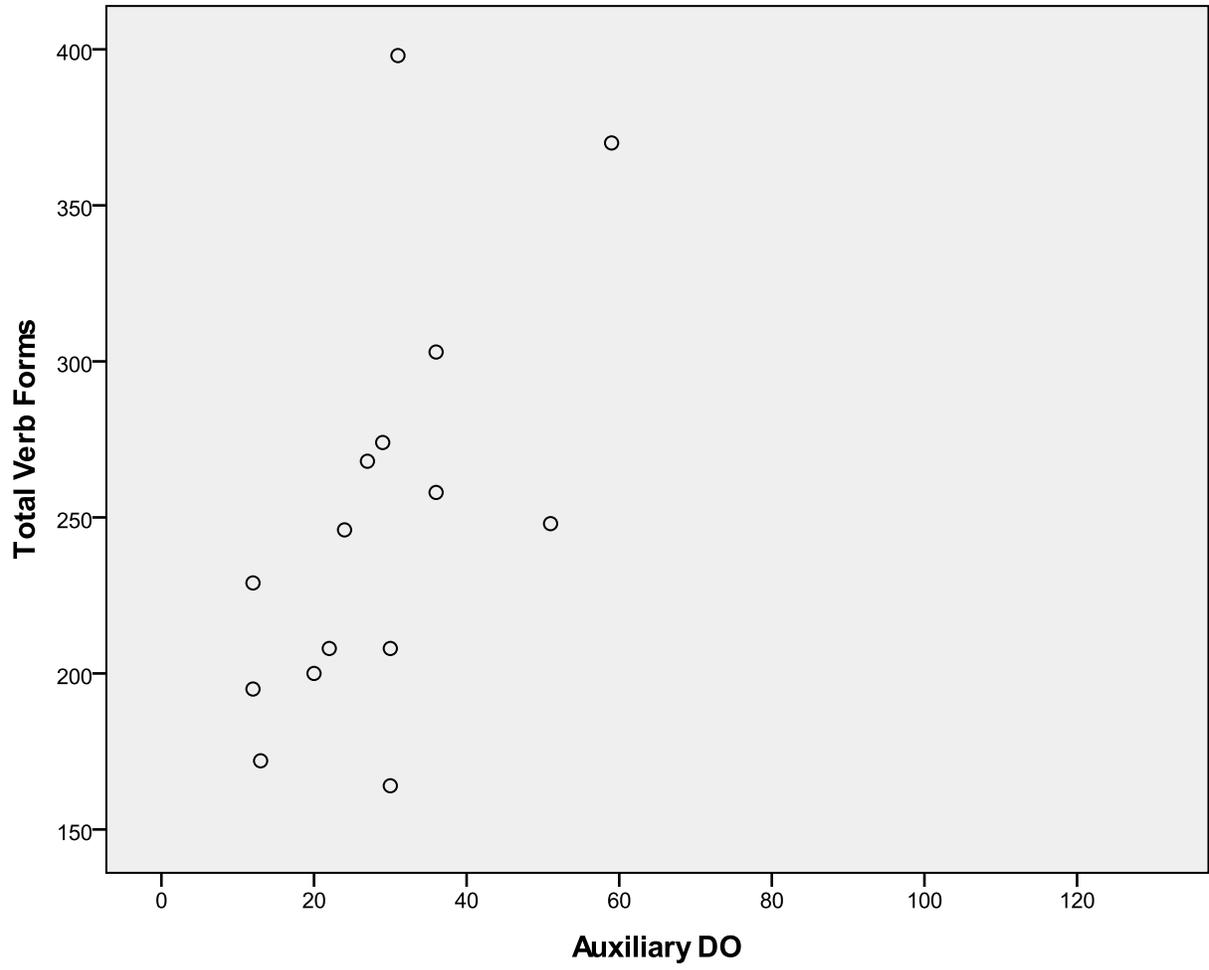
Figure 10. Copula frequency and talkativity

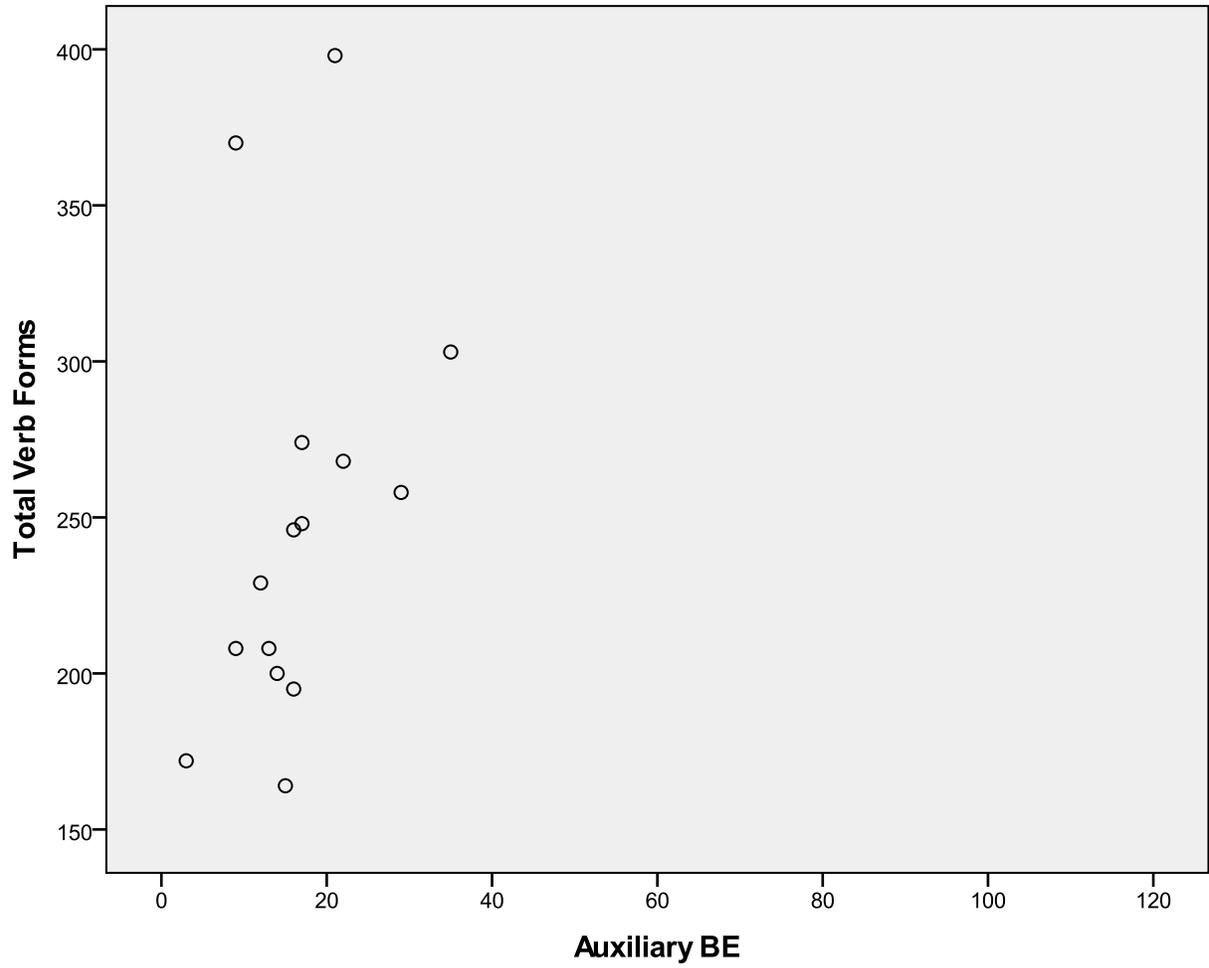*Figure 11*. Auxiliary DO frequency and talkativity

