A Multimodal Approach to the Development of Negation in Signed and Spoken Languages: Four Case Studies

ALIYAH MORGENSTERN AND PAULINE BEAUPOL
Sorbonne Nouvelle University

MARION BLONDEL
CNRS, UMR SFL

DOMINIQUE BOUTET
Université D’Evry

WE ADDRESS THE EXPRESSION OF negation in four longitudinal studies including (1) Madeleine, a hearing child in multimodal French interactions, (2) Ellie, a hearing child in multimodal English interactions, (3) Charlotte, a deaf child of deaf parents in monomodal French sign language (langue des signes française, LSF) interactions, and (4) Illana, a hearing child with one deaf, one hearing parent in bimodal bilingual (French-LSF) interactions. All the negative multimodal utterances (including French, English, or LSF, symbolic gestures, and actions) were coded and analyzed between twelve and thirty-six months for the four children. We draw the four pathways to illustrate how each child combines symbolic categories and visual/aural modalities in successive steps with respect to her own linguistic environment. Madeleine and Ellie use gestures less as they enter verbal negation but keep using the gestural cues when necessary or for emphasis. Charlotte uses more and more manual and nonmanual combinations including coverbal gestures and LSF items. Illana uses fewer French or LSF negations than her monolingual peers but she exploits a wide range of bimodal combinations. She seems always aware of the visual information she has to maintain in her output. We present quantitative and qualitative analyses of the children’s multimodal path into negation, focusing on PalmUp-Shrug and IndexWave gestures, and also underline systematic properties at the junction.
between coverbal gestures and signs. To do so, we show (a) their contrastive physiological patterns, and (b) their semantic and pragmatic value for the expression of negation.

Introduction
The expression of negation begins very early in infancy. The study of negation in a pragmatic context is especially propitious in the context of language acquisition. Children learn how to use negation with a variety of semiotic means as a tool to express their needs, their desires, and ultimately, their will, which is part of establishing their own identity (Morgenstern 2006, 10). Previous research on first language acquisition has highlighted a tight relation between actions, gestures, and speech to express negation. As discussed by Spitz (1957) and Clark (1978), children’s first negative constructions seem to take over from early gestures of rejection and avoidance. The study of the expression of negation in longitudinal data of adult-child conversations is therefore a privileged locus for a multimodal approach to language acquisition, particularly in the framework of a comparison between signing and speaking children.

In this exploratory study, the paths of four children’s early language development will be described with a focus on their expression of negation in different modalities and on the use of two conventional gestures: the IndexWave and the PalmUp-Shrug gestures. We use the label PalmUp-Shrug in order to include the main formal components of the gesture that involves the hands, the shoulders, and the head (sometimes even the mouth as defined in Streeck 2009). Through our qualitative and quantitative analyses of the children’s negative productions, the following questions will be investigated: To what extent do they resort to gestural means? Is the use of those gestures linked to the language(s) used by the children, signed or spoken? Does exposure to two languages in two modalities play a role in the use of gestures?

We first make a brief overview of the issues at stake. We then present quantitative and qualitative analyses of the children’s multimodal paths into negation and finally discuss their uses of IndexWave and PalmUp-Shrug gestures.

A Multimodal Approach to Language Acquisition
Our work on child language development in hearing and deaf children led us to adopt a multimodal approach to the expression of negation in order to take all the dimensions of children’s communicative systems into account. Like Kendon (2004) and McNeill (2014), we do not restrict the definition of language to the use of words or signs. They are one dimension of a complex system involving other paradigms such as gestures, actions, facial expressions, gaze, and intonation. We consider language as being composed of a vast set of semiotic means on which speakers rely to construct meaning. Since negation is conventionally expressed by gestures (such as the HeadShake, the IndexWave, the PalmUp-Shrug gestures), or words and signs, children progressively acquire various negative symbolic forms in both the visual
and aural channels. We thus chose negation as a relevant topic to illustrate how our definition of “language” can be broadened to an integrative system composed of a variety of semiotic means.

