INFINITIVAL CLAUSES IN CHILDREN WITH TYPICAL AND LATE LANGUAGE EMERGENCE: SUPPORTING A DIMENSIONAL ACCOUNT OF LANGUAGE DELAY

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ABSTRACT

Children who do not speak single words by 2 years of age have been labeled as having late language emergence (LLE). While the majority of children with LLE recover by school-age, it has been argued that they often still perform below the level of their typical peers for specific linguistic skills. In this case, speech-language pathologists (SLPs) should consider language skills as varying along a dimension, rather than as simply impaired vs. unimpaired. To examine the dimensionality of language skill, this study compared infinitival clause production in 22 school-age children with and without LLE. The infinitive clauses were: catenatives, such as *gonna*; *let us* + verb, typically produced as *let's*; unmarked infinitives such as *make it go*; and simple infinitives such as *We want to run*. The 22 participants included 11 with typical development and 11 with a history of LLE, sampled in a conversational context at 8-years of age. Analysis indicated that the groups did not statistically differ for use of the four types of infinitival clauses. However, the LLE group did use fewer simple infinitives, offering support for a dimensional model of language development.

KEY WORDS

Late Language Emergence
Infinitive Clause Production, Syntactic Development
Dimensional Account of Language Delay

INTRODUCTION

Children with late language emergence (LLE) are those for whom the onset of expressive language is delayed to 24 months or later (Zubric, Taylor, Rice, and Slegers, 2007). This delay in expressive language has been operationalized as a productive vocabulary of fewer than 50 words at 2 years, or a score in the lowest 10th percentile on a standardized parent questionnaire regarding vocabulary size. Children with LLE have normal hearing and nonverbal IQ scores, and no obvious neurological impairments. Children with known medical conditions or who are bilingual have typically been excluded from studies of LLE.

Definitions of LLE have shown some variability with regard to age and expressive vocabulary size, with production of two-word combinations as a potential third factor to consider. Some have restricted use of the LLE diagnosis to children at 24 months of age (Zubric et al, 2007), while others have included children up to 35 months of age (Girolametto, Wiigs, Smyth, Weitzman, and Pearce, 2001). For vocabulary size, the commonly suggested cutoff of fewer than 50 words has been implemented by several researchers. Paul and Smith (1993), for example, reported a mean vocabulary size of 27.7 words, with no range given. Similarly, Rescorla (2009) described a group of children with LLE who produced an average of 24.54 words, with a range = 5-131, in contrast to a comparison group of typically developing (TD) children who produced an average of 235.17 words, with a range = 27-319. Both of these studies employed a parent questionnaire to measure expressive vocabulary size. Given the ranges for vocabulary size just noted, both studies included children with vocabularies larger than 50 words in their LLE groups. For these children, both studies reported that a lack of two-word combinations was taken as diagnostic of LLE.

Other studies (e. g., Girolametto et al., 2001) have used a percentile score for vocabulary production as their diagnostic indicator for LLE. The *MacArthur Communicative Development Inventory* (CDI) (Fenson, Dale, Reznick, Thal, and Bates, 1993) is a 680-word parent checklist, which yields a percentile score for vocabulary production for children between the ages of 16-30 months. Thal, Tobias, and Morrison (1991) used a score in the lowest 10th percentile on an early version of the CDI as their cutpoint for LLE, while Girolametto et al. used the lowest 5th percentile.

Other, larger studies have employed yet a different criterion, beyond expressive vocabulary size in words or a percentile score on a checklist. Zubrick et al. (2007), in an epidemiologically-ascertained sample of 1,766 children, defined LLE as a score of -1.0 SD or below on a communication subscale that asks whether a child points to pictures and body parts, follows simple directions, names objects, combines words, and/or uses early-developing personal pronouns. Using that varied tasks and this cutoff, 13.4% of the sample was diagnosed with LLE.

