The effect of individual discourse-pragmatic features on referential choice in child English

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Abstract

Previous research has shown that children attend to discourse-pragmatics (e.g. newness, joint attention) when they produce referential forms in both languages that permit subject omission and those that do not. However, studies in languages that do not permit subject omission have been limited to only one or two discourse-pragmatic features, bilingual participants, and/or data taken from transcripts rather than videotapes. In the present study, we extend this work by investigating how English-speaking children attend to six discourse-pragmatic features, using videotaped data so that context for all features can be accurately assessed. We find that children as young as 2;0 are sensitive to these discourse-pragmatic features in selecting each of four referential forms: omitted subject, pronominal, demonstrative, and lexical noun phrase. PRIOR MENTION, PHYSICAL PRESENCE, and JOINT ATTENTION emerge as the most salient individual features, and children are sensitive to the features in combination.

Keywords: Argument realization; Accessibility; Null subject; Referential choice

1. Introduction

It has been widely observed that young children up to about 4 years of age omit subjects from their sentences more frequently than their adult counterparts do, whether the target language allows it or not. Thus, they frequently produce utterances like want more apple instead of I want more apple (Eric 1;11; Bloom, 1970) or Spill instead of Mommy spilled the juice (Allison 1;10; Bloom, 1970). Children speaking languages like English and German where subject omission is not typically permitted, nonetheless, omit between 20% and 50% of subjects (compared to 5–10% omission by adults; e.g., Bloom, 1990; Clahsen, 1991; Hyams and Wexler, 1993; Valian, 1991; Wang et al., 1992; Weissenborn, 1990, 1992). Children speaking languages like Inuktitut and Italian where subject omission is permitted typically omit 70% or more of their subjects (compared to 50–60% omission by adults; e.g., Valian, 1991; Skarabela and Allen, 2003).

Why do children over-omit subjects? Explanations for this phenomenon come from three main theoretical perspectives: grammatical, performance, and discourse-pragmatic. Research from the first two perspectives has focused almost exclusively on languages like English and German where subject omission is not typically permitted, and has attempted to explain why children omit subjects at all. Accounts from the generative grammatical tradition center on the idea that children have a slightly different grammar from that of adults, such that some syntactic constraints that are mandatory for adults are instead optional for children. This optionality of certain constraints allows subject omission to be licit for children. A wide variety of such constraints have been proposed including truncation (e.g., Rizzi, 1993/4, 2005),
underspecification (e.g., Hyams, 1996; Clahsen et al., 1996; Sano and Hyams, 1994; Wexler, 1998), and the null auxiliary (Boser et al., 1992). In contrast, accounts focusing on children’s performance (as opposed to competence) claim that children have the same internal grammatical system as adults but have a much more limited processing capacity. Therefore, they omit subjects in conditions where the processing load is higher, such as in long utterances (e.g., Bloom, 1990; Valian, 1991; Valian and Aubry, 2005; Freundenthal et al., 2007), or where subjects can be easily reduced, as in prosodically weak positions in the sentence (Gerken, 1991).

Research from the discourse-pragmatic perspective, however, has mainly focused on languages like Inuktitut and Italian where subject omission is permitted, and has attempted to explain why some subjects are omitted while others are not. This approach has highlighted children’s sensitivity to the complexities of information flow in discourse, claiming that children omit subjects that are accessible to their interlocutor through recency of mention in the discourse, joint attention to the referent, etc. (e.g., Clancy, 1993; Allen, 2000; Serratrice, 2005; Skarabela, 2007a,b; Huang, 2011). Children then occasionally overestimate what is accessible, resulting in more subject omission for children than adults.

While numerous studies are available from the grammatical and performance perspectives on languages that prohibit subject omission, there are far fewer from the discourse-pragmatic perspective, especially studies that solely focus on English acquisition. In the present study, we fill this gap by exploring English-speaking children’s sensitivity to six established accessibility features in producing referential forms with caregivers in naturalistic situations in their homes. This study will provide the basis for future detailed comparison of explanations for subject omission across theoretical approaches.

1.1. The discourse-pragmatic approach

The underlying theoretical basis for this study is the discourse-pragmatic assumption that both adults and children are more likely to omit a subject in speech when its referent in the real world is prominent in and easily recoverable from the discourse and/or physical context. This is consistent with Grice’s (1975) Maxim of Quantity which states that the speaker should be as informative as required but no more informative than needed: if the referent is already salient from context, it does not need to be expressed in speech.

For adults, there is ample literature showing that subject omission is strongly influenced by factors of information flow within discourse (e.g., Ariel, 1990, 2001; Bock and Warren, 1985; Chafe, 1987, 1996; Du Bois, 1985, 1987; Givón, 1983; Gundel et al., 1993; Prince, 1985). This work is broadly organized around the notion of the conceptual accessibility of a referent, defined as “the ease with which the mental representation of some potential referent can be activated in or retrieved from memory” (Bock and Warren, 1985, p. 50). Thus, a subject that is highly accessible in the information flow of the discourse is likely to be omitted in actual speech because it can easily be retrieved from memory.

A variety of discourse features have been shown to feed into what makes the referent of a subject accessible, as discussed at length in the literature just mentioned. These include the recency of prior mention of the referent in discourse, the number of other potential competitor referents in the immediate discourse context, the number of utterances that the referent persists in the discourse after its initial mention, the extent to which the referent is the topic of current discourse, the degree to which the referent is the focus of attention in the physical context, the presence of the referent in the physical context, the degree of animacy of the referent, the degree to which the referent is uniquely identifiable for all in a given setting or social group (e.g., the sun, the floor, the queen, the boss, John), and the degree of imageability of the referent. In general, a highly accessible referent tends to be recently mentioned, with no competitors, persistent after initial mention, the topic of current discourse, the focus of attention of the interlocutors, present in the physical context, highly animate, uniquely identifiable, and highly imageable.

