

Encoding motion in gestures and speech: Are there differences in bilingual children's French and English?

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The purpose of the present study was to test the hypothesis that preschool French-English bilingual children produce language-specific gestures to encode motion events in both French and English. The hypothesis rests on two assumptions: 1) that there are language-specific differences in encoding motion events and 2) bilingual children can differentiate their two languages. Both of these assumptions have been supported by research. McNeill (1992) has demonstrated that the meaning of both adults' and children's gestures usually corresponds to the co-occurring speech. Furthermore, cross-linguistic differences have been shown between gestures used in verb-framed languages and satellite-framed languages (e.g., Kita & Özyürek, under review), as will be detailed below. In support of the second assumption, bilingual children have been shown to differentiate their two languages by two years or earlier with regard to phonology, syntax, morphology, lexicon and pragmatics (see Nicoladis & Genesee, 1997, for review).

Verb-framed vs. Satellite-framed languages

Talmy (1985) has argued that languages can be roughly divided into two categories of preferred patterns of lexicalization to encode motion: verb-framed languages and satellite-framed languages. In verb-framed languages, like French or Spanish, the path of the motion event is usually encoded in the main verb and, if the manner of motion is encoded, it is in a dependent verb, as in the French example in (1).

(1) Il est sorti en courant.
'He went out running' or 'He ran out'

In satellite-framed languages, such as English or Chinese, the manner of motion is usually encoded in the main verb while the path of motion is encoded in a satellite, as in (2).

(2) He ran out.

Because of the kind of verb that appears in the main verb slot, speakers of satellite-framed languages tend to use more manner verbs than speakers of verb-framed languages (Özçaliskan & Slobin, 2000). English-speaking children tend to encode path (in satellites) quite early, often with neutral verb of motion (like 'go out') and later encode manner (Berman & Slobin, 1994). Path is also encoded earlier in children speaking Mandarin Chinese (Nicoladis & Yin, under review). It is quite possible, then, that children are interested in path of motion and interested in finding linguistic ways to encode it (see Mandler, 1996). Lexicalization of manner of motion or manner and path seem to emerge later in development (Berman & Slobin, 1994; Nicoladis & Yin, under review).

Speakers of verb-framed languages have been shown to use gestures to encode motion events differently than speakers of satellite-framed languages. That is, speakers of satellite-

framed languages use more manner-path conflated gestures than speakers of verb-framed languages. And, speakers of verb-framed languages use more gestures encoding manner-only and path-only than speakers of satellite-framed languages (e.g., Kita & Özyürek, under review). These crosslinguistic differences in gesture use correspond to the different lexicalization patterns in the two kinds of languages. These results support the general argument that gestures emerge from the way speech is organized for production (McNeill, 1992).

We hypothesized that French-English bilingual children would be produce gestures encoding motion in ways that correspond to the preferred lexicalization patterns in their two respective languages. More specifically, the predictions for the present study were as follows:

- 1) French-English bilingual children will use more conflated gestures in English than in French, corresponding to their use of verb phrases that conflate manner and path (e.g., “run out”).
- 2) They will use more gestures encoding either path-only or manner-only in French, corresponding to their use of verb phrases that encode only path and only manner (e.g., “sort en courant”).
- 3) They will use fewer manner verbs (and therefore possibly gestures) in French than in English.

Methods

Eight French-English bilingual children between 3;6 and 4;11 participated in this study. All children heard both languages on a regular basis and were growing up in or close to Edmonton, Alberta, Canada. Table 1 summarizes the children’s ages and languages the children heard regularly from each of their parents and daycare.

Table 1
Age and language spoken regularly to children

Child	Age	Mother	Father	Daycare
Hélène	3;6	French	English	English
Jason	3;7	French	English	French
Julie	3;10	French	both	French
Nicole	4;0	French	French	French
Stéphane	4;7	French	French	French
Anthony	4;8	French	both	English
David	4;8	English	English	French
Aidan	4;11	French	English	English

The children were videotaped in two separate one-hour long sessions, one in French and one in English. Because the children heard both languages from a variety of sources, we tried to videotape them with a conversational partner that was somewhat representative of their normal interactions in that language. Table 2 summarizes the conversational partners for each of the children. The videotaped conversations were transcribed according to CHAT conventions (MacWhinney, 2000). Each utterance was coded for language (i.e., French-only, English-only, mixed language, either language or incomprehensible, following Genesee, Nicoladis & Paradis, 1995). We calculated the Mean Length of Utterance (in words) in both French and English to estimate children’s dominant language. The children’s dominant language was the language with the higher MLU. For these children, there was always a clear dominant language. There were

four English-dominant children (Hélène, Jason, Anthony, and David) and four French-dominant children (Julie, Nicole, Stéphane, and Aidan).

Table 2
Conversational partners for the children

Child	French session	English session
Hélène	Mother	Father
Jason	Mother	Father
Julie	Mother and father	Grandmother
Nicole	Mother	Unfamiliar adult
Stéphane	Mother	Unfamiliar adult
Anthony	Mother and father	Cousin
David	Unfamiliar adult	Mother
Aidan	Mother	Mother

The open-handed gestures used by the children were coded (following Nicoladis, Mayberry & Genesee, 1999) in the following categories: conventional gestures, deictic gestures (usually points) and iconic gestures. Only iconic gestures that encoded something about motion under consideration here. When the gestures were produced with an utterance that was entirely in French or entirely in English, they were counted as French and English gestures respectively. The iconic gestures were further coded for manner, path or manner/path conflation, as in (3).

(3) Anthony: Sometime you could, you could go inside.
Gesture form/meaning: index finger traces path of going inside

The verbs of motion used by the children were also coded according to path, manner and manner/path conflated. Both authors classified verbs of motion. Differences were resolved by discussion. The verbs were classified as either French or English. Examples of each of these coding categories are given in Table 3.

Table 3
Examples of speech lexicalization codings in English and French

	English	French
Path	Elene: I'm <u>coming out</u> , my boy.	Elene: on <u>s'en va</u> dehors . 'we're going outside'
Manner	Anthony: I could <u>run</u> faster than you a little bit.	Stephane: il <u>vole</u> . 'he flies'
Path/manner conflated	Jason: after the spaceship is <u>landed</u> ... Elene: <u>climbing on</u> .	Jason: I <u>trébucher</u> xxx +/- 'I trip' Aidan: toi tu m'as fait <u>tomber</u> ! 'you made me fall'

We excluded from the analysis any motion verbs from idiomatic expressions as in (4c) or with metaphoric meanings, as the near future in (4a) and (4b).

(4) (a) Aidan: moi je vais toute les faire.

- ‘me I am going to do them all’
 (b) David: he's just going to have a ride around the town.
 (c) Elene: here you go (*handing something to someone*).

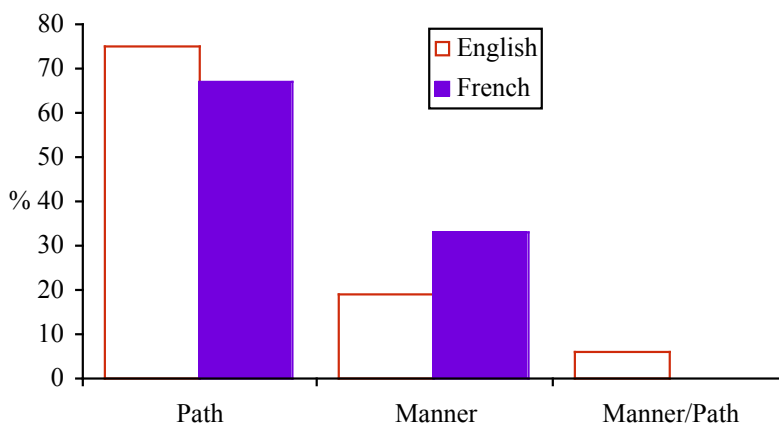
Results

Gestures

Most of the children’s gestures were deictic (as has been found previously for preschool children; Nicoladis et al., 1999). Out of the total of 140 iconic gestures, only 25 (or 18%) encoded motion. Of these 25, more than twice as many were used with English utterances (N = 18) as with French utterances (N = 7).

Figure 1 summarizes the percentage of the 25 motion gestures used by the children that encoded path, manner or path/manner conflated. As can be seen in this figure, most of the children’s gestures encoded path. The only conflated gesture occurred in English (“climbing up”). And, given the small numbers, we could detect no striking difference between the kinds of children’s gestures in French and English.

Figure 1
Percentage of gestures in each language encoding each aspect of motion



To illustrate how children are using gestures to encode motion events, we give all the examples of children gesturing about flying in (6). We chose the concept of flying because many of the children referred to flying. When talking about flying, the children might have been trying to emphasize the manner of motion. However, only 2 out of the 6 gestures referring to flying (6a and 6b) encoded primarily the manner of motion. In (6c) and (6d), the hand shape of the children encoded something about the size of the agent and so the manner may have been implicitly coded, although the path of the movement seemed to be the emphasis in both these gestures. In (6e) and (6f), the children encoded only the path of the motion.

- (6) (a) Jason: Jason can fly it.
 Gesture meaning: manner of flapping wings like a bird
- (b) Stéphane: [No speech].
 Gesture meaning: opens and closes hand at one side indicate the manner in which a bird flies

(c) Julie: Ils ont volé. ‘They flew’

Gesture meaning: with cupped hand moves hand from close to her stomach up high and outward; path of the birds flying away.

(d) Jason: The orange ones is for the bees.

Gesture meaning: pinched finger and thumb together and move that around in somewhat random circles; focus is on path of flight of bees, although the hand shape encodes something about agent.

(e) Anthony: You can fly like that.

Gesture meaning: future path of flight of a Lego construction, i.e., straight up

(f) David: Il vole! ‘He flies’

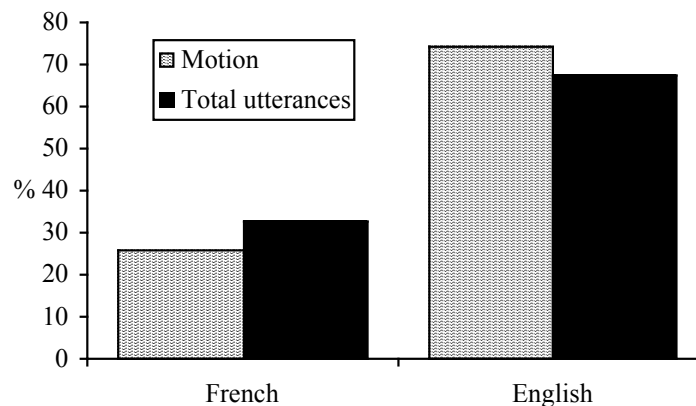
Gesture meaning: indicating the path of flight of a toy superhero

In sum, the crosslinguistic pattern we predicted did not show up in these children’s gestures. Instead, the children typically encoded path in the gestures of both their languages, even when their word choice might have emphasized manner of motion. One possible reason for the gestures encoding primarily path was that they may have been *talking* primarily about path.

Speech

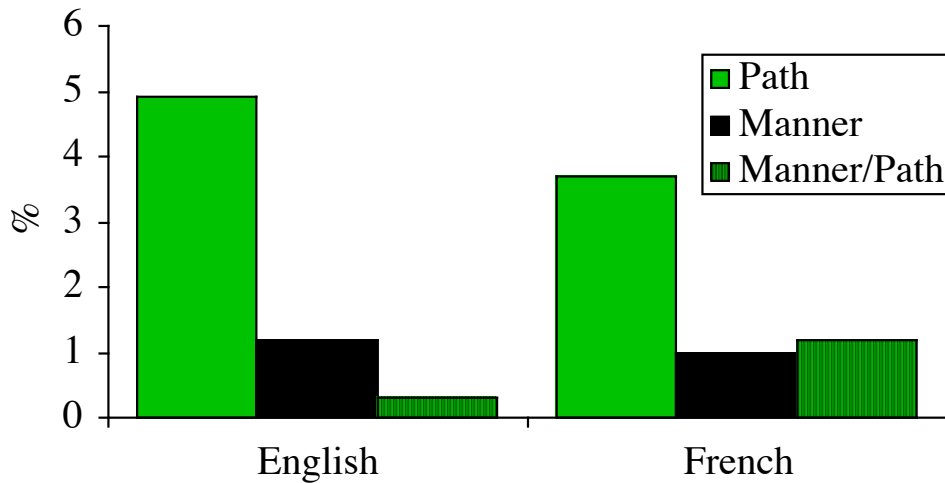
Figure 2 summarizes the percentage of utterances in each language to encode motion events and the total number of utterances. The children were more likely to use motion verbs in English (312 verb tokens) than in French (108 verb tokens). The children’s choice of language of motion events could have been due to their dominance (i.e., the French-dominant children spoke English better than the English-dominant children spoke French). However, the children were significantly more likely to encode motion events in English than their total relative number of utterances in English, $\chi^2(1) = 8.50, p < .01$. This result suggests that the children found English a better language to encode motion events than French.

Figure 2
Percentage of utterances and motion verbs in French or English



Because the children were more likely to talk about motion in English than in French, we present the following results in terms of percentages per utterance in each language. Figure 3 summarizes the rate of kinds of motion by language. The children encoded path more than any other aspect of motion in both languages. There was a small difference in terms of how often they talked about path (a bit more in English) and about manner and path conflated (a bit more in French). Overall, however, there was little difference in how the children talked about motion in the two languages.

Figure 3
Percentage of kinds of motion encodings per utterance in speech by language



The above analyses have collapsed across all of the children’s speech and gesture use. It is possible that the children talked more about various aspects of motion as their morphosyntactic proficiency increased. To see if this was the case, we have summarized the correlation coefficients for each child’s rate of referring to different aspects of motion (i.e., number of path, manner or path/manner conflated in each language out of the number of utterances used in that language) and his/her MLU in that language. As can be seen in Table 4, the children with higher English MLU were more likely to talk about all aspects of motion, while the same cannot be said of French.

Table 4
Correlation coefficients between MLU in each language and the rate of encodings per utterance in each language

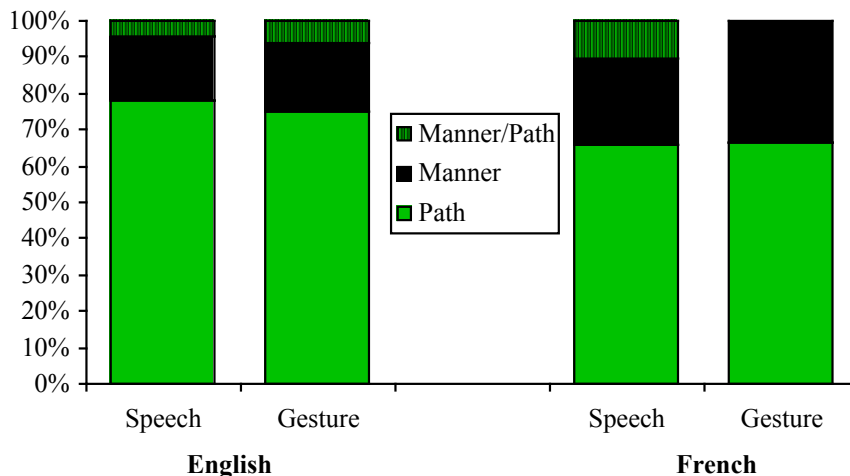
	English	French
Path	.769*	-.043
Manner	.826*	.282
Path/manner conflated	.559	-.389

*p < .05

Speech/gesture

For our last analysis, we wanted to see if there were any difference in how the children encoded motion in speech and gesture. Figure 4 shows the percentage of motion codings by language and modality. There was no difference between the different kinds of motion codings in gesture in speech, either in English, $\chi^2(2) = 0.34, p > .05$, or in French, $\chi^2(2) = 0.81, p > .05$. These results suggest that the children were referring to similar aspects of motion in both speech and gesture.

Figure 4
Percentage of motion encodings of each kind in speech and gesture



Discussion

Before turning to a more general discussion, we briefly summarize the results of our study relative to our predictions.

1) French-English bilingual children will use more conflated gestures in English than in French, corresponding to their use of verb phrases that conflate manner and path (“run out”).

While the one conflated gesture that occurred was in English, the children used very few gestures to encode motion and there was no striking difference between languages. Most of their gestures in both languages encoded path of motion.

2) They will use more gestures encoding either path-only or manner-only in French, corresponding to their use of verb phrases that encode only path and only manner (“sort en courant”).

This prediction did not hold up. The children’s use of path-only or manner-only gestures was fairly similar in English and French. The lack of difference between the way gestures were used in the two languages could be attributed to the fact that crosslinguistic differences in encoding motion were not observed in the children’s speech. In other words, the children gestured about the same kinds of things that they were talking about and they talked mostly about path in both languages.

3) They will use fewer manner verbs (and therefore possibly gestures) in French than in English.

This prediction did not hold up either. The children used a similar rate of manner verbs (and gestures) in both French and English. In both languages, the children rarely referred to manner of motion.

In sum, contrary to our predictions, the French-English bilingual preschoolers in this study did not show any crosslinguistic differences in gesture use to encode motion events. The lack of difference in gesture meaning could be attributed how the children were talking about motion in the two languages. That is, the children's gestures often referred to path of motion and they often spoke about path of motion in both languages. The fact that the meaning of the children's gestures corresponded to the meaning expressed in their speech supports McNeill's (1992) finding that speech and the co-occurring speech usually have the same or similar meanings.

One of the reasons that children's ways of speaking about motion events is that the children used no typical verb-framed utterances in French (i.e., with the manner verb in the dependent clause). When the children referred to manner or path and manner conflated in French, it was always in the main verb of a sentence. Why did the children use no typical verb-framed utterances? One possibility is that the children in this study were simply too young. Using a dependent verb may take some linguistic sophistication that these children did not yet possess. However, monolingual preschool children learning verb-framed languages have been shown to use verb-framed utterances (Özçaliskan & Slobin, 2000), so this possibility seems unlikely. Another possibility, then, is that the children in this study did not produce verb-framed utterances because they are bilingual. While this is possible, bilingual children have not been shown to be delayed relative to monolingual children in morphosyntactic or semantic acquisition, nor have they been shown to be qualitatively different in development from monolingual children. A third possibility for the lack of verb-framed utterances is the context of speech. It is possible that verb-framed utterances typically occur in narrative (as in Berman & Slobin, 1994) and not in free-play situations (the context of the present study). In negotiating the next activity in a free-play situation, the path of motion may be the most relevant variable for children to encode. To test this possibility, we are currently collecting data on French-English bilingual children's narratives. One final possibility for the lack of verb-framed utterances is that the children's input may have lacked verb-framed utterances. Encoding motion events has been known to be affected by language contact (Munske, 1986). French and English have been in contact in Canada for several centuries. It is possible that Canadian French has taken on some aspects of English in encoding motion events. To test this possibility, we are currently carrying out an analysis of the adults' encodings of motion events.

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