Children with LLE at Kindergarten Entry: Short-Term Outcomes

Many children with LLE exhibit significant growth in vocabulary during the time between diagnosis and school entry, with a majority of them scoring in the average range for language skills at kindergarten (Paul, 1996). Rescorla, Roberts, and Dahlsgaard (1997), for example, reported that children diagnosed with LLE between 24 and 31 months scored in the average range for single-word vocabulary by 3-years, indicating significant growth in what was for some only a five-month period. Likewise, Paul (1993) reported that 37 children with LLE did not differ from typically-developing children for scores on a standardized vocabulary test administered at age 3.

Despite this potential short-term growth in vocabulary, some children with LLE remain below average for syntactic achievement. Many of the bound morphemes of English are acquired between ages 2 and 4, which results in increases to children's mean-length-of-utterance (MLU) during this time. Rescorla, Roberts, and Dahlsgaard (1997) analyzed conversational samples for MLU in 34 children who were diagnosed with LLE between 24-31 months, and then seen for a follow-up visit at 36-months. The children with a history of LLE had an average MLU *z* score of -1.51, indicating that they were either failing to use bound morphemes at a rate similar to peers, or that they were failing to combine words at similar rates, or both. The same study used the *Index of Productive Syntax* (IPSyn) (Scarborough, 2010) which evaluates noun and verb phrase elaboration, the use of questions and negation, and overall sentence structure. The children with a history of LLE performed even lower than they did for MLU, with an average IPSyn *z* score of -2.21. It appeared that the early language delay that may have improved or even resolved relative to single-word acquisition had not improved for more sophisticated language tasks.

In regard to syntactic delays, Paul [9] found that 60% of her sample of children with LLE scored below the 10th percentile on the *Developmental Sentence Score* (DSS) (Lee, 1974), which assesses use of indefinite and personal pronouns, main and secondary verbs, negation, and the use of questions. Ellis Weismer (2007) compared language outcomes at age 5.5-years for 40 children with LLE with those of 43 TD peers. Although the children with LLE scored in the average range on a standardized language test, their mean scores were significantly below those of their TD peers, particularly in sentence imitation, a task which requires the use specific bound morphemes and often complex syntactic structures.

Children with LLE in the Early Grades: Longer-Term Outcomes

The longer-term outcomes for this population will affect their educational placements and their academic progress. As Paul (1996) reported, the majority moved into the average range at kindergarten, while some continued to require clinical attention. It is important to note that even children scoring in the average range for language skills in kindergarten may fall

out of the average range once vocabulary demands increase, once syntactic structures become more complex, and once independent reading is expected, such as in second and third grades (Nippold, 2007).

To address the question of longer-term outcomes, Rice, Taylor, & Zubrick (2008) examined syntax in conversation in 7-year-olds with and without a history of LLE. Results indicated that those with a history of LLE demonstrated significantly lower MLU in morphemes, as well as increased errors on a number of verb structures (i.e., marking of past tense, use of copula and auxiliary "be," and use of auxiliary "do" etc.). In an even longer-term study, Rescorla (2009) found that teens with a history of LLE tended to score lower on standardized tests of grammar than teens without such history, and argued that slow early language development may reflect a predisposition to lower linguistic performance over time. In a recent review paper, Rescorla reported that both small and large *n* epidemiological studies examining long-term outcomes in children with LLE have supported the dimensional account of language delay, "whereby late talkers and typically developing peers differ quantitatively on a hypothetical language ability spectrum" (Rescorla, 2013, p 141).

Infinitival Clause Development in TD Children and Those with SLI

In a concise review of the development of infinitives in TD children, Eisenberg (2004) notes that infinitive use begins around 2 years of age with a restricted set of verbs (e.g., *go*, *want*, *have*), and that they emerge as catenatives (e.g., I *wanna* eat, He's *gonna* jump, We *hafta* wash our hands) or as being unmarked (e.g., *Help me do it*). Some researchers have labeled *let* clauses (e.g., *Let's eat*) as unmarked infinitives (Steffani, 2007), while others have separated *let* into an infinitive category of its own (Scheule, 2009), likely due to the frequency of its use in young TD children (e.g., Let's *pretend*). Unambiguous use of the infinitive marker *to* (e.g., *I need to move that*) occurs once MLU has reached approximately 3.5 (Bloom, Tackeff, and Lahey, 1984) and is labeled as a simple infinitive. The simple infinitive category typically excludes verbs that are usually produced as catenatives, including *gonna*, *wanna*, and *hafta* as noted above.

Regarding infinitive clause development in children with specific language impairment (SLI), findings have been equivocal. Marinellie (2004) examined use of infinitives in conversation for 10-year-old children with and without SLI, and reported no significant differences. In contrast, Leonard, Eyer, Bedore, and Grela (1997) reported lower use for the infinitive *to* marker on a sentence completion task as compared to both age- and MLU-matched peers. Likewise, Eisenberg (2003) reported that children with SLI produced infinitival object complements with fewer verbs than did TD children of the same age or even younger. However, when Eisenberg (2004) compared 5-year-olds with SLI to typical children ranging in age from 3- to 5-years using an elicited production task for infinitival complements, she found that all eight children with SLI demonstrated production of infinitives with a variety of main verbs, and that only one child of the eight with SLI omitted the *to* marker more than once. Given that performance in an elicited task was relatively strong, Eisenberg argued that "the limited production of infinitives in conversation may in part reflect a problem with mobilizing syntactic knowledge (a performance issue) rather than a lack of knowledge per se (a competence issue)" (Eisenberg, 2004, p 319). Thus, it is possible that children with SLI have an "infinitive structure-finding" problem, in the same way that some children demonstrate receptive knowledge of specific vocabulary items yet cannot readily produce those words in conversation and so are labeled as having word-finding difficulties. Arndt and Schuele (2012) also studied infinitival complement use in children with SLI as compared to younger, MLU-matched children with typical language development. Comparison of infinitives used in spontaneous language samples found no difference in the number of infinitival complements or the number of different complement-taking verbs, but the children with SLI were significantly less likely to include the infinitival marker *to*, which Arndt and Schuele took as evidence that these children were experiencing "difficulty with the specific grammatical requirement of infinitival clauses" (Arndt and Schuele, 2012, p. 1).

The current study provides a test case regarding long-term outcomes in LLE by examining the specific use of four infinitival clause types (e.g., catenatives, *let's*, unmarked infinitives, simple infinitives) in a conversational context, where production is not intentionally modeled. Infinitive use in TD children and those with SLI has been examined in both conversational language and elicited tasks, as noted above, but has not, to the best of our knowledge, been specifically tabulated in school-age children with LLE. Whether school-age children with a history of LLE perform more like their TD peers or more like children with SLI for these tasks will shed light on the extent to which language development in those with a history of early delay remains weaker than expected, thereby supporting the dimensional model of Rescorla (2013). The specific questions are as follows:

Do 8-year-olds with and without a history of LLE use catenatives at similar rates in conversational samples?

Do 8-year-olds with and without a history of LLE use *let's* at similar rates in conversational samples?

Do 8-year-olds with and without a history of LLE use unmarked infinitives at similar rates in conversational samples?

Do 8-year-olds with and without a history of LLE use simple infinitives at similar rates in conversational samples?

METHODS

This study was approved by the Institutional Review Board of Texas State University-San Marcos. Informed consent was obtained from the parents of all participants, and assent was obtained from all children in the study.

Participants

Twenty-two children participated in this study, 11 with a history of LLE and 11 with a history of TD. The children in the LLE group were participants in a previous study of early vocabulary growth (Roid & Miller, 2001). That study included 20 children with LLE, who were recruited through newspaper advertising, fliers distributed at daycare centers, and word-of-mouth. The first author attempted to locate all 20 children approximately five years after completing the initial study, but families could not be located (n = 3), or had moved out of state (n = 2), or they declined participation (n =2), or their data were lost (n =2). As a result, this study included a group of 11 children who had LLE as toddlers. At intake, these 11 children had a mean age of 29.7 months (SD = 4.4, range = 24-39).

LLE was diagnosed using the following inclusion criteria. First, children exhibited a reduced vocabulary size, defined as a score below the 10th percentile for their ages on the CDI, as in Thal and colleagues (1991). For the children older than 30 months, vocabulary production scores were below the 10th percentile for 30 months. The mean vocabulary size for these 11 children was 63.4 words (SD = 56, range = 8-188). Second, they exhibited an average nonverbal IQ score on the Brief IQ subtest of the *Leiter International Performance Scale-Revised* [26] with a mean score of 104.00 (SD = 10.51, range = 85-117). Third, English was the only language spoken in the home. Finally, parents reported no history of hearing impairment, autism, or any other neurological disorder. The average level of maternal education was 14.45 years (SD = 2.77). One child was female, and the rest were male. Of the 11 children, 9 were Caucasian, one was African American, and one was Asian-American. At the time of this follow-up study, the 11 children who had LLE as toddlers now had a mean age of 8.6 years (SD = 0.36). All were in mainstream classrooms in public schools in central Texas at the time of this study.

The rate of attrition (11 children with LLE found out of an original n of 20) raises the possibility that the children "lost" to follow-up might have differed from the children "found" for follow-up. Thus, the 9 children lost for follow-up were compared to the 11 children found for follow-up for gender and maternal education in years, as well as their toddler measures of nonverbal IQ and vocabulary size. A 2 x 2 contingency table analysis showed that the proportion of the "lost" group who were males (67%, n = 6) was significantly lower than the proportion of the "found" group who were males (91%, n = 10), χ^2 (1, N = 20) = 1.82, p < .05. Three females were lost to follow-up from the original group, and only one female was retained. Comparisons for the other variables were calculated using independent samples t – tests with equal variances assumed. No significant differences were noted between the two groups for maternal education (t(18) = .315, p = .756), nonverbal IQ (t(18) = .212, p = .834), or vocabulary size t(18) = -.544, p = .593).

The 11 children in the TD group were recruited through contacts at Texas State University (n = 4 children) and an elementary school in the Austin Independent School District (n = 7). Their mean age was 8.5 years (SD = 0.20), and their average level of maternal education was 15.73 years (SD = 2.20). All 11 children were Caucasian. Six were male and five were female. All children were reported by their parents to be functioning on grade level and receiving no special education services. They learned to talk at the expected age, by parent report, and had never received speech-language therapy.

Data Collection and Analysis

Participants were visited in their homes by the first author, and engaged in ten minutes of conversation, which was videotaped. Topics included school, family members, holidays, and favorite activities. It should be noted that conversational language samples are, by their nature, uncontrolled for content and/or syntactic difficulty. Video samples were transcribed by graduate students. Transcripts were segmented into C-units, defined as an independent clause plus any modifiers. C-units could also include coordinated clauses, defined as one main clause plus one additional clause that was introduced with *and*, *but*, or *or*, following procedures in Marinellie (2004).

Once transcription and segmentation into C-units was complete, the samples were coded for the four infinitive structures of interest (Schuele, 2009). C-units containing *gonna*, *wanna*, *gotta*, *sposta*, and *hafta* were coded as catenatives, and any use of *let's* was coded for that category. Production of unmarked infinitives was coded for C-units containing *make*, *help*, and *watch* that did not include the infinitival marker *to*. Simple infinitives were coded for C-units that included the infinitival marker *to*, followed by a verb. Reliability for identification of the four infinitival clauses was 91% for six randomly-selected transcripts (three LLE and three TD) across all four clause types when coded separately by the graduate student transcribers as compared to the first author. Disagreements in coding were resolved through discussion.

RESULTS

Gender

A 2 x 2 contingency table analysis showed that the proportion of the LLE group who were males (91%, n = 10) was not significantly greater than the proportion of the TD group who were males (55%, n = 7), Pearson χ^2 = (1, N = 22) = 3.67, p = .056. Because this result was not statistically significant, the gender of the participants was not included as an independent variable.

Levene's Test for Equality of Variances

Levene's test was calculated to ensure that the dependent variables did not violate the assumptions of homogeneity of variance necessary for MANOVA. A statistically significant result indicates that the equality-of-variance assumption is violated (Green and Salkind, 2011). Results for the dependent measures indicated that this assumption for the dependent measures (e.g., use of catenatives, *let's*, unmarked infinitives, and simple infinitives) was not violated for homogeneity of variance. Therefore all variables were included in the MANOVA.

Demographic Variables

Results of an independent samples *t*-test with age (unequal variances assumed) and maternal education (equal variances assumed) as the dependent variables and group membership (LLE vs. TD) as the independent variable found no significant differences between the groups for age, (LLE M = 8.66, SD = .38, TD M = 8.58, SD = .20; $t(15.2)$ = .588, p = .565) or maternal education (LLE M = 14.45, SD = 2.77, TD M = 15.73, SD = 2.20; $t(20)$ = -1.19, p = .25). Due to this non-significant finding, no further corrections were made for age or maternal education in the analyses.

Infinitival Clause Use

A MANOVA was computed to determine the effect of language history (e.g., LLE vs. TD) on the use of catenatives, *let's*, unmarked infinitives, and simple infinitives. Dependent variables were the number of catenatives, *let's*, unmarked infinitives, and simple infinitives produced by each participant. The independent variables were talker group membership as a child diagnosed with LLE or as a child with TD. Results of the MANOVA indicated no main effect for the dependent variables and talker group, Wilks' Λ = .827, $F(1,20)$ = .891, p = .490. Table 1 contains the means and the standard deviations on the dependent variables for the two talker groups.

	LLE Control
Catenatives	1.10 (*1.58*) 0.727 (*1.79*)
Let's	0.364 (*0.674*) 0.818 (*2.40*)
Unmarked infinitives	0.910 (*1.14*) 1.09 (*0.944*)
Simple infinitives	10.5 (5.68) 15.09 (6.38)

Table 1. Means (*standard deviations*) for dependent variables by talker group (LLE n = 11; and TD n = 11.)

Follow-up ANOVAs were calculated with significance level corrected using the Bonferroni correction to $p < .012$ (4 comparisons). Results indicated no significant differences between the groups for the use of catenatives, ($F(1, 20)$ = .255, p = .619, partial η^2 = .013), *let's* clauses, ($F(1, 20)$ = .365, p = .552, partial η^2 = .018), unmarked infinitives, ($F(1, 20)$ = .167, p = .552, partial η^2 = .008), and simple infinitives ($F(1, 20)$ = 3.24, p = .087, partial η^2 = .139).

The typically-developing group and the LLE group did not differ for use of catenatives, unmarked infinitives, or the use of *let's*. All three were relatively low-frequency structures, occurring on average fewer than three times per sample. Although the difference between groups was not significant, the typically-developing group used more simple infinitives in conversation than did the LLE group (M = 15.1 productions vs. M = 10.5 productions, respectively). It is worth noting that simple infinitives emerge once MLU has reached 3.5, so reduced usage at age eight by the LLE group hints at a differing level of proficiency with this complex structure.

DISCUSSION

First, the finding that catenatives, *let's,* and unmarked infinitives are relatively infrequent in conversation at age eight is consistent with results from Marinellie [20], who reported a range from 0-8 uses for catenatives and *let's* clauses combined for TD 10-year-olds in conversational samples (M= 3.00, SD = 2.2), as compared to a range of 0-7 uses in 10-year-olds with SLI (M = 2.73, SD = 2.73). Catenatives are restricted in number by definition, as not every verb can form a catenative. *Let's* may occur more frequently in the conversation of younger children (e.g., *Let's pretend*) than it does in that of older children. Unmarked infinitives, like catenatives, can only occur with specific verbs (e.g., *make, help*), which may also be unlikely to occur in a conversational setting between a school-age child and an examiner, where there are no toys or manipulatives in use.

Second, while the use of simple infinitives did not statistically differ between the TD and LLE groups, the M number of productions was 15.09 vs. 10.5, respectively. These results are consistent with those reported by Marinellie (2004), who combined simple and unmarked infinitives into a single category, and found no significant differences in use between a typical group and a group with SLI. In that study, the TD group used a M of 9.13 (SD = 4.54) infinitive clauses, while the group with SLI used a M of 6.73 (SD = 4.09) infinitive clauses. These results are also consistent with reports that children with LLE score in the average range for standardized tests of language skill (Ellis Weismer, 2007; Resorla, 2009), though their specific scores are often lower than those of their TD peers.

It is noteworthy that none of the long-term studies of children with LLE have reported their participants earning significantly higher scores than TD peers. Instead, outcomes indicate either no significant differences (though scores may be lower for the LLE group), or the LLE group does indeed score significantly lower. The results of this study lend further support for a dimensional account of language delay (Resorla, 2013) and suggest that SLPs treating school-age children would be well-advised to probe the language development history even of children who are well past first words, and to adopt a more nuanced model of assessment than a binary impaired vs. unimpaired model.

Finally, it should be noted that one of the advantages of conversational language sampling (i.e., its ecological validity, as the child is allowed to choose the topic and direct the interaction), which has made it a standard language assessment task for years, is also a disadvantage in that children make very

different choices about what to discuss, which then influences the syntactic nature of their language. In reviewing the transcripts of the children in this study, it was apparent that some children chose to discuss family members, teachers, and favorite foods, and that these topics may have provided fewer opportunities for the emergence of complex syntax. Other children chose to describe a favorite vacation, which led to use of a narrative structure that included elements of story grammar (e.g., initiating events, conflict resolution, etc.), which provided more opportunities for complex sentences though use of conjunctions such as *because*. Still other children chose to explain a favorite game or sport, which has been described as an expository task and one which elicits perhaps the most use of complex syntax (Nippold, 2007).

Thus, it appears that children respond differently to the same conversational prompts, though it was outside the scope of this study to perform an ethnographic analysis of topic selection and any potential influence of it on syntactic complexity.

Limitations

The attrition rate from the Domsch and Camarata original study (2008) is one potential limitation of this study, though it should be noted that the children with LLE who were found for follow-up did not differ from the children with LLE who were lost to follow-up for vocabulary size, nonverbal IQ, or maternal education. The ethnicity of the participants in this study was relatively homogenous, with a large proportion being Caucasian. One of the often-used diagnostic criteria for LLE, which was employed in this study, has been exposure to English-only in the home, which obviously eliminates the participation of bilingual families of every ethnicity. Finally, the size of the LLE group is small (n = 11), which contributes to the possibility of a Type II error. It is possible that differences between groups would have emerged in a larger sample.

Future Research

One issue in the study of infinitival complements is that previous research studies have grouped clauses differently, with some including unmarked infinitives and simple infinitives in the same category while others separate them. These differing patterns of data analysis make it difficult to compare results across studies. In addition, most studies have employed a single task to measure infinitive production, which in some cases has been conversational speech, while in others infinitives have been elicited in single sentences. Future studies should include multiple methods for assessing infinitive production, as it would be useful to compare conversational vs. elicited production in a single large sample. Finally, the type of spontaneous language task administered should include expository discourse, in addition to conversation. Expository discourse is the main type of discourse that school-age children encounter at school, which they are required to both comprehend and produce. Expository discourse tasks have also been shown to yield more syntactically complex language than conversational samples (Nippold, 2007).

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