Ariel (1994:99) proposes that speakers “direct their addressees’ retrieval of the intended referents by signalling to them how accessible those mental entities are” through the use of particular forms in speech to express those referents. Several researchers propose scales of forms in speech (e.g., zero anaphora, pronoun, demonstrative, full noun phrase) ordered by the degree of information about the referent provided in the form, indicating correspondence between each form and the level of referent accessibility it is used to express (e.g., Ariel, 1990; Givón, 1983; Gundel et al., 1993). The most accessible referents are typically realized by forms that provide very little information about that referent: zero anaphora as well as agreement markers on the verb and unstressed or bound pronouns. Thus, an omitted subject signals that the referent is known because no information about that referent is provided in the linguistic expression. The relationship is not completely straightforward, however. For example, speakers may sometimes choose a higher information form (e.g., a full noun phrase) for a highly accessible referent in order to combat the effect of natural decay or to reduce the possibility of interference from other possible referents.

Numerous studies have shown that children, like adults, are also sensitive to the complexities of information flow in determining which subjects to omit in their speech. These include studies in at least eight languages where subject omission is permitted – Hindi (Narasimhan et al., 2005), Inuktitut (Allen, 2000; Allen and Schröder, 2003; Skarabela, 2007a,b), Italian (Serratrice, 2005; Serratrice et al., 2004), Japanese (Guerriero et al., 2006; Mishina-Mori, 2007), Korean
(Clancy, 1993, 1997), Mandarin (Huang, 2011), Spanish (Paradis and Navarro, 2003; Shin and Cairns, 2012) and Turkish (Gürçanlı et al., 2007) – as well as three languages where subject omission is largely prohibited – English (Serratrice et al., 2004; Guerriero et al., 2006; Mishina-Mori, 2007; Graf, 2010; Campbell et al., 2000; Matthews et al., 2006), French (De Cat, 2004; Salazar Orvig et al., 2010a,b), and German (Hofemoeller et al., 2005; Schmitz, 2007).

All of the studies have shown the same general pattern: that children tend to omit subjects more frequently when the referent is accessible than when it is not. A total of nine different accessibility features have been investigated across the different studies (Allen et al., 2008), although they are labelled and defined somewhat differently across studies. They are all derived from the features used in the adult studies mentioned earlier, but not all the features studied for adults have been studied for children, and not all studies have investigated the same features. The features are PRIOR MENTION (how recently a referent has been mentioned in speech), PHYSICAL PRESENCE (whether a referent is present in or absent from the physical context of the interlocutors), DISAMBIGUATION (whether a particular referent has potential competitor referents in the linguistic or physical context), ANIMACY (whether the referent is animate), JOINT ATTENTION (whether the speaker and listener are focused on the same referent while they are aware of each other’s attention), TOPICALITY (whether the referent is the focus of conversation), QUERY (whether the referent is the subject of or the response to a question), EXPLICIT CONTRAST (whether a contrast is made explicit or emphasized by the speaker), and PERSON (whether the referent is first/second vs. third person). All of these factors have been found to have a significant effect on subject omission in one or more studies.

Analyzing languages that prohibit subject omission, as in the case of English, is of particular interest because subject omission is ungrammatical with respect to the adult language and thus requires the most explanation. Since grammatical and performance-based studies are mostly based on naturalistic data from monolingual speakers, the ideal parallel discourse-pragmatic-based study would also be based on naturalistic data from monolingual speakers and would investigate several already established features of discourse that signal accessibility. However, virtually all of the existing discourse-pragmatic studies on languages prohibiting subject omission focus on only one or two accessibility features (English: Graf, 2010; Guerriero et al., 2006; Gundel et al., 2007; Matthews et al., 2006; French: De Cat, 2004; Salazar Orvig et al., 2010a,b; German: Hofemoeller et al., 2005)\(^1\) or they assess cross-linguistic influence in bilinguals rather than patterns in monolingual speakers (English-Spanish: Paradis and Navarro, 2003; English-Italian: Serratrice and Sorace, 2003; Serratrice et al., 2004; German-Italian: Schmitz, 2007). Further, the only naturalistic study with monolingual English-speaking children that looks at more than one accessibility feature (Serratrice et al., 2004) is based on transcript data taken from the CHILDES database rather than data for which the researchers had access to either audio or video. Features such as joint attention that are derived from the physical setting are quite difficult to assess in transcript data.

Therefore, despite a number of previous studies on English subject omission from the discourse-pragmatic perspective, there remains a significant need for an assessment of monolingual children’s sensitivity to several accessibility features, including ones relevant to the physical context, in a naturalistic setting. This study intends to fill that gap.

1.2. The present study

The present study is designed to fill the previously mentioned gap in the literature by investigating monolingual children’s sensitivity to six accessibility features when expressing referents in their naturalistic interactions with caregivers in a language that typically prohibits subject omission. Data from four monolingual English-speaking children are analyzed at two time points – early in their acquisition (age 2;0–2;7) and towards the end of the subject omission period (3;0–3;1) – and compared to caregiver data. Videotaped data from naturalistic child-caregiver interactions are used to allow for reliable coding of a range of accessibility features based on context, and to allow for maximum comparability to studies from other theoretical perspectives which also used naturalistic data. In addition to the main goal of determining how sensitive English-speaking children are to accessibility features, we also briefly touch on two other questions: which features have the strongest effect on referential choice and the cumulative effect of accessibility.

2. Method

2.1. Participants

Data for this study were taken from the Manchester-Max Planck Dense Data Database (Lieven et al., 2003, 2009). Participants were four monolingual English-speaking children: Annie, Brian, Eleanor, and Fraser. All the children lived

\(^{1}\) Salomo et al. (2010,2011) assess the role of Prior Mention and Perceptual Availability on referential choice for objects in German-speaking three- and four-year-olds.
with their families in a large metropolitan area in England and came from middle-class backgrounds. Two of the children – Eleanor and Fraser – were taped five hours per week for six weeks during the periods 2;0–2;1 and 3;0–3;1, while a third child Annie was taped for 7 weeks from 2;0–2;1 and for three weeks from 3;0–3;1; The fourth child, Brian, was taped five hours per week throughout the entire period 2;0–3;1. The five hours per week typically comprised one-hour sessions on each of five different days, four of which were audi-taped and one videotaped. For our study, we used only the one hour per week per child recorded on videotape in order to analyze the utterances in the light of non-verbal aspects of the interaction as well as the physical context.

2.2. Data

The children were videotaped in spontaneous interactions with their mother and/or a familiar researcher while taking part in such every-day activities as playing with toys and having snacks. All utterances spoken by and to the child were transcribed by research assistants in CHAT format (MacWhinney, 2000; see Lieven et al., 2003, 2009, for further details about the method of recording and transcription). The transcripts and videotapes were kindly made available to us by Elena Lieven. Previous studies have shown that both proportion of subject omission and sensitivity to accessibility features change over time (e.g., Hyams, 1986; Guerriero et al., 2006; Serratrice et al., 2004; Salazar Orvig et al., 2010a,b). Therefore, we analyzed utterances separately at the two available time points to assess development. Time 1 for three of the children comprised data from 2;0 to 2;1. One child, Brian, had a somewhat lower mean length of utterance (MLU) than the other three children during these earliest recordings. Since we also had later recordings for him, we used a slightly later set of data for his Time 1 – from 2;4 to 2;7 – so that the linguistic level of all four children would be as comparable as possible. Time 2 for all four children comprised data from 3;0 to 3;1, by which point the children all have a similar linguistic level.

Only fully intelligible utterances containing a verb were coded for grammatical and discourse-pragmatic information. The following were excluded: exact self-repetition, imitation, recitation of poems or songs, frozen forms, and routines. Thus, a total of 1901 utterances were coded from 25 files at Time 1 and 3177 utterances were coded from 21 files at Time 2.

A crucial part of our study is determining the effect of discourse-pragmatics on subject realization. Therefore, we excluded from analysis all utterances in contexts where the omission or overtness of the subject is fixed and cannot vary depending on the accessibility of the referent for that subject. This comprised six types of contexts. First, all imperative utterances were excluded (Time 1: 227; Time 2: 317). Subjects of imperatives must be omitted for grammatical reasons in English, and thus are excluded as a matter of course in studies of subject omission in English.

Second, all utterances containing first and second person subjects were excluded (Time 1: 627 first person and 60 second person; Time 2: 1194 second person and 278 second person2). First and second person subjects are, by definition, virtually always fully accessible in the discourse: they are animate, present in the discourse context, jointly attended to, recently mentioned, and unambiguous. Because they do not vary in accessibility, they are not a good test of whether children are sensitive to accessibility features in their subject omissions and they can only be either null or pronominal, so the full range of realization cannot be observed.

Third, in earlier analyses of this data set (Hughes and Allen, 2006; Hughes, 2011), we found that both the children and the adults often used proper names to refer to themselves or to their interlocutors as in the following examples:

(1)  

a. **Mommy doesn’t want any sugar.** (Mother of Annie) [about herself]  
b. **Brian got a big job to do.** (Brian, 2;04) [about himself]  

This is a common feature of both child speech and child-directed speech in English and certain other languages (Snow and Ferguson, 1977; Gallaway and Richards, 1994; Hyams, 2008). Importantly, these proper nouns are grammatically third person, but pragmatically first and second person. Therefore, in order to make sure that these lexicalized, fully accessible subjects were not skewing the results in any way, they were removed from this analysis (Time 1: 48; Time 2: 88). Fourth, all utterances were excluded in which the existence of JOINT ATTENTION could not be determined due to the positioning of the video camera or movement out of frame by the participants (Time 1: 67; Time 2: 118).

Finally, utterances were excluded that contained either of two types of subjects that are virtually never omitted in English: subjects that are explicitly contrasted with an alternative referent using stress or tone of voice (e.g., ‘This cup is mine and that cup is yours’), and subjects that are the referent of or the answer to a question (e.g., referent of question: ‘What broke?’; answer to question: ‘The vase broke.’). These two features – CONTRAST and QUERY – have been used

2 At Time 1, the children omitted subjects in 37% of all first person utterances and 60% of all second person utterances. These percentages are significantly higher than the percentage of omitted third person subjects at Time 1 (24%). At Time 2, the children omitted far fewer subjects but still omitted 16% of all first person subjects. This is significantly higher than the proportion of second and third person omissions (3% and 4% respectively), which show a more adult-like rate of omission.
as accessibility features in previous studies of the effect of discourse-pragmatics on subject omission (e.g., Clancy, 1993; Allen, 2000). However, they are different from other features in being categorical: contrasting or questioning a subject in this way necessitates rather than simply influences the use of an overt subject in English (Hughes and Allen, 2006; Hughes, 2011), so these utterances were excluded (Time 1: 25 contrastive utterances and 124 queries; Time 2: 57 contrastive utterances and 97 queries). Excluding utterances with these two types of subjects from the analysis allowed us to achieve a more accurate picture by assessing only those features that truly allow for variation.

The final data set for analysis, then, included all third person subjects that were not explicitly contrasted or queried, and that appeared in fully intelligible and non-imperative utterances. Table 1 gives the age, number and length of sessions, the MLU, and the number of possible subject contexts for each child at each of Time 1 and Time 2. For comparison purposes, 15% of the utterances from each of the four mothers were randomly selected using the same criteria as outlined above for the child files. This yielded a total of 1129 possible subject contexts.

2.3. Accessibility features

All third person subjects from both the child and mother data that fit the above criteria were coded for accessibility. Six accessibility features were selected for analysis, based on the nine that have been previously investigated in child language studies (Allen et al., 2008). These are ANIMACY, CONTEXTUAL DISAMBIGUATION, PHYSICAL PRESENCE, PRIOR MENTION, LINGUISTIC DISAMBIGUATION, and JOINT ATTENTION. Note that DISAMBIGUATION was treated as two features for this study – CONTEXTUAL DISAMBIGUATION and LINGUISTIC DISAMBIGUATION – because those two types of disambiguation have been shown to function differently in previous studies (e.g., Allen, 2000). Thus, four of the nine previously studied accessibility features were not analyzed in this study. The reasons for excluding PERSON, EXPLICIT CONTRAST, and QUERY were already noted in section 2.2. The feature TOPICALITY was excluded because it is much more general than the other features and indeed subsumes several of them.

Each subject in the data was assigned a binary value for each feature based on how accessible its referent was in the discourse context (e.g., Ariel, 2001; Clancy, 1993; Allen, 2000; Skarabela, 2007b).3 An accessible value indicates that the referent is easily identified in the discourse context, so the speaker is likely to be less explicit in speech and possibly omit the subject. An inaccessible value indicates that the referent is not easily identified in the discourse context, so the speaker should be more explicit in speech and thus not omit the subject. Table 2 lists the six features and how accessibility vs. inaccessibility was defined for each.

The following example illustrates how each subject was coded. In the interaction in (2), the mother and child are playing with multiple blocks on the table. At the time of the final utterance, the mother is looking at and touching the block in question (Block B), and the child is also looking at it.

(2) MOT: That block fell down. [referring to Block A]
     MOT: Where does this block go? [referring to Block B]
     CHI: Ø go there. [referring to Block B] (Annie 2:0)

3 In reality, these features are not binary but rather gradient in nature. For example, numerous hierarchies posit degrees of animacy in which people are considered more animiate than animals, which are more animate than plants, which in turn are more animiate than rocks (Silverstein, 1976). A similar gradient can be posited for the other five features as well. However, as it has been the practice in the literature to treat these features as binary in order to simplify the analysis and to allow for statistical analysis based on these values, the current study maintains the use of binary values.
Table 2
Accessibility features.

<table>
<thead>
<tr>
<th>Accessibility Feature</th>
<th>Accessible Value</th>
<th>Inaccessible Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANIMACY (AN)</td>
<td>Animate</td>
<td>Inanimate</td>
</tr>
<tr>
<td>CONTEXTUAL DISAMBIGUATION (CD)</td>
<td>Only referent in physical context</td>
<td>Multiple referents in physical context</td>
</tr>
<tr>
<td>PHYSICAL PRESENCE (PP)</td>
<td>Physically present</td>
<td>Physically absent</td>
</tr>
<tr>
<td>PRIOR MENTION (PM)</td>
<td>Given: mentioned within preceding</td>
<td>New: not mentioned within preceding</td>
</tr>
<tr>
<td></td>
<td>5 utterances</td>
<td>5 utterances</td>
</tr>
<tr>
<td>LINGUISTIC DISAMBIGUATION (LD)</td>
<td>No other possible referents in preceding</td>
<td>Other possible referents in preceding</td>
</tr>
<tr>
<td></td>
<td>5 utterances</td>
<td>5 utterances</td>
</tr>
<tr>
<td>JOINT ATTENTION (JA)</td>
<td>Referent focus of attention for child and interlocutor</td>
<td>Referent not focus of attention for child and interlocutor</td>
</tr>
</tbody>
</table>

Table 3
Four referential forms - A hierarchy of accessibility markers.

<table>
<thead>
<tr>
<th>Low Accessibility Marker</th>
<th>Accessible Value</th>
<th>Inaccessible Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Accessibility Marker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lexical NP</td>
<td>Boy go. (Brian 2:07.01)</td>
<td></td>
</tr>
<tr>
<td>Demonstrative</td>
<td>This go round here. (Fraser 2:00.20)</td>
<td></td>
</tr>
<tr>
<td>Pronoun</td>
<td>It goes there. (Annie 2:00.25)</td>
<td></td>
</tr>
<tr>
<td>Null</td>
<td>Ø want chips. (Eleanor 2:00.15)</td>
<td></td>
</tr>
</tbody>
</table>

The (omitted) subject in the final utterance is coded as follows:

ANIMACY. A block is inanimate. Because animate entities are particularly salient to children in the discourse context, the subject which has an inanimate referent is coded as inaccessible.

CONTEXTUAL DISAMBIGUATION. At the time of the utterance, the child is playing with several blocks, so there are numerous other possible referents in the physical context that could fit the semantics of the verb and the grammatical elements of the intended referent. Therefore, the subject is coded as inaccessible.

PHYSICAL PRESENCE. The block is physically present, and therefore more easily identified than if it were absent from the physical context. The subject is coded as accessible.

PRIOR MENTION. Any referent that has been mentioned in the preceding 5 utterances is considered accessible.4 Because the block referred to was just mentioned in the previous utterance, it is coded as accessible.

LINGUISTIC DISAMBIGUATION. There are two referents mentioned in the preceding five utterances that fit the semantics of the verb and the grammatical elements of the referent, making it more difficult to identify. Therefore, the subject is coded as inaccessible.

JOINT ATTENTION. The block is the focus of attention for both the mother and the child, and they are aware of each other’s attention on the block. Thus the subject is coded as accessible.

2.4. Argument forms

In order to achieve a better understanding of the effects of discourse-pragmatics on subject choice, all third person subjects in the analysis were categorized as one of four possible referential forms, based on Ariel’s accessibility theory (Ariel, 2001). The central claim of accessibility theory is that adult speakers will choose a referential form based on the accessibility of the referent. The four grammatical forms analyzed in this study are lexical noun phrases, demonstratives, pronouns, and null forms. Table 3 demonstrates the hierarchy of these four forms. Lexical forms are low accessibility markers because they are used by a speaker in situations when a referent is inaccessible, meaning that the speaker has to convey more information in order to identify the referent. Conversely, null subjects, zero forms, are high accessibility markers because they mark that a referent is highly accessible in the discourse context, meaning that the speaker does not have to convey as much information to identify the referent. In other words, the subject form signals the degree of accessibility of a referent. Demonstratives and pronouns fall somewhere in between lexical forms and null subjects in terms of accessibility. In many previous studies, demonstratives are ranked slightly higher than pronouns in terms of informational status, hence the ordering given in Table 3 (see Ariel, 1990, 2001; Givón, 1983; Gundel et al., 1993 among others).

4 In their corpus of Inuktitut child speech, Skarabela and Allen (2003) determined that few arguments have preceding references more than 5 utterances prior, showing that the difference between a cut-off of 5 versus 20 preceding arguments is minimal. They suggest that a threshold of 5 previous utterances to encode a referent as new rather than given may be an appropriate distance for child spontaneous speech (Allen et al., 2008).
2.5. Analysis

The general hypothesis for this study is that the accessibility of each of the six previously defined discourse-pragmatic features (i.e., ANIMACY, CONTEXTUAL DISAMBIGUATION, PHYSICAL PRESENCE, PRIOR MENTION, LINGUISTIC DISAMBIGUATION, and JOINT ATTENTION) has a significant effect on the choice of referential form produced by the children. To determine whether this is the case, the data were analyzed in two ways.

First, the choice of referential forms for accessible vs. inaccessible referents was compared for each individual feature for the caregivers as a group (section 3.1) and then for each child at Time 1 and Time 2 (section 3.2). As described earlier, each possible subject context in the data was assigned a binary value – accessible or inaccessible – for each of the six accessibility features. A two-way contingency table analysis was then conducted for each of the six predictors, with accessibility (accessible, inaccessible) as the independent variable and form (null, pronominal, demonstrative, lexical) as the dependent variable. Chi-square tests of independence were performed to determine whether there was a statistically significant relationship between each of the predictors and the form of the subject. Second, in section 3.3, the cumulative effect of the six features was analyzed for each child by comparing the choice of form for those subjects whose referents are fully accessible (i.e., accessible for all six features) vs. those subjects whose referents are fully inaccessible (i.e., accessible for none of the six features).

3. Results

In the following three sections, we report the effect that the accessibility of the six previously defined discourse-pragmatic features has on the caregivers’ and children’s choices of referential forms.

3.1. The effect of individual features for the caregivers

Fig. 1 shows the results for the caregivers’ data for all four mothers combined. As is expected for adult speech, the overall number and proportion of omitted subjects was quite small (i.e., 2% or less for accessible and inaccessible values of each feature). However, the distribution of the other three forms (pronom, demonstrative, lexical) was found to be significantly different for accessible vs. inaccessible referents for each of the six features, clearly demonstrating the effect of accessibility on the caregivers’ referential choice. When the values for the features were accessible, the caregivers produced pronouns at a rate of 52–63% depending on the feature. When the values for the features were inaccessible, pronouns were produced at a much lower rate of 22–50% depending on the feature. Instead, demonstrative and lexical forms were predominantly used for inaccessible referents. This finding supports the claim that demonstrative forms carry more information than pronouns as has been suggested in previous studies (e.g., Ariel, 1990, 2001; Givón, 1983; Gundel et al., 1993; Hughes and Allen, 2006; Hughes, 2011).

While every feature shows highly significant differences between the forms chosen for accessible vs. inaccessible forms, the feature PRIOR MENTION has the greatest effect in determining whether a pronominal versus a demonstrative or lexical form is used. These results confirm results found in other studies demonstrating that adults’ production of referents is influenced by discourse-pragmatic features.

3.2. The effect of individual features for the children

Fig. 2a–d illustrates the results at Time 1 for each of the four children. Fig. 2a demonstrates that Annie produces more null subjects and pronouns when referents are accessible for a particular feature and many more lexical forms when referents are inaccessible. This is a significant difference for five of the six features – ANIMACY at the p ≤ 0.05 level, and

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5 Although typically developing children go through corresponding stages of development and eventually achieve similar language ability, it has been well-established that there is considerable variation between individual children in both the rate of acquisition and the cognitive strategies that each child applies to the task (Goldfield and Snow, 1997). Therefore, instead of reporting on the trends of the children as a group, we report their individual results in order to exclude the possibility that one or two children are responsible for the patterns seen in the data.

6 The occasionally higher than expected proportion of lexical subjects for accessible referents can at least partially be explained by a common feature of child and child-directed speech in English. Both caregivers and children often repeat lexical forms for third person referents as in the following example:

CHI: Butterfly has gone.

MOT: Where has the butterfly gone? (Fraser, 2:01) [about a puzzle piece]

Because these examples represent true third person subjects, they were not removed from the analysis.
CONTEXTUAL DISAMBIGUATION, PHYSICAL PRESENCE, PRIOR MENTION, and JOINT ATTENTION at the \( p \leq .01 \) level. Brian also shows this pattern for five of the six features – four of the same features as for Annie, and LINGUISTIC DISAMBIGUATION instead of CONTEXTUAL DISAMBIGUATION (which was significant for Annie). However, Brian produces very few pronouns and demonstratives in comparison to Annie (see Fig. 2b). Like Brian, Eleanor’s choice of forms for accessible versus inaccessible referents is significant (\( p \leq .05 \)) for all features except CONTEXTUAL DISAMBIGUATION (see Fig. 2c). Her data show a very clear pattern in which she produces many more lexical forms and demonstratives when subjects are inaccessible. The data for Fraser in Fig. 2d do not demonstrate as clear a pattern as for the other three children. For three of the features, PHYSICAL PRESENCE, PRIOR MENTION, and JOINT ATTENTION, he produces significantly more null forms when referents are accessible for these features and significantly more lexical forms when they are inaccessible (\( p \leq .01 \)). However, Fraser’s data show an unexpected result for the features ANIMACY and CONTEXTUAL DISAMBIGUATION. For these two features, Fraser actually produces significantly more null subjects in inaccessible contexts. This finding does not match the patterns found for the other three children and requires further analysis.

Overall, the children show sensitivity to discourse-pragmatic features at Time 1 and choose their referents accordingly. They omit a greater number of subjects when referents are accessible and produce more lexical forms and demonstratives when referents are inaccessible. Moreover, the accessibility of three features - PHYSICAL PRESENCE, PRIOR MENTION, and JOINT ATTENTION - has a strong effect on referential choice across all four children.

Fig. 3a–d illustrates the results for each of the four children at Time 2. The patterns of referential choice here strongly resemble those found for the caregiver data in Fig. 1: the number and proportion of pronouns has increased at Time 2 for all children, and there are very few null subjects overall (4%). In addition, and also similar to the child results at Time 1, accessibility for discourse-pragmatic features still plays a significant role in determining referential choice for all of the children. In Annie’s data (Fig. 3a), all six features are significant: ANIMACY, CONTEXTUAL DISAMBIGUATION, PHYSICAL PRESENCE, LINGUISTIC DISAMBIGUATION, and PRIOR MENTION at the \( p \leq .01 \) level and PRIOR MENTION at the \( p \leq .05 \) level. This means that she produces significantly more pronouns when referents are accessible for these features, and significantly more lexical forms and demonstratives when referents are inaccessible for these features. Brian (Fig. 3b) also shows this pattern for four of the six features (\( p \leq .01 \)). As at Time 1, he shows no significant effect of accessibility on referential choice for CONTEXTUAL DISAMBIGUATION. For ANIMACY, he shows the opposite pattern to that expected: he produces more lexical forms for accessible than for inaccessible referents, and more pronouns for inaccessible than for accessible referents. As shown in Fig. 3c, Eleanor replicates the expected pattern for
Fig. 2. (a–d) Percentage of each form for each feature for accessible and inaccessible subjects for each child at Time 1. Feature key: ANIMACY (AN); CONTEXTUAL DISAMBIGUATION (CD); PHYSICAL PRESENCE (PP); PRIOR MENTION (PM); LINGUISTIC DISAMBIGUATION (LD); JOINT ATTENTION (JA). Total N of subjects = 775; Total N overt = 576. *Significant at the p ≤ .05 level; **significant at the p ≤ .01 level.
(a) Percentage of each form for each feature for accessible and inaccessible subjects for Annie at Time 1. Total N of obligatory contexts for subjects = 306; Total N overt = 277. (b) Percentage of each form for each feature for accessible and inaccessible subjects for Brian at Time 1. Total N of obligatory contexts for subjects = 157; Total N overt = 92. (c) Percentage of each form for each feature for accessible and inaccessible subjects for Eleanor at Time 1. Total N of obligatory contexts for subjects = 81; Total N overt = 65. (d) Percentage of each form for each feature for accessible and inaccessible subjects for Fraser at Time 1. Total N of obligatory contexts for subjects = 179; Total N overt = 92.
Fig. 3. (a–d) Percentage of each form for each feature for accessible and inaccessible subjects for each child at Time 1. Feature key: ANIMACY (AN); CONTEXTUAL DISAMBIGUATION (CD); PHYSICAL PRESENCE (PP); PRIOR MENTION (PM); LINGUISTIC DISAMBIGUATION (LD); JOINT ATTENTION (JA). Total N of subjects = 1091; Total N overt = 1044. *Significant at the p ≤ .05 level; **significant at the p ≤ .01 level.

(a) Percentage of each form for each feature for accessible and inaccessible subjects for Annie at Time 2. Total N of obligatory contexts for subjects = 191; Total N overt = 184. (b) Percentage of each form for each feature for accessible and inaccessible subjects for Brian at Time 2. Total N of obligatory contexts for subjects = 272; Total N overt = 250. (c) Percentage of each form for each feature for accessible and inaccessible subjects for Eleanor at Time 2. Total N of obligatory contexts for subjects = 278; Total N overt = 265. (d) Percentage of each form for each feature for accessible and inaccessible subjects for Fraser at Time 2. Total N of obligatory contexts for subjects = 179; Total N overt = 92.
Fig. 4. Cumulative effect of accessibility for six features distributed across four forms for caregivers for fully accessible and fully inaccessible referents only. *Significant at the $p \leq .05$ level; **significant at the $p \leq .01$ level. Total N fully accessible subjects = 99; Total N for fully inaccessible subjects = 19.

five of the features: ANIMACY, PHYSICAL PRESENCE, PRIOR MENTION, LINGUISTIC DISAMBIGUATION, and JOINT ATTENTION are significant at the $p \leq .01$ level. She produces null forms and pronouns at a rate of 70% and higher when referents are accessible for each of the six features. Like Brian, she shows no significant effect of accessibility on referential choice for CONTEXTUAL DISAMBIGUATION. The pattern for Fraser in Fig. 3d is almost identical to that for Eleanor.

The children at Time 2 all show the same general tendency to produce more pronouns when referents are accessible and more lexical forms and demonstratives when referents are inaccessible. While their choice of referents is more adult-like at Time 2 in that they omit fewer subjects than at Time 1, there are still some individual differences. In particular, Brian still seems to rely quite heavily on lexical forms even in accessible contexts, while the other three children are expanding their repertoire of forms by producing many more pronominal and demonstrative forms than at Time 1. Moreover, for all four children, four features are highly significant in determining their choice of referent. When the features PHYSICAL PRESENCE, PRIOR MENTION, LINGUISTIC DISAMBIGUATION, and JOINT ATTENTION are accessible the children produce null subjects or pronouns at a rate of between 45% and 85% depending on the child, and when these features are inaccessible, they produce null subjects or pronouns at a much lower rate of between 17% and 50%.

3.3. Cumulative effect of features

The final analysis focused on the cumulative effect of features. Although the features so far have been treated as though they can be assessed independently from each other, this is almost certainly not the case. Children undoubtedly pay attention to several or all the features at once when they are determining what referent to produce. One way to investigate this cumulative effect of features is to compare subjects whose referents are accessible for all six features with those whose referents are inaccessible for all six features. The hypothesis in this case is that the fully accessible subjects are much more likely to be omitted in speech or to be produced as pronouns than the fully inaccessible subjects, and that few if any of the fully inaccessible subjects would be omitted.

The results of the caregivers’ data for all four mothers combined in Fig. 4 match the prediction above. When referents are fully accessible, 67% of the forms produced by the adults are pronouns; whereas, for fully inaccessible referents, only 5% of the forms produced are pronouns and 95% are lexical NPs. This difference is highly significant and demonstrates the cumulative effect of discourse-pragmatic features on the adults’ choice of referential forms.

As Figs. 5 and 6 demonstrate, the data bear out this prediction for the children at both age ranges as well. At Time 1, the children realize fully accessible subjects with either a null form or a pronoun at a rate of between 46% and 100% depending on the child, and only one child realizes fully accessible subjects with lexical NPs. In contrast, inaccessible subjects are realized as pronominal subjects at a rate of only between 0% and 50% depending on the child, and as lexical NPs at a rate of between 50% and 100% (see Fig. 5). At Time 2, all four children omit subjects at a much lower rate (between 0% and 12%). Instead, they realize fully accessible subjects predominantly as pronouns, at a rate of between 35% and 100%. When subjects are completely inaccessible for all six features at Time 2, there are no omissions and subjects are realized as lexical NPs at a rate of between 50% and 100% (see Fig. 6). Although there are some individual differences, the children show substantial sensitivity to the cumulative effect of discourse-pragmatic features when producing a referent at both Time 1 and Time 2.
Fig. 5. Cumulative effect of accessibility for six features distributed across four forms at Time 1 for each child for fully accessible and fully inaccessible referents only. Feature key: ANNIE (AN); BRIAN (BR); ELEANOR (EL); FRASER (FR). *Significant at the $p \leq .05$ level; **significant at the $p \leq .01$ level. Total N fully accessible subjects: AN = 2; BR = 2; EL = 2; FR = 22. Total N for fully inaccessible subjects: AN = 23; BR = 7; EL = 2; FR = 2.

Fig. 6. Cumulative effect of accessibility for six features distributed across four forms at Time 2 for each child for fully accessible and fully inaccessible referents only. Feature key: ANNIE (AN); BRIAN (BR); ELEANOR (EL); FRASER (FR). *Significant at the $p \leq .05$ level; **significant at the $p \leq .01$ level. Total N fully accessible subjects: AN = 13; BR = 17; EL = 55; FR = 8. Total N for fully inaccessible subjects: AN = 3; BR = 11; EL = 3; FR = 7.
4. Discussion

This study set out to determine whether accessibility as revealed through six accessibility features could explain the patterns of selection of argument form in naturalistic interactions between English-speaking children and their mothers. The effect of the features was examined individually and in relation to each other. In line with previous studies, we expected that the children would omit subjects more at the earlier stage of development (Time 1) than at the later stage (Time 2) regardless of accessibility factors, and that the children would omit subjects more than their adult caregivers. We also predicted that discourse-pragmatic features would have an effect on the production of referential forms for the children at both developmental stages as well as for their caregivers. That is, although the children at Time 1 and Time 2 might not be completely adult-like in their choice of argument form, a referent’s accessibility status in the discourse context would still play a major role in whether the children chose to realize a referent as a null subject, a pronoun, a demonstrative or a lexical NP. However, the question remained as to whether all six features would have an effect on subject realization and whether children would show sensitivity to the cumulative effect of the features (e.g. if several features are accessible for a given referent).

As expected, the omission of third person subjects decreased significantly with age. The children at Time 1 (age 2;0–2;7) omitted more than five times as many subjects as the children at Time 2 (age 3;0–3;1) – 27% vs. 5% – who in turn omitted more than twice as many subjects as the adults – 5% vs. 2%. These findings fit the developmental trajectory found in many other studies in English and other languages, demonstrating that at around age 3:0 or at an MLU of 3.0, children’s omission of subjects drops sharply to approach the rate of subject omission in the target language (e.g., Bloom, 1990; Clahsen, 1991; Hyams and Wexler, 1993; Skarabela and Allen, 2003; Valian, 1991; Wang et al., 1992; Weissenborn, 1990).

Next, the six features were tested to determine their individual effect on subject realization in terms of whether the referent would be omitted or realized as a pronoun, demonstrative, or lexical NP. For the caregivers, the accessibility versus the inaccessibility of all six features was found to be significant in determining the choice of referent. For the children at Time 1, there were some differences in the significance of the six features for each child; however, for all four children, the accessibility of three features was found to be highly significant in determining the form of the subject: PHYSICAL PRESENCE, PRIOR MENTION, and JOINT ATTENTION. Although the choice of referential form differed somewhat at Time 2 compared to Time 1 (i.e., more pronominal subjects were produced and fewer omissions occurred), the findings as to the significance of features were similar. The same three features, PHYSICAL PRESENCE, PRIOR MENTION, and JOINT ATTENTION, and one other, LINGUISTIC DISAMBIGUATION, were shown to be significant in determining the choice of referent based on their accessibility values.

Overall, the results indicate that the features PHYSICAL PRESENCE, PRIOR MENTION, and JOINT ATTENTION are the most powerful and persistent of the six accessibility features studied here. This jibes well with results demonstrating the powerful effect of these features in other naturalistic (e.g., Guerriero et al., 2006; Huang, 2011; Hughes and Allen, 2006; Narasimhan et al., 2005; Salazar Orvig et al., 2010a,b; Serratrice, 2005; Skarabela, 2007a,b) and experimental studies (e.g., Campbell et al., 2000; Matthews et al., 2006). However, this is the first study, naturalistic and experimental, to consider all three features at once focused solely on a language where subject omission is not permitted.

Finally, an analysis of the cumulative effect of the features showed that all three groups were sensitive to the effects of accessibility in the discourse context. For the caregivers, when referents were fully accessible for all six features, they produced pronouns at a rate of 67% and omitted subjects at a rate of 1%. When referents were fully inaccessible, only 5% of the forms produced by the adults were pronouns and there were no omitted subjects. For each of the four children at Time 1, 46–100% of all subjects were omitted or were pronominal (null: 0–100%; pronominal 0–50%) when referents were fully accessible. When referents were fully inaccessible, 0–50% of all subjects produced were pronominal and no subjects were omitted. At Time 2, 0–12% of all subjects were omitted and 35–100% of all subjects produced were pronominal when referents were fully accessible for all six features. For fully inaccessible subjects, only 0–15% were pronominal while 50–100% were lexical NPs.

Taken together, these results suggest that English-speaking children are indeed sensitive to a range of accessibility features in determining their production of referential forms in naturalistic interactions with their mothers. This is consistent with findings from earlier experimental studies (Campbell et al., 2000; Matthews et al., 2006; Graf, 2010) and naturalistic studies of English-speaking monolingual children focusing on only one or two accessibility features (Guerriero et al., 2006; Mishina-Mori, 2007), as well as with findings from naturalistic studies analyzing more than two accessibility features but based on transcript data and focusing on bilingual rather than monolingual children (Serratrice et al., 2004; Paradis and Navarro, 2003). However, by testing a full set of six accessibility features in videotaped data produced by monolingual children acquiring a language that does not permit null subjects, the results also underline the cross-linguistic applicability of sensitivity to accessibility features: the patterns found here for English are very similar to the patterns found in other studies with languages which allow subject omission. Moreover, this study demonstrates preliminary results as to the cumulative effect of accessibility indicating a rich area for further research.
It is clear from these findings that the children's sensitivity to the relationship between accessibility features and referential form improves with age: they become more adult-like in their selection of referential forms, selecting pronouns instead of null forms and correctly mapping demonstrative and lexical forms to less accessible referents. This study demonstrates that children, although they begin by using a large number of (ungrammatical) null forms, are appropriately honing and applying their sensitivity to the discourse context by using their developing mapping skills to determine whether a subject should instead be realized as a pronoun, a demonstrative, or a full noun phrase. This development in turn suggests a sharpening of the child's awareness and ability to take the perspective of the other into account when engaged in dyadic interaction with an interlocutor. Further studies should investigate more fully the relative strength of features and how features work together in predicting the selection of appropriate referential forms.

In sum, the positive findings in this study demonstrate that even two-year-olds have a basic understanding that the information status of referents does matter and that they are sensitive to the knowledge of their interlocutors.

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References


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