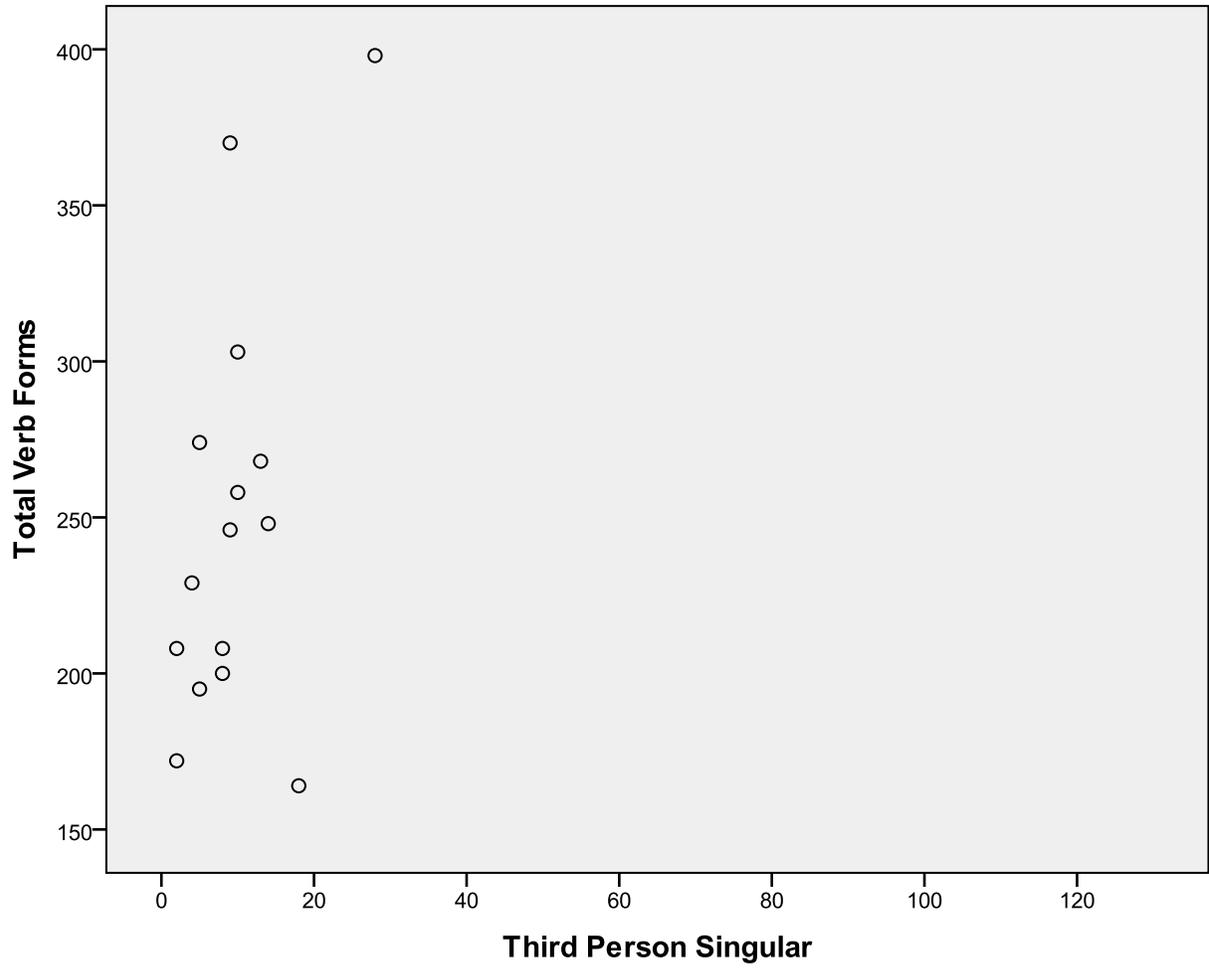*Figure 12.* Auxiliary BE frequency and talkativity

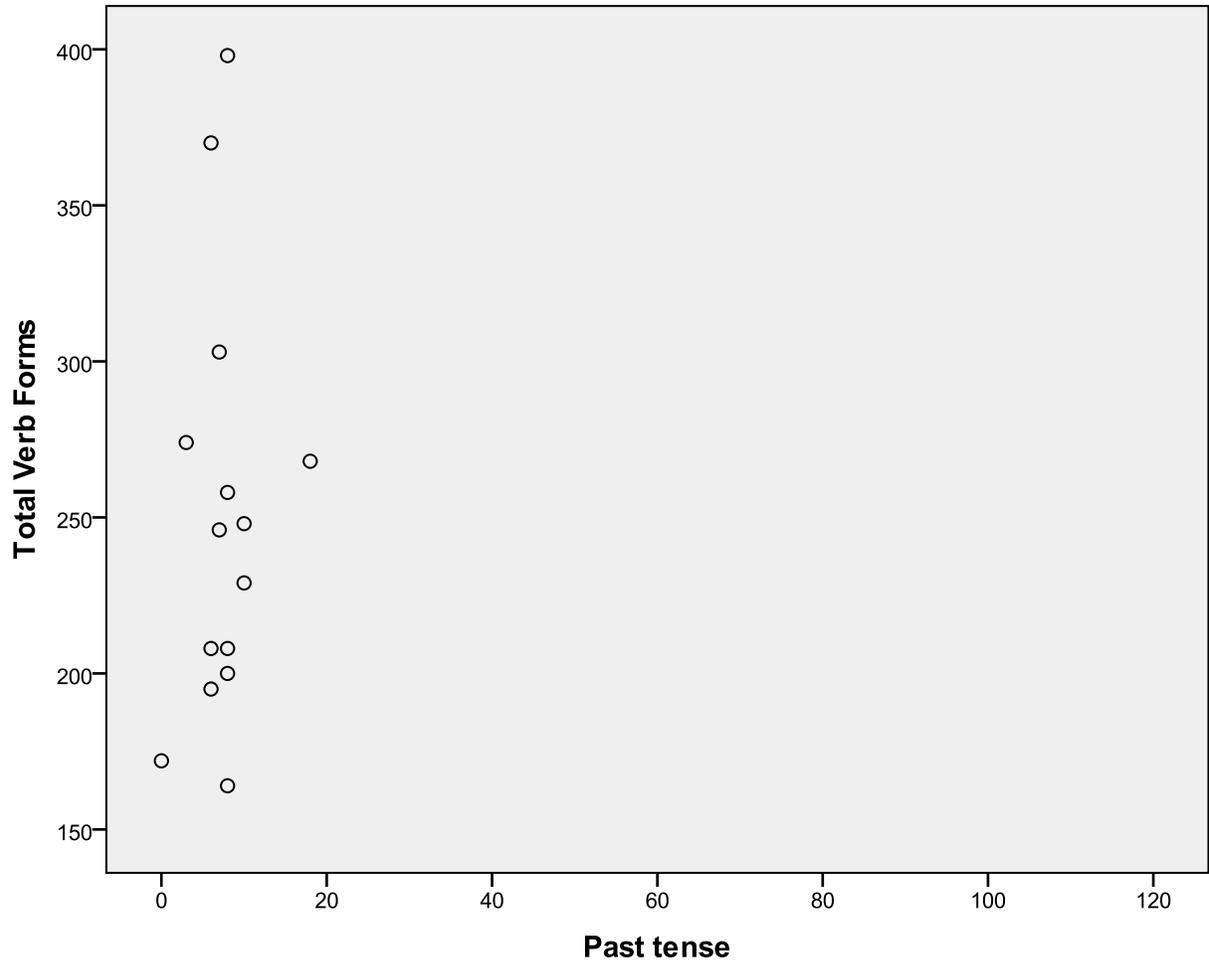*Figure 13*. Third person singular –*s* frequency and talkativity

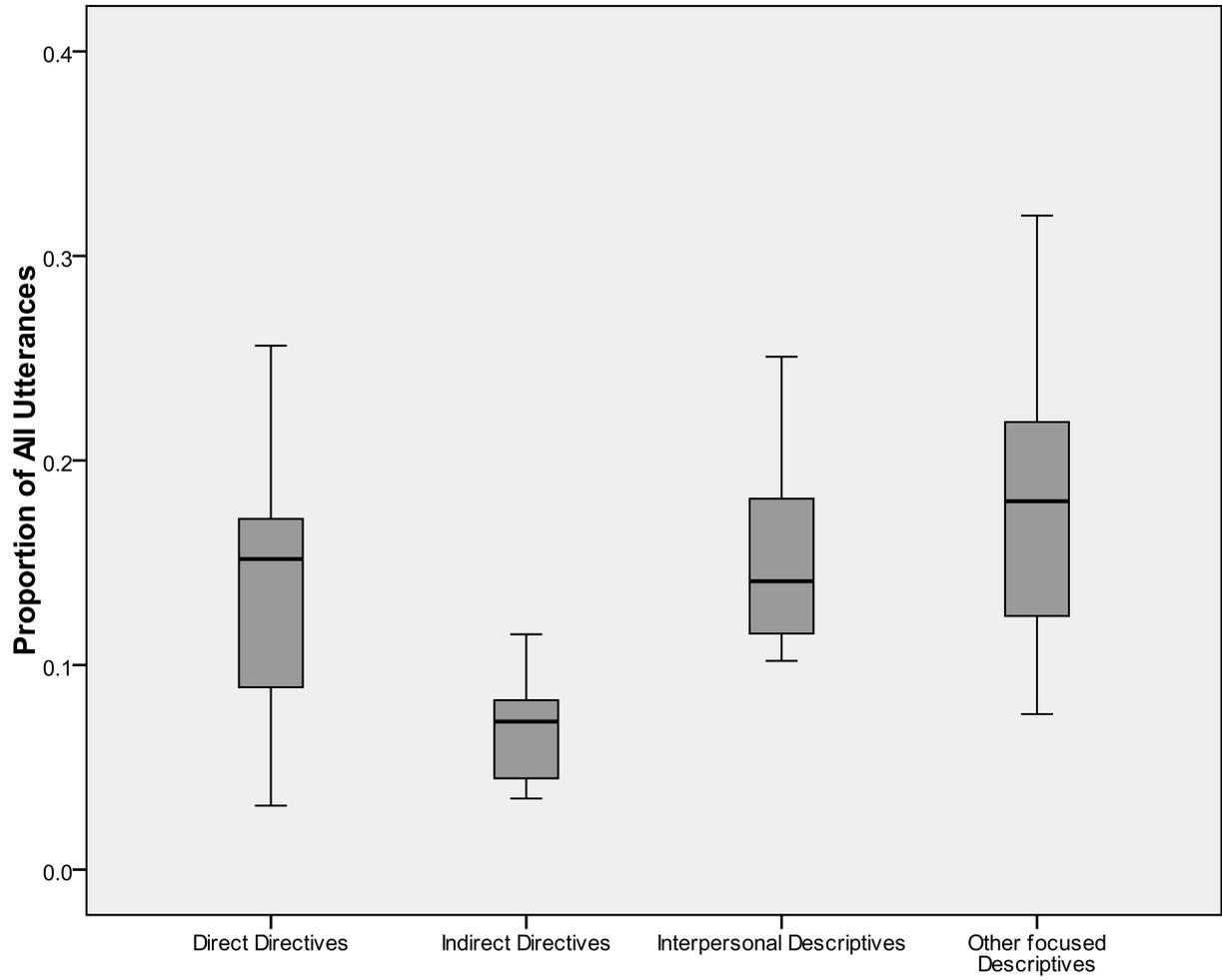*Figure 14.* Past tense (+Tense) frequency and talkativity

Figure 15. Style code proportions and talkativity relative to total number of utterance

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Input Informativeness Coding Instructions (Hadley et al., in press)

1. Code all child-directed, spontaneous, complete and fully intelligible parent utterances in the first 30 min of each transcript.

    a.   Do not code parent utterances directed to another adult/researcher.

         Insert an = as the line identifier if you encounter this.

    b.   Do not code incomplete, partially unintelligible, or abandoned utterances.

    c.   Do not code utterances that are verbatim reading of books.

         Insert an = as the line identifier if you encounter this.

    d.   However, spontaneous comments about the book would be coded!

    e.   Also, you WILL code utterances with the <utterance overlap> notation.

2. Code all tokens in single verb utterances, main clauses, and embedded clauses that are overtly marked for finiteness or ambiguous. Insert the codes [+T] or [-T] at the end of each parent utterance. If there are multiple clauses, you will have more than one code.

    ```
    M look [-T]!
    M where is it [+T]?
    M Leave them in there [-T].
    M Be nice to the baby [-T].
    M I think it's in the other door [-T] [+T].
    M I don't know where it is [+T] [+T].
    ```

3. Code all forms listed in table 1, even if the forms are contracted or used multiple times by the parent.

    ```
    M where's the cow [+T]?
    M where's my hat [+T]?
    ```

4. If you encounter an utterance with a [x2] code, this means the parent said the exact same utterance two times (x3 = 3 times). Insert the number of [+T] or [-T] codes to match the number of repetitions.

```
M no throw toys [x2] [-T] [-T].
```

5. Regular past tense verbs are +T, as are irregular past tense verbs. However, irregular verbs that do not change form in the past tense are –T.

```
M He missed the ball [+T].

M You made a mess [+T].

M He hit the ball [-T].
```

6. Remember that when a verb has an auxiliary to express tense, you are coding the auxiliary and not the main verb:

```
M Do you want some juice [+T]?
```

7. DO not code 'whatcha' as either + or - because the auxiliary form is so drastically reduced.

```
M Whatcha doing?  {no code inserted at all!}
```

8. Do not code embedded infinitives that are marked with infinitival *to* or gerund clauses. The examples below are coded for the main clause verb forms, *want* and *see,* but the infinitive *to run* and gerund *running* are not coded.

```
M They want to play [-T].

M Wanna play checkers [-T]?

M I see him running [-T].
```

9. Code bare infinitives that are not marked with the infinitival particle *to*.

```
M Let's play checkers [-T] [-T].

M Don't make us play checkers [+T] [-T].
```

10. Code unmarked verb forms that appear in succession.

```
M go find your shoes [-T] [-T].

M go play with the toys [-T] [-T].
```

11. Examine parents' use of *got* carefully. Sometimes it will appear in perfect constructions with an omitted auxiliary *have* (cf. you got to be strong = you've got to be strong). Other times it will appear as a past tense of *get* (cf. yesterday you got a new bed). When got is used in as gotcha, this is most typically means the completion of "I'm gonna get you," so this would be coded as past tense of get.

```
M You got to be strong [-T].
M You've got to be kidding [+T].
M Yesterday, we got you a new bed [+T].
M I gotcha [+T]!
```

12. When a parent marks tense but makes an agreement error, code it as [+T:E]. It is also possible that a parent may make other types of errors, but these will be rare.

```
M where's the cows [+T:E]?
M where's the cow [+T]?
```

Appendix B

Parent-Child Interaction Style Codes

DIRECTIVE

Utterances will be coded as "direct" when the function of the utterance is to direct the child's attention or behavior using explicit instructions. The primary types of utterances coded as direct will take the form of imperatives (e.g., *Come here*), prohibitions (e.g., *don't touch*), and *you can't* statements that serve to terminate the child's action (e.g., *You can't go in there*). To determine whether a *you can't* statement meets the operational definition of a directive, *are not permitted to* will be substituted for *can't*. If the substitution is possible with no change in meaning, the utterance will be coded as directive. Utterances receive only a directive code if they begin with an imperative. For example, *Look what he does* does not also receive any additional code.

INDIRECT

Utterances will be coded as "indirect" when the adult attempts to influence the child's attention or behavior using questions or suggestions. The primary types of utterances coded as indirect will take the form of questions with a fronted modal and 1st/2nd person subject (e.g., *Should we play over here?*) and *let's* constructions (e.g., *Let's play over here*). *Let's* constructions can direct either attention or behavior. *Let's* utterances will receive an indirect code, even though *let* is actually an imperative, because *let's* is stylistically indirect, not specifically directing a child's behavior. In this way, *let's* is very much like a modal in style. Imperatives are coded as indirect if they do not explicitly tell a child what to do, e.g., *Watch out* or *Be careful*. Utterances without verb forms may also be coded as indirect, e.g., *Not in your mouth*. Utterances with the word *can* will be coded as indirect if *can* is replaceable with *BE permitted to* and combined with a first or

second person subject (e.g., *You can open that*) or if the parent suggests a behavior using *can*, e.g., *Can you do it?*, *Can mommy see the book?*. Questions such as *Do you want to play over here?* will also receive the indirect code because they are used to indirectly guide the child's behavior or attention rather than request information.

INTERPERSONAL FOCUSED DESCRIPTIVE

Declarative utterances will receive the "interpersonal focused descriptive" code if they are describing the actions, states, or attributes of either the parent or child. A sentence must have either a first or second person subject in the main or an embedded clause. Uses of Mommy/Daddy when referring to self (i.e., the speaker) as subject or use of the child's name when referring to the child addressee as the sentence subject will also be coded as "interpersonal." Subjects and predicates must be overtly present. Exclusions include *Gotta try this one*, *Jumping high*, *See?*. Questions will receive a descriptive code if there is no option for omission in the adult grammar. For example, an intonation only question such as *You're coming?* is a description of the child's action with an auxiliary BE that cannot be deleted because it has not been inverted and moved to the beginning of the utterance. Likewise, Wh- questions receive a descriptive code rather than a question code because the tense carrying morpheme in them cannot be grammatically omitted and these questions can describe, e.g., What do you want to play with? What did you put the boy on?). However, test questions and Wh- questions seeking labels do not receive an interpersonal focused descriptive code because neither the parent nor the child is being described (Furrow, Nelson & Benedict, 1979; Hoff-Ginsberg, 1986; Newport, Gleitman & Gleitman, 1977). For example, in the question, *Who's a big girl?* the parent seems to be talking about the child, but a clear subject is not included. Other abstract subjects are also insufficient to receive this code (e.g., *What's on your hand?*). Like statements, questions will

only be coded as descriptive interpersonal focused if they include a subject and a verb. This means that a question coded as reduced because of an ambiguous subject cannot receive a descriptive code. Statements that describe possibility such as *You can* and *You can't* are coded as interpersonal focused descriptive if *can* is replaceable with *are able to* and *can't* is replaceable with *are not able to* (e.g., *You can play this game all day*). Every utterance receives a single code that is determined by the function of the main clause or main idea being predicated. When a sentence starts with a mental state verb clause such as *I think* or *I wonder*, that clause does not receive a code because it's not a real description of the mental state. Only the embedded clause is coded in these cases. The denominator for interpersonal focused descriptive utterances is all utterances.

OTHER-FOCUSED DESCRIPTIVE

Utterances will be coded as "other-focused descriptive" if the parent is describing the actions, states or attributes of a third person subject such as a toy or the examiner. Subjects and predicates must be overtly present. Therefore, exclusions to this style include *goes down here*, and *bubbles all over the carpet*. Labeling as in *there's Roo* are included as descriptive because they describe a locative state. Questions seeking labels or any "test question," e.g., *What's this called?*, *Where's the bear?* or *What's in there?*, do not receive a descriptive code because unlike intonation only questions and other types of Wh-questions, they do not describe anything in the environment. *Who* questions (e.g., *Who's next to Pooh?*), have ambiguous subjects, so they do not receive other-focused descriptive codes. Wh- questions only receive other-focused descriptive codes when a third person subject in the environment is described, e.g., *What will Roo do next?* or *Where do the balls go?* Questions are included as descriptive when there is no option for omission of tense marking and a third person subject is described (e.g., *Roo ate all the food?*).

Other examples of "other-focused descriptive" include *It must need batteries*, *These cars are fast*, and *The baby is eating*.

QUESTIONS

Questions are coded as full or reduced, then further subcoded for the tense carrying morpheme that was included or omitted, i.e., copula, auxiliary or modal. To receive a question code, questions must be of the type that can be optionally reduced. This means inversion of a copula or auxiliary must have occurred, even if the morpheme is deleted, and that intonation only questions and Wh-questions do not receive a code. Tag questions are excluded because there is no possibility for variation among parents in tense marking in tag questions. Full questions include both a subject and an auxiliary BE or DO, or copula. Auxiliary HAVE will not be included because of the extremely low variability in use with most parents never omitting it. The second subcode is "reduced." These questions are characterized by omitted tense marking morphemes. The omitted morphemes will be further subcoded as auxiliary, copula, ambiguous, or telegraphic. In the case of ambiguous question, the subject has also been omitted, e.g., *Hungry?* or *Coming?* making it difficult to be sure which tense carrying form has been deleted. Telegraphic questions include a subject but are not grammatical in the adult grammar, e.g., *Baby eat?* The frequency of the reduced style will be determined by dividing reduced questions by all questions that are reduced or could have been reduced. Questions beginning with a modal such as *can* or *should* that indirectly guide a child's attention or behavior (e.g., *Can you count them?*, *Should we slide Elmo?*) will receive the indirect code and no question code because the modal cannot be omitted.

NO CODE

Some utterances will not receive one of the preceding codes. First, statements that neither direct nor describe will not be coded because they do not fit into the categories created to

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investigate parent interaction style. Ungrammatical statements (e.g., *Can get it*) will not receive a code because these sentences do not include enough information to be identified as descriptive or directive. Furthermore, there is no need to code this simplified, telegraphic manner of interaction because it will overlap with the telegraphic code given in Hadley et al (in press).

Utterances that do not meet the definition of the other styles will not receive a code. Copulas contracted to pronouns often don't describe an action, attribute or state. These utterances get no code because nothing is described and the referent of the statement is abstract rather than focused on anyone or anything present. These statements will include *that's right*, *that's why*, *there you go* and any other statement that neither directs nor describes.

Appendix C

Interaction Style Coding Instructions

1) Code all child-directed, spontaneous, complete and fully intelligible parent utterances in the first 30 min of each transcript.

2) Do not code parent utterances directed to another adult/researcher.

3) Do not code incomplete, partially unintelligible, or abandoned utterances.

4) Do not code utterances that are verbatim reading of books.

5) You WILL code utterances with the <utterance overlap> notation.

Coding

1) For each utterance, determine if the utterance asks a question or is a statement.

2) Each utterance receives only one function code regardless of the number of verbs or clauses. However, a single utterance may receive both a question code and a function code.

3) Questions

    a. Questions are coded as full or reduced, then further subcoded for the tense carrying morpheme that was included or omitted, i.e., copula, auxiliary or modal, or telegraphic. Questions are also coded for descriptive focus. See descriptive utterances below (4b).

    b. To receive a question code, questions must be of the type that can be optionally reduced. This means inversion of a copula, auxiliary or modal must have occurred, even if the morpheme is deleted, and that intonation-only questions, tag questions, and Wh-questions do not receive question codes (they may receive descriptive focus codes). Even ambiguous Wh- questions do not receive a code.

4) Statements

    a. Directives are parents' attempts to change children's behavior or attentional focus.

        DIRECT:

        Direct directives provide the child with exactly what action the parent does or doesn't want the child to do.

        INDIRECT:

        Indirect directives make a suggestion or guide the child.

    b. Descriptives describe an action, attribute or state of a first/second person subject (interpersonal) or third person subject (other-focused). To be descriptive, something must be described.

Tips to avoid mistakes:

1. Think about if there is grammatical optionality in questions.

2. Only one code for pragmatic function per utterance.

3. Code the embedded clause.

4. Wh- questions never get a question code but can get function code.

5. Use context. *That's a girl* is other-focused descriptive if talking about a toy girl, but it doesn't get a code if it means *That'a girl* directed at child.

6. Watch out for abstract subjects.

Code	Meets operational definition	Does not meet operational definition
Direct directive	Get the fork. Look. Don't put that in your mouth. Come show me.	Not in your mouth. Watch out. Keep going. Just pretend.
Indirect directive	Can you get him to stay? Let's look in here. You could play with that ball. Not in your mouth. Be careful.	The boy fits better. You gotta stir it.
Interpersonal focused descriptive	I had too much. You're using the spoon to cook? Mommy wants more.	We're rolling them, not throwing them. I mean in his pond. You know what these are. You're right.
Other-focused descriptive	Roo is hungry? Where does the girl go? He ate the food?	Looks like her sister. It's all about timing. That's a way to go swimming too.
Reducible question	You finished? Are you finished? You playing with that? Are you playing with that? You wanna play? Do you wanna play?	What do you see? Where they all going? It's ready now? What are you going to play with?

Appendix D

Glossary of Typology Subcodes

Code	Verb form
MOD	modal
PRES -T	1st and 2nd person singular or 3rd person plural present tense
AMB	Omitted auxiliary DO, BE, or HAVE or missing subject and tense marking
IMP	imperative
LET'S	Let's
BARE	Serial verbs or bare infinitives
TEL	telegraphic
PNC	no change irregular past tense (e.g., hit, cut, put)
COP	copula
AUX	auxiliary BE
DO	auxiliary DO
HAVE	auxiliary HAVE
PAST	regular past tense –ed or all other irregular past tense
PRES +T	third person singular present tense (regular –s or irregular e.g., says, has)

Appendix E

Conversational Contexts for Reduced Questions

Conversational contexts arose in conversations the 15 parents had with their children in which asking a reduced question seemed more appropriate than asking a full question. Other times, asking a full question seemed to be optional. First, at times, a parent was initiating a conversation topic and asked a full question (1). Other times when initiating a topic, the question was reduced (2). Both options sound grammatical in the adult input but native speaker judgments suggest that parents are more likely to use the auxiliary when initiating a conversation as compared to responding to a child utterance by expanding or recasting it. An expansion occurs when the parent adds to the child's utterance while a recast changes the syntax of the child's message without changing the meaning (3-6; Girolametto & Weitzman, 2006; Baker & Nelson, 1984). Intonation only questions also seem more likely when requesting clarification than when requesting information. Some parents may request clarification using reduced questions frequently. One reason they may do so is that their children are unintelligible or that they're young and not yet using adult like sentences (3). In these cases, requests for clarification confirm for the parent what the child meant (Fey, 1986). Another reason that parents may request clarification is supported by informal observation. Many parents expand their children's statements with reduced intonation only questions to keep the conversation going (4; Hoff, 2006). Native speaker intuition tells us that asking a full question in these cases seems less felicitous than asking a reduced question.

(1)   M: Do you want to build?   (F16)

(2)   M: You wanna build with the blocks? (F13)

(3)   C: xxx?
       C: Out?

M: You want it out? (M01)

(4)   C: I want play.
        M: You want to sit at the table and play? (F04)

When recasting or expanding results in reduction, informativeness will be affected differently based on the grammatical subject of the question. When parents ask question with first or second person subjects, the question is more likely to reward a –T grammar than a question with a third person subject is (5 and 6).

(5)   C: Hold it.
        M: You want me to hold it?   (F04)

(6)   C: Whee Roo.
        M: Roo likes the slide? (F08)

The implication is that requesting information does not necessarily need to decrease informativeness. If an adult keeps the conversation focused on third person subjects, then the child utterances which are expanded as intonation only are +T. Using reduction in interpersonal conversation could be engaging to the child when the reductions come in the form of encouraging expansions, but requesting clarification on third person topics would both achieve this goal and reward a +T grammar for the English learning child.