Parental Translation of Child Gesture Helps Bilingual Vocabulary Development

Valery Mateo, Şeyda Özçalışkan, and Erika Hoff

1. Introduction

Children learning one language display their readiness to learn a particular concept in gesture before expressing the same concept in speech (Iverson & Goldin-Meadow 2005; Özçalışkan & Goldin-Meadow 2005a). Parents often translate the gestures their children produce without speech by providing the spoken label for the referents conveyed in gesture. Children benefit from these translations; they show earlier mastery of the linguistic skills for which they are given targeted instruction (Goldin-Meadow, Goodrich, Sauer, & Iverson, 2007)—an effect that holds across children with different developmental profiles (Dimitrova, Özçalışkan, & Adamson, 2016). However, we do not yet know if the effect of parental verbal translation of gesture on later speech vocabulary remains the same for children learning two languages. If gesture remains a robust aspect of the language-learning process, then we should observe parental translations to be significant predictors of children’s emerging vocabularies in bilinguals and monolinguals alike.

1.1. Gesturing in monolingual and bilingual children

During the early stages of language development, children learning only one language communicate primarily through gesture (Bates, 1976; Iverson, Capirici, & Castelli, 1994; Özçalışkan & Goldin-Meadow, 2005a). The three common gestures that they produce are deictic gestures that indicate entities in their surroundings (e.g., pointing to or holding up an object), give gestures that request objects (e.g., extend empty palm toward object), and conventional gestures (e.g., nodding head to indicate yes) that communicate culturally prescribed meanings, along with a few iconic gestures (e.g., interlocking thumbs and flapping hands to resemble a bird) that express features or actions associated with objects (Özçalışkan & Goldin-Meadow, 2005a; 2011). At the early ages, gesture constitutes a preferred modality over speech; young children also express a greater diversity of meanings in gesture than they do so in speech.
(Acredolo & Goodwyn, 1988; Özçalışkan, & Goldin-Meadow, 2005b; 2010; Rowe, Özçalışkan, & Goldin-Meadow, 2008). Children, of course, go on to produce their first words soon after they begin to produce gestures. Importantly, these early gestures predict the diversity of the meanings children will eventually express in speech. Approximately 75% of children’s new vocabulary words first appear in gesture (Goldin-Meadow, et al., 2007), and the age at which a child gestures at an object predicts the age that same child will produce the word for that object (Iverson & Goldin-Meadow, 2005). The token and type diversity of meanings children convey in their early gestures also predicts the size of their subsequent spoken vocabularies (Özçalışkan, Adamson, Dimitrova, 2015; Rowe et al., 2008). Previous research thus has shown that gesture is a robust feature of the vocabulary development of children learning one language.

Gesture and speech forms a closely integrated system not only for children learning one language, but also for children learning two languages. Most of the previous research focusing on amount of gesture production suggests a gesture advantage in bilinguals compared to monolinguals (e.g., Pika, Nicoladis, & Marentette, 2006; Nicoladis, Pika, & Marentette, 2009—but also see Smithson, Nicoladis, & Marentette, 2011 for counter evidence) and close positive association between proficiency in a language and amount of gesture production (Gulberg, 1998; Kita, 2000). Some researchers further suggest that different types of gestures show unique patterns of association with bilingual children’s proficiency in their two languages. An earlier study by Nicoladis, Mayberry, and Genesee (1999) reported that French-English bilingual children produced more iconic gestures in their dominant than in their weaker language—a pattern that was reversed for the production of deictic gestures. Nicoladis (2002) also replicated the results from Nicoladis et al. (1999) in a later study with an older group of French-English bilingual children. In this later study, children used more conventional and deictic gestures without speech when speaking their weaker language and more iconic gestures when speaking their dominant language (Nicoladis, 2002). The same pattern has been found in more recent work with English-Spanish bilinguals. Mateo, Özçalışkan, and Hoff (2016) found that English-Spanish bilinguals used more iconic gestures in their dominant language than in their weaker language—a finding that did not hold true for other gesture types. Despite research suggesting a close association between proficiency and amount of gesture production (particularly for iconic gestures) among bilinguals, no research to date has yet examined how early gesture relates to bilingual children’s emerging vocabularies in speech. That is, we do not yet know whether the gestures of bilingual children will show the same pattern as gestures of monolingual children, preceding and predicting their later vocabulary skills.

1.2. Parents’ verbal response to their children’s gestures

Children’s gestures elicit timely verbal responses from parents. These responses often take the form of translations in which parents provide the
spoken labels for the referents their children convey uniquely in gesture but not yet in speech. In fact, parents translate the majority (71%) of their children’s gestures (Masur 1982). The unique gesture referents (e.g., child points to a bear, but does not say ‘bear’) translated into words by the parent (e.g., ‘Do you want the bear?’) are more likely to enter the child’s speech than the gesture referents that are not translated into words (Goldin-Meadow et al., 2007a). More recent work further showed that the effect of parental translation on vocabulary development holds for monolingual children with different developmental trajectories. Parents of children with autism and with Down syndrome are just as likely to provide verbal responses to their children’s unique gesture referents as parents of typically developing children. More importantly, the gestures that are translated into words by the parents are more likely to appear in children’s vocabularies as words than the ones that are not translated in both groups of children who show relative strengths (i.e., Down syndrome) or weaknesses (i.e., autism) in gesture production (Dimitrova et al., 2016). Overall, research has demonstrated that translation of child gesture is an important tool in vocabulary development by helping monolingual children transition from gesture to speech. The question still remains whether parents of bilingual children will show similarities to parents of monolingual children in how often they respond to and translate their children’s gestures into words; and if so, whether these translations will positively influence children’s subsequent vocabularies in speech.

In this study, we focus on the influence of parental verbal response to child gesture on the vocabulary development of bilingual children, learning English and Spanish simultaneously as their two languages. (1) Our first question is whether bilingual children will be as likely as monolingual children to convey different referents uniquely in gesture before they use words to label the same referents. Based on previous research that shows that bilingual children express as many meanings in speech as monolingual children when their vocabularies across the two languages are combined (Hoff et al., 2012), we predict that bilingual children will express as many referents uniquely in gesture as their monolingual peers. (2) Our second question is whether parents of bilingual children are as likely as parents of monolingual children to translate their children’s unique gestures into words. We predict that the amount of parental verbal translation will be similar in the two groups, based on work that showed no differences in parental response to child gesture in monolingual children with different language development trajectories (Dimitrova et al., 2016). (3) Our third question is whether parents’ verbal translations will increase the likelihood of the words for the objects conveyed uniquely in gesture subsequently entering children’s speech vocabularies. We predict that the unique gestures that parents translate into words will be more likely to enter children’s spoken vocabularies than the ones that are not translated by the parents – a pattern observed for monolingual children’s overall vocabulary development in earlier work (Goldin-Meadow, 2007; Dimitrova et al., 2016).
2. Methods

2.1. Participants

The participants in this study were part of a larger study on language development of dual language learners (Hoff, 2012). In this study, we focus on 10 child-parent dyads of bilingual children learning English and Spanish simultaneously and 10 child-parent dyads of monolingual children, 5 learning only Spanish and 5 learning only English as their native language. All dyads were observed longitudinally from child age 2;6 to child age 3;6 with six month intervals. Half of the bilingual children were dominant in English, and half were dominant in Spanish—assessed by Macarthur Bates Communicative Development Inventories (CDI) and Inventario Del Desarrollo de Habilidades Comunicativas Inventario (IDHC; Fenson et al., 2007)—allowing us to control for possible effect of language dominance on speech and gesture production. The two groups were comparable in expressive vocabulary at 2;6, based on their CDI and IDHC scores ($M_{\text{monolingual}} = 423.00$, $SD = 226.20$ vs. $M_{\text{bilingual}} = 559.56$, $SD = 181.21$; Mann-Whitney $U = 62.00$; $p = .18$)\(^1\). The two groups of children also came from similar family backgrounds. The parents in each group were comparable in educational level; 80% of both monolingual and bilingual children had at least one parent who had a college degree at the time of our initial observation (see Table 1 for sample characteristics).

<table>
<thead>
<tr>
<th>Sex</th>
<th>English vocabulary at 2;6</th>
<th>Spanish vocabulary at 2;6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monolingual English</td>
<td>3 girls, 2 boys</td>
<td>542.00 210.33</td>
</tr>
<tr>
<td>Monolingual Spanish</td>
<td>3 girls, 2 boys</td>
<td>N/A  N/A</td>
</tr>
<tr>
<td>Bilingual English dominant</td>
<td>3 girls, 2 boys</td>
<td>444.25 126.47</td>
</tr>
<tr>
<td>Bilingual Spanish dominant</td>
<td>4 girls, 1 boy</td>
<td>172.00 124.82</td>
</tr>
</tbody>
</table>

2.2. Procedure for data collection

Children and their parents were videotaped in their homes three times from child age 2;6 to 3;6, with 6-month intervals. At each visit, the dyads were given the same 3 toys, including a set of picnic food items, animals, and a book. They were asked to play with each toy as naturally as possible for 10 minutes,

\(^1\) For monolingual children, the vocabulary score reflects expressive vocabulary size (i.e., word types) only for one language (English or Spanish); for bilingual children, vocabulary score reflects expressive vocabulary across both languages (English and Spanish).
resulting in a total observation time of 30 minutes per child-parent dyad at each visit. Monolingual child-parent dyads were observed only once at each age period. Bilingual child-parent dyads were observed twice at each age period on two different days, once interacting in English and once in Spanish.

2.3. Transcription and coding

All parent-child videos were transcribed for speech using the Codes for Human Analysis Transcript (CHAT, MacWhinney, 2000) by two trained research assistants, and divided into utterances. An utterance was defined as a segment of speech that was preceded and followed by a pause or a change in intonation. All intelligible words that were produced by the parent and the child were transcribed as words. Agreement between two independent transcribers was 85% for dividing speech into utterances and 85% for identifying a particular sound as a word. The videos were further coded for child gesture and parental verbal response to child gesture, following guidelines outlined in earlier work (Özçalışkan & Goldin-Meadow, 2005a, Dimitrova et al., 2016).

**Child gesture at age 2;6:** We coded all gestures produced by the children during initial observation, at child age 2;6. Gesture was defined as a symbolic communicative hand movement that does not involve direct manipulation of objects. The one exception was when the child brought an object to the parent’s attention by holding up the object; we considered these show gestures as serving the same function as the pointing gestures and treated them as deictic gestures as well, following earlier work (Özçalışkan and Goldin-Meadow 2005a, 2005b). In this study, we focused on gestures that convey information about objects, including deictic gestures that indicate objects (e.g., pointing at or holding up a ball to share information about the ball) and give gestures that request objects (e.g., extending an empty open hand toward a ball to request it). We did not include conventional gestures that conveyed culturally prescribed meanings (e.g., nodding the head to mean yes) in our analysis because they did not convey information about objects. We also excluded the few iconic gestures that we observed, because almost all (96%) of these gestures conveyed action (e.g., circling hands over bag of toys as if casting a spell).

We further coded deictic and give gestures as either expressing the referent already expressed in speech (e.g., child points to toy bear and produces the word ‘bear’) or as expressing a referent not yet expressed in speech (e.g., child points to toy bear but does not produce the word ‘bear’) during initial observation at age 2;6. In our analysis, we only focused on gestures that indicated or requested objects for which the child had not yet produced a spoken label, and created a ‘unique gesture vocabulary’ for each individual child. We assessed reliability on gesture coding with two raters, blind to the hypotheses of the study. Agreement was 88% for gesture detection, 97% for gesture type, and 96% for gesture gloss.

**Parents’ verbal translation of child gesture at child age 2;6:** We coded all parental responses to children’s unique gestures (e.g., point at bear) during initial observation, at child age 2;6. We categorized parental verbal response as
either *translating* (e.g., ‘That is a bear’) or *not translating* (e.g., ‘I will get it’) the child’s unique gesture into words, following the criteria outlined in earlier work (Goldin-Meadow et al., 2007; Dimitrova et al., 2016).

**Child speech vocabulary at ages 3:0-3:6:** We examined children’s speech at two subsequent observations (3:0, 3:6), following initial observation for the emergence of the words that were initially conveyed uniquely in gesture. These unique gesture referents were coded as either *entering* or *not entering* the child’s vocabulary as words.

### 2.4. Analysis

We examined differences between groups (bilingual vs. monolingual) in production of unique gestures and parents’ verbal translations of these unique gestures using Mann-Whitney U tests. We assessed the relation between child unique gesture at 2;6 and overall spoken vocabulary at ages 3;0 and 3;6 using two separate simple linear regressions, one for bilinguals and one for monolinguals, on log transformed data that met the normality assumptions for parametric testing despite the small sample size. In addition, we examined the effect of parental translation on the likelihood of child unique gestures entering children’s vocabulary as words with a Wilcoxon Ranked Test with *parents’ translation* (translated vs not translated) as a within-subject factor, separately for monolinguals and bilinguals. In an effort to understand the effect of parental translations of child gesture at 2;6 on spoken vocabulary in each language at 3;6, we also conducted simple linear regressions on log transformed data separately for English monolinguals, Spanish monolinguals, bilingual word productions in English, and bilingual word productions in Spanish. Our decision to use nonparametric measures (Wilcoxon and Mann-Whitney) was based on the nature of the data distribution, which violated the normality assumption.

### 3. Results

We first asked whether bilingual children were as likely as monolingual children to indicate or request referents uniquely in gesture before they did so with words, and found evidence for it. As can be seen in Figure 1 (panel A) bilingual children did *not* differ from monolingual children in the number of unique gestures that they produced at age 2;6 ($M_{\text{monolingual}} = 12.20$, $SD = 7.55$ vs. $M_{\text{bilingual}} = 10.80$, $SD = 6.82$; Mann-Whitney $U = 41.50$; $p = .53$). The majority of the gestures children produced were deictics (e.g., point or hold up ball to indicate ball), for both monolinguals (99%) and bilinguals (97%).

We next asked whether parents of bilingual children were as likely as parents of monolingual children to translate their children’s unique gestures into words, and also found evidence for it. Parents of children in each group translated a substantial proportion of their children’s unique gestures into words (61% for monolinguals, 50% for bilinguals). More important, parents of bilingual children were as likely as parents of monolingual children to provide
spoken labels for the referents that their children conveyed uniquely in gesture ($M_{\text{monolingual}} = 8.20, SD = 7.50$ vs. $M_{\text{bilingual}} = 6.20, SD = 5.12$; Mann-Whitney $U = 44; p = .68$, see Figure 1, Panel B).

We last asked whether parental translation of child unique gesture had any influence on the likelihood of unique gesture referents entering children’s spoken vocabularies as words in subsequent observations. We found that the number of unique gestures children produced at age 2;6 significantly predicted
variability of these unique gestures appearing as words in children’s speech at ages 3;0 and 3;6 for both monolinguals $F(1, 8) = 67.91, p < .001, R^2 = .90$, and bilinguals $F(1,8) = 8.45, p = .023, R^2 = .56)$. More important, the unique gesture referents children produced, when translated by the parents, were more likely to enter children’s speech as words than the referents that were not translated—not only for monolinguals ($M_{\text{translated}} = 5.00, SD = 4.87$ vs. $M_{\text{not translated}} = 1.00, SD = 1.56$; Wilcoxon, $Z = 4.50, p = .02$), but also for bilinguals ($M_{\text{translated}} = 2.15, SD = 2.16$ vs. $M_{\text{not translated}} = 1.15, SD = 1.26; Z = 4.00, p = .04$; see Figure 1, panel C).

Table 2. Correlational analysis of parents’ translations of child unique gesture in English and Spanish at age 2;6 and the number of unique gesture referents entering monolingual and bilingual children’s spoken English and Spanish vocabularies, separately at ages 3;0 and 3;6

<table>
<thead>
<tr>
<th>Language</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monolinguals</td>
<td>.86</td>
<td>.25</td>
<td>.89</td>
<td>.80*</td>
</tr>
<tr>
<td>Spanish</td>
<td>1.00</td>
<td>.25</td>
<td>.92</td>
<td>.84*</td>
</tr>
<tr>
<td>Bilinguals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>in English</td>
<td>.70</td>
<td>.17</td>
<td>.82</td>
<td>.68*</td>
</tr>
<tr>
<td>in Spanish</td>
<td>.58</td>
<td>.20</td>
<td>.71</td>
<td>.51*</td>
</tr>
</tbody>
</table>

* p < .05

$B =$ constant, $SE B =$ standard error of the estimate, $\beta =$ standardized regression coefficient, $R^2 =$ variance explained by the predictor.

Effect of parental translation of child gesture on children’s subsequent vocabulary was also evident for each language. As shown in Table 2, parental translations significantly predicted the likelihood of children’s unique gesture referents entering speech for the English monolingual ($F(1,3) = 11.93, p = .04, R^2 = .80$) and Spanish monolingual ($F(1,3) = 15.79, p = .03, R^2 = .84$) children. Similarly, the translations parents produced in English and Spanish significantly predicted the likelihood of children’s unique gesture referents entering bilingual children’s speech in English ($F(1, 8) = 16.61, p = .004, R^2 = .68$) and in Spanish ($F(1,8) = 8.25, p = .02, R^2 = .51$) at ages 3;0 and 3;6.

4. Discussion

In this study, we asked whether parents of bilingual children were as likely as parents of monolingual children to translate their children’s unique gesture...
referents into words and whether such translations had the same scaffolding effect on the vocabulary development of bilingual children as it does for monolingual children. We found that bilingual children were as likely as monolingual children to indicate referents uniquely in gesture before they do so with words. Furthermore, parents in both groups paid close attention to these unique gestures and responded to them by providing the spoken label for their children’s gesture referents. Even more importantly, we found that these gesture referents that were translated into words by the parent were more likely to appear in children’s vocabularies as words than the referents that were not translated, showing the powerful role parental verbal input could play in fostering the acquisition of new vocabulary words.

In this study, we first explored the gestures and speech produced by 10 monolingual children and 10 bilingual children. Contrary to previous work that found bilingual children to gesture more than monolingual children (Nicoladis, et al., 2009; Pika et al., 2006), we found no group difference in the number of unique gestures children produced. Bilingual children were as likely as their monolingual peers to indicate or request items uniquely with deictic (e.g., holding up a ball or pointing at a ball) and give (e.g., extending an open palm to request a ball) gestures before they did so in speech with words. One reason for the lack of difference in the amount of unique gesture production could be the comparable expressive vocabularies of the two groups. Earlier work (Rowe et al., 2008) has shown a positive association between child gesture and child vocabulary in speech. The bilingual children in our study knew almost as many words across their two languages as the monolingual children knew in one language; as such, they were as likely as their monolingual peers to gesture about objects for which they did not yet have spoken labels.

Our study also showed—for the first time—that gesture plays an important role in the language development of bilinguales as it does for monolinguals by both preceding and predicting children’s burgeoning spoken vocabularies. Like monolingual children, the bilingual children initially indicated and requested a variety of referents initially in gesture before they did so with speech while interacting with caregivers in each of their two languages. Importantly, these early gestures significantly predicted the number of vocabulary words that appeared in both the bilingual and the monolingual children’s speech one year later, suggesting a close coupling between early gesture and early words in bilingual language development.

Our study—also for the first time—showed that parents of bilingual children translated the majority of their children’s unique gestures into words—mirroring and further extending the patterns found in earlier work for monolinguals with different developmental trajectories (Dimitrova et al., 2016). Although we found that parents of bilingual children interpreted their children’s gestural cues as an opportunity to introduce new vocabulary words, future research is needed to determine whether the bilingual child’s proficiency in each language influences the effect of parental translation on children’s acquisition of new words in each of their two languages.
Most importantly, we found evidence that parental translations of gesture had similar positive effects on bilingual children’s vocabulary development. Previous work (Goldin-Meadow et al., 2007; Dimitrova et al., 2016) showed that the gesture referents parents translated into words were more likely to emerge in the child’s speech shortly after than those gesture referents that were not translated into words. However, our study adds to this finding by providing evidence that parental translations lead to earlier acquisition of new words in bilingual children. In addition, previous work on parents’ translation of child gesture only provided evidence for monolingual children who were at the cusp of two-word sentences (Goldin-Meadow et al., 2007; Dimitrova et al., 2015). Our study shows that parents’ translation of child gesture remains vital for vocabulary development at even later age (i.e., age 2;6), when the child has already begun producing their first words.

But why do parental translations enhance vocabulary development across different learners? As shown in earlier work (see Goldin-Meadow, 2014 for a review) children who are ready to learn a new concept use gesture to convey information that is different from their speech—akin to the unique gestures produced by children in our study. Children who show this readiness in gesture are in turn more likely to learn and express the new concept in speech when provided with the targeted instruction on the concept. Parental verbal translations of child unique gestures in our study might be providing this critical instruction in helping children who are ready make the transition from gesture to speech.

In sum, our results extend previous work on English monolinguals to monolingual children learning Spanish and to bilingual children learning English and Spanish. It shows that targeted parental input to child gesture is as important for language development in bilingual children as it is for monolingual children.

References