**Gesture, Speech, and Negation in Language Acquisition**

Previous studies on children’s negative spoken productions have shown that *no* (and its equivalent in other languages) is the most consistently used word throughout the single word utterance period (Pea 1980, 170). Children begin using spoken productions for negation around eighteen months (Tomasello 2003, 228–29). However, gestures and actions precede grammatical words (Clark 1978; Spitz 1957).

Guidetti (2005) showed that gestures of negation are among the first symbolic gestures children use, and that when children fully enter the spoken modality, they mostly use words. Several studies have analyzed the role of gestures prior to speech as well as during the one- and two-word utterance period and have concluded that gestures trigger language development (Iverson and Goldin-Meadow 2005). Previous studies on the gesture-word relation have highlighted that symbolic gestures tend to develop in tandem with early words (Acredolo and Goodwyn 1988), which indicates that they are a manifestation of the same cognitive development and represent an alternative means of expression. On the same line, it has been observed that cross-modal combinations (1 word + 1 gesture) facilitate the transition to the two-word stage (Capirci et al. 1996).

All studies also highlight a striking individual variation in the extent to which children resort to symbolic gestures and gesture–word combinations (Acredolo and Goodwyn 1988; Capirci et al. 1996; Guidetti 2005). Some children who enter the verbal modality precociously seem to use very few symbolic gestures outside pointing at first (Morgenstern 2009). Such a variation is ascribed to the influence of different factors. On the one hand, symbolic gestures might be easier to process in comprehension and easier to produce than equivalent verbal expressions, which might explain their early emergence in a lot of children; on the other hand, they might be more or less exploited by the child according to social factors like parents’ input or response.

The negative HeadShake and the gesture of raising palms up in the air for ‘all gone’ (disappearance) or combining it with a shoulder shrug to express ‘I don’t know’ are conventional gestures, because their meaning is specific to certain cultures and they are learned as such by children in the same types of situations as words or signs.

Our study will enable us to make an overview of four speaking and signing children’s negative productions in their longitudinal data with a focus on two specific gestures in order to question whether their productions are linked to the children’s linguistic environment: the PalmUp-Shrug and the IndexWave. The gestural construction, which we have called the PalmUp-Shrug, is a composite posture described as a “compound enactment” (Streeck 2009, 189). It can combine palm-up flips, lifted shoulders, and a lateral HeadTilt (Kendon 2004; Streeck 2009). French speakers in
particular, might add mouth shrugs also called lip-pout. These various elements can either separately or combined express absence, uncertainty, incapacity, or helplessness (Debras 2014).

The IndexWave is a gesture that has been conventionalized and is used by English and French speakers as well as signers of LSF as an expression of negation: it is an oscillating movement of the index finger held in line with the palm, with the other fingers most often folded back.

Data and Method

This study is part of a larger project on multimodal and multilevel language development in twelve monolingual and bilingual children, speaking French, English, Italian, Brazilian Portuguese, and LSF. Our team is composed of specialists of syntax, phonology, semantics, pragmatics, discourse, gesture, and sign who work together on the same data set. Our aim is to describe and analyze each child’s individual pathway and find regularities and individual differences in their use of the visual and aural channels as well as the various linguistic levels.

In this chapter, we focus on multimodal analyses of negations in the productions of four children between the ages of 1;0 and 3;0 interacting with their parents in various linguistic environments. We analyze negative productions in the longitudinal data of Madeleine, a monolingual French child; Ellie, a monolingual British child (Beauipoil-Hourdel, Morgenstern, and Boutet, in press); Charlotte, a deaf signing child with input in LSF (Limousin 2011); and Illana, a hearing bilingual bimodal child in contact with French and LSF (Tuller, Blondel, and Niederberger 2007). The four children were filmed once a month for one hour at home. Charlotte, the deaf signing child, is raised by her two deaf signing parents and was filmed by Fanny Limousin (then a PhD student) who is a native deaf signer. Illana was filmed in a bilingual, bimodal environment by a bilingual observer. Her hearing mother is bilingual (LSF-French) and her deaf father sometimes produces code-blends. LSF was more prevalent when the deaf father was present and he was a very engaged participant (he was absent during two sessions in the data analyzed for this chapter). We used the videos and the transcriptions when they were available (the data in signed language was not entirely glossed but was tagged for negations). All the parents gave permission for us to use the data in papers and show video clips of the data as well as the children’s faces in pictures. The ethics review board of our university approved the protocol. All the data are spontaneous; we added no experimental design. A specific coding system was developed, combining the use of CLAN and ELAN with the video data and the transcriptions in order to make micro and macro analyses of the functions of the different forms of negation according to context in dialogue.

For this study, we restricted the data to one session every six months from the ages of one to three for the four children. This enabled us to code twenty hours of data as shown in table 2–1. We followed a two-step coding process:

1. We used our films and transcriptions in CLAN (spoken data) and ELAN (signed and bimodal bilingual data) to find all forms of negation.
This chapter presents a multilevel study of the emergence and development of negation. We adopted a multimodal methodological approach by analyzing all negative communicative acts the child expressed. This involved coding all spoken negative productions in the child’s data as well as all Acts of Bodily Communication (Zlatev and Andrén 2009) that could be conveyed with actions or gestures. Our research investigates the interface between the visual modalities—actions and gestures—and the auditory modalities—vocal productions and speech—and takes into account the combinations of these modalities in the construction of negative meaning.

The negative functions (refusal/rejection, nonexistence/absence, denial, negative assertion, epistemic negation, and prohibition) were coded according to three types of forms:

1. Actions, such as pushing away an object.
2. Symbolic conventional gestures: HeadShake for refusal, Shrug for epistemic negation (Streeck 2009, 190), PalmUp for nonexistence (Kendon 2004, 277). We also include what we called SGS (Symbolic Gesture/Sign): gestures shared by gesturing speakers and signers, such as IndexWaves. We only coded gestures used for communicative purposes in interaction.
3. Speech or sign including negative markers in each language. For example, in French non, pas, y a plus, rien; in English no, don’t, not anymore, nothing; in LSF, signs meaning none or I don’t want; as well as lexical negation such as French arrête or English stop it.

We thus make a distinction between actions and gestures, but the difference between the two modalities is not always easy to draw when it comes to young children (Willems and Hagoort 2007). We coded the behavior as an action when the movement produced by the child is a reaction to the environment rather than being conventionalized and when the movement does not seem to carry a communicative intention (Liebal and Call 2012, 119). However, it is interpreted by the parents as a negation and integrated in the ongoing dialogue.

The children have a complex system at their disposal that includes symbolic and nonsymbolic means of expressing negation. Figure 2–1 presents the resources at

---

**Table 2–1. Recordings and negative productions of the four children**

<table>
<thead>
<tr>
<th>Negative productions</th>
<th>Hours of video</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ellie</td>
<td>256</td>
</tr>
<tr>
<td>Madeleine</td>
<td>202</td>
</tr>
<tr>
<td>Charlotte</td>
<td>117</td>
</tr>
<tr>
<td>Illana</td>
<td>216</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>791</strong></td>
</tr>
</tbody>
</table>

2. We coded them in Excel grids in order to make micro and macro analyses of the type of modality and the functions of the different forms of negation according to context in dialogue.
their disposal. The only child who can use all the resources is Illana, who is brought up bilingual French–LSF and is a hearing child.

In this study, we focus our analyses on the use of the visual-gestural and auditory-vocal modalities and will now present the results of our coding of actions, gestures, speech, and sign (and combinations of modalities) for each child.

Analyses of the Four Children’s Multimodal Expression of Negation

Ellie’s longitudinal data (monolingual English)

As shown in figure 2–2, at the beginning of the data, action seems to be sufficient for the child to express negation. Beaupoil-Hourdel, Morgenstern, and Boutet (in press) have shown that Ellie begins to use gestures and enters a symbolic mode of expression at 1;02. But as early as 1;06, she is already using an important proportion of symbolic means of expression, and predominantly with gestures (over 30 percent gesture in isolation and 35 percent combinations of speech and gesture). After 1;06, speech is the predominant modality, either in isolation (over 35 percent) or combined with gestures (20 percent) or actions (15 percent). At 2;06, there is a decrease in the use of gestures (less than 10 percent and always in combination with speech). However, she reintroduces gestures at 3;0 in combination with speech (almost 20 percent of all negative productions) and in isolation. Overall, the child uses actions in 35 percent of her negative productions and gesture in almost 30 percent. Even though 71 percent of the child’s productions involve speech, only 35 percent of them are only verbal. Of the negative productions coded for this study, 36 percent are combinations of speech and either an action or a gesture.
As speech becomes predominant, Ellie’s spoken negative utterances are more and more complex. We observe that her spoken productions for negation are constantly becoming more elaborate. At 3:0, the child’s negative utterances have a mean length of utterance (MLU) just below three, which is high when you think of the number of occurrences of “no” in isolation that children and adults produce. At 1:0, she only uses the grammatical marker “no.” At 2:0, she can produce constructions such as “all gone” or “couldn’t do it.” At 3:0, she is producing more elaborate utterances like “he can’t push the baby,” “now Pepper, you mustn’t move my toys” (speaking to her cat), or “I don’t like cheese, Mummy” and uses all functions of negation (refusal, epistemic negation, negative assertions). Thus, in only three years, she has developed a good mastery of her mother tongue. Even though speech becomes predominant around 2:0, an analysis of negations restricted to speech would leave aside a great proportion of Ellie’s productions and the role of the visual-gestural modality in her pathway. The come-back of the visual modality in the role of coverbal actions and gestures at 3:0 also indicates that once Ellie has acquired the verbal means to express negations, she can still resort to actions and gestures to complement her speech.

Madeleine’s longitudinal data (monolingual French)

As can be gleaned from figure 2–3, Madeleine’s pathway is quite different from Ellie’s, as she does not use gestures during an intermediary period to enter the symbolic expression of negation. She is already producing speech at the beginning of the data, but mostly in combination with actions interpreted as negative by her addressee and the coder (pushing away toys, turning away from her mother, avoiding spoonfuls of food). At 2:0, her speech in isolation is highly predominant (over 90 percent of her productions). However, coverbal gestures start emerging and are part of 45 percent of her productions at 3:0. Madeleine uses gestures once she has a
finer mastery of speech. As she has been extensively studied in the CoLaJE project, we know that Madeleine’s mastery of speech is quite precocious (Morgenstern and Parisse 2012) and that as of 2:03, she has mastered the French phonological system, uses quite a variety of grammatical tenses (Parisse and Morgenstern 2012), produces 3 argument clauses, prepositions, and connectives (Sekali 2012), refers to herself in the first person (Caët 2013), starts using complex sentences (Sekali 2012), and can self-repair her utterances (Morgenstern, Leroy, and Caët 2013).

At 1:0, Madeleine uses the grammatical marker “non” in isolation. The phonological realization of her use of “non” is not yet complete as she pronounces them [næ]. At 2:0, she expresses various functions of negation using a variety of syntactic forms as in “télé éteinte fait rien” (‘TV shut do nothing’), “non pas les brocolis” (‘no, not broccoli’), or “pas fini mon lait” (‘not finished my milk’). Contrary to Ellie at the same age, Madeleine does not use chunks or frozen verbal expressions to convey her negations. At 3:0, Madeleine’s negations have a complex syntactic structure, such as “moi je l’avais ramassé mais maintenant je sais plus où il est” (‘I picked it up but now I don’t know where it is anymore’).

Charlotte’s longitudinal data (monolingual LSF)
Zeshan (2006) underlines that “the relation between signing and gesturing, with both manual and non-manual aspects is important . . . in negation” (29–30). Indeed, the numerous lexical and morphosyntactic forms involved in the sign languages studied so far are tightly linked to the speakers’ gesture systems in the speaking community the signers live in. The coding for Charlotte’s data (see figure 2–4 for main results) is thus slightly different since a number of the signs used in LSF to express negations are shared with the gestural repertoire of both signers and speakers in the
DEVELOPMENT OF NEGATION

French community. This includes mostly IndexWaves and HeadShakes for negations. Charlotte benefits from input through a single modality, the visual modality, including actions, gestures, and signs, as well as visual input derived from the vocal modality: mouthing and lip reading. Typical LSF (in white in the graph) refers to the core LSF lexicon that hearing people would not use as gestures (the manual lexical signs NON, IL-N-Y-A-PAS we would translate as ‘no’ ‘none’, and the predicative signs incorporating negation such as NE-PAS-VOULOIR (‘don’t want’) or NE-PAS-AIMER (‘don’t like’) as opposed to gestures such as the IndexWave or the HeadShake). We can observe a larger number of shared gesture/sign productions (in black) throughout the data than of specific signs. The LSF core lexicon is only used as of 2;0 and predominantly combined with other gestures in the same production (between 20 and 30 percent of overall productions as of 2;0 combine a shared gesture and a typical LSF sign).

As shown in Limousin (2011), Charlotte’s LSF productions during that period are more and more complex. At the beginning of the data, Charlotte mostly expresses rejection like the other children studied in our study through what we categorized as actions. She expresses refusal with HeadShakes and IndexWaves. They are gestures that have been incorporated in the sign language system as grammatical signs. All her actions or gestures/signs are produced in isolation. As she gets older, Charlotte produces those same forms but in combination with facial expressions in two or three sign utterances. At 1;06, she starts using negative predicates as well: for example, PT13 NE-PAS-VOULOIR (‘I don’t want’) and PT1 NE-PAS-SAVOIR (‘I don’t know’). Between two and three years of age, her signed productions become more sophisticated and include up to four signs together, as in Neg-index PT1 VOULOIR (‘want’) PT [-food] when she is 3;0.

**Illana’s longitudinal data (bilingual bimodal LSF-French)**

Illana is a hearing child growing up in a bilingual, bimodal environment. She has all semiotic means to express negation at her disposal, but gesture plays a predominant role in her productions, especially when her deaf father is present during the recordings. Illana’s negation patterns are summarized in figure 2–5.

![Figure 2–4. Rate of actions, gestures, and speech, and number of occurrences per category in Charlotte’s data](image)
Interestingly enough, Illana does not produce any LSF lexical signs of negation in the selected sessions. Her input is predominantly in French during the sessions, and at 2;0 and 3;0, her deaf father is not present during the recordings, thus isolated French takes up 50 percent of her productions. However, she uses shared gestures much more than the other children and they are part of 37 percent of her productions over the whole data (combined or in isolation). When her father is present, isolated French occurs in 20 to 25 percent of her occurrences only and her use of the visual modality amounts to 73 percent of her productions. The visual forms do not decrease to the advantage of the vocal forms since Illana continues to use HeadShakes, IndexWave negations, and different symbolic gestures or facial expressions.

In example 2–1 at 2;06, Illana is answering her father while addressing both her father and mother. They are playing cards with pictures of animals, and the child mixes vocal and labial French with negative symbolic gestures:

**Example 2–1**

**FAT:** CROCODILE (‘crocodile’)

**CH1:** Neg-index/ nan trompé c’est pas ... c’est un crocodile (‘No, you are wrong this is not... it’s a crocodile’)

**FAT:** SE-TROMPER ILLANA (‘You’re wrong Illana’)

**CH1:** palm-down gesture/ nan crocodile ! (‘Let’s give up, no, a crocodile’)

**FAT:** BALEINE (‘Whale’)

**CH1:** nan/Headshake baleine (‘No, this is not whale’)

**FAT:** her father takes one card

**CH1:** call gesture/ñan c’est à pa(pa), c’est à maman (‘Hey, it is not your turn, it is Mummy’s’)

The majority of her productions are accessible to both her parents, hearing and deaf. As she gets older, she seems to resort more and more to the combination of vocal productions with symbolic gestures. She uses all the bimodal semiotic
resources at her disposal to express her negations. She is therefore predominantly a bimodal child who makes use of the visual modality to adjust to her bilingual bimodal environment.

**Summary of longitudinal findings**

The analysis of each child’s individual pathway into negation clearly demonstrates their differences but there are some common features. All the children who have access to both the gestural-visual and auditory-vocal modalities use them both and they all start expressing their rejections and refusals with actions that are clearly interpreted by their interlocutors and integrated in the ongoing dialogue.

The hearing children with no sign language input enter negation at first through actions but then there follows a period when they either use symbolic gestures (Ellie) or speech (Madeleine). They get more or less rapidly involved in speech and seem to abandon gestures for a while, during what McNeill (2014, 159–61) calls the “Dark Age.” But gestures make a comeback with the use of coverbal gestures of negation when speech seems to be already quite elaborate.

Charlotte, the deaf child, also first expresses negation with bodily actions, then uses symbolic gestures that are incorporated as signs in the LSF linguistic system and which are present from the beginning in their input.

Illana, the bilingual bimodal child has created an efficient transitional system during her developmental path by combining modalities. The necessity to enter two languages at once and to speak both to deaf and hearing addressees might have an influence on the management of the visual-gestural modality, which is a stable resource to rely on in all the types of linguistic environments she experiences. The visual modality is of course crucial for Illana when she wants to address her deaf father.

In order to make finer distinctions between the children’s use of conventional gestures, we will now focus on the PalmUp-Shrug and the negative IndexWave.

**Focus on Two Specific Gestures: the PalmUp-Shrug and the Negative IndexWave**

We conducted a closer analysis of the use of the four children’s IndexWave and PalmUp-Shrug gestures in the data. Table 2–2 shows the results of our coding.

The number of occurrences produced in our data is not very high but we could observe differences that might indicate general trends to be tested on more signing/non-signing deaf and hearing children.

1. The signing children, Illana and Charlotte, are the only ones to use IndexWaves (nineteen and ten occurrences, respectively) in the data.4
2. The hearing children use PalmUp-Shrugs when the deaf child does not in the sessions we coded for this study.
3. The bilingual bimodal hearing child uses more IndexWaves and PalmUp-Shrugs than all the other children together. She seems to be resorting to the visual modality more than all the other hearing children together in the data as we’ve
In the next two sections, we will present qualitative analyses in order to explore the semantic and pragmatic functions in dialogue of the IndexWave and the PalmUp-Shrug gestures that might account for the quantitative differences observed between the uses of the signing versus non-signing as well as hearing versus deaf children.

Qualitative analyses of the use of the IndexWave
The IndexWave is used in many cultures as a gesture expressing negation, but with various functions ranging from refusal, negative assertions to deontic values such as prohibition or negative obligation (Calbris 1990; Jorio 2000). In LSF, the IndexWave is a gesture/sign used extremely frequently, often associated with the HeadShake and possessing the same range of negative values (Limousin 2011).

In our data, the IndexWave is not used by the two non-signing girls up to 3:0. We have only found it in the adults’ data in interaction with their children when they are expressing a deontic modality meaning ‘you are not allowed to…’ or ‘don’t do that.’ We do observe in the Paris Corpus (Morgenstern and Parisse 2012) that it is occasionally used by some children after 3:6 to forbid something to their dolls, their dogs, or to warn the adults not to do something. For example, when Ellie is 3:7 (after the period analyzed in this study), she is cutting star-shaped cookies in raw dough and putting them on a tray. She tells her grandmother that they should not be cooked by saying “Not cook yet [+ IndexWave]” the grandmother reformulates the gesture and

<table>
<thead>
<tr>
<th></th>
<th>Ages</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
<th>All gestures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1:0</td>
<td>1:6</td>
<td>2:0</td>
<td>2:6</td>
<td>3:0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Madeleine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUShrug</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>5</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Index</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Ellie</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUShrug</td>
<td>0</td>
<td>9</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Index</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Charlotte</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUShrug</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Index</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>9</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Illana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUShrug</td>
<td>0</td>
<td>8</td>
<td>10</td>
<td>14</td>
<td>2</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Index</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>10</td>
<td>44</td>
</tr>
</tbody>
</table>

seen in part 3.4, especially when her father is present, as she maintains visual information even when she is speaking.
words together by saying “Not to cook yet, ok” understanding Ellie’s production as carrying a deontic value. The IndexWave thus seems to be produced by our hearing speakers to express a deontic modality, which is often used when speakers have an asymmetric status in the dialogue and can exert some pragmatic ‘power’ over their interlocutors. Children thus begin using it with animals or dolls but do eventually address it to adults when they are more expert speakers and make more subtle and complex multimodal productions with subjective positioning.

The two signing girls, however, make a much more frequent use of the IndexWave in a broader range of negative contexts. Our hypothesis is that they are in contact with many more occurrences of that gesture with a larger variety of functions since it is part of the sign language system and is produced with or without the HeadShake to express refusal as well as negative assertions in a variety of contexts. Charlotte is already using it in the first session of the data coded for this study, at 1;0, as shown in example 2–2.

**Example 2–2**

At 1;0, Charlotte’s mother is changing her diaper. After she takes off the dirty diaper, Charlotte starts wiggling her legs and arms. Her mother explains she shouldn’t move and uses both an IndexWave and a HeadShake in her explanation. Charlotte smiles then takes up the IndexWave repeatedly. She then produces a HeadShake.

**Figure 2–6. Charlotte 1;0 IndexWave**

As of 2;0, all Charlotte’s productions of IndexWaves are refusals and negative assertions (‘I’m not washing my hair’ for example at 2;0 when she is in the bath). Figures 2–7 and 2–8 in example 2–3 in Illana’s data illustrate the same use in a bilingual context.

**Example 2–3**

At 1;0, Illana is having dinner in her high chair and her mother has just refused to give her the cheese the child was pointing at. The mother offers her yogurt or a fruit, the father a glass of water. The child answers both parents by saying “nan” (a proto “non”) associated with an IndexWave.

**Figure 2–7. Illana 1;0 IndexWave + vocal-verbal production**
The father then turns to the mother, takes up his daughter’s IndexWave and adds a pouting mouth.

The more frequent use of the IndexWave by Charlotte and Illana thus seems to be linked to the fact that it carries a wider range of functions: for the two little girls surrounded by sign language, the same form first used as an isolated gesture is incorporated into the child’s sign language system and can thus be formally categorized as a sign.

**Qualitative analyses of the use of the PalmUp-Shrug gesture**

In adult language the PalmUp-Shrug can express absence, uncertainty, incapacity, or helplessness (Debras 2014). In our adult-child data up to 3;0, the children only express either absence, which could be glossed as ‘gone’ / ‘no more’ / ‘not here,’ or lack of knowledge, capability, or responsibility, corresponding to ‘I don’t know’ / ‘I can’t do it’ / ‘what now?’.

There are very few occurrences of any version of the PalmUp-Shrug gesture in Charlotte’s whole data and we have found zero occurrences in the five sessions coded for this study. The three hearing children all use that gesture, English-speaking Ellie as well as French-speaking Madeleine and Illana. In what follows, we discuss examples that illustrate Illana, Ellie, and Madeleine’s uses.

Illana, the bilingual bimodal hearing child, uses thirty-four PalmUp-Shrugs in the data. Example 2–4 shows how she can use the gesture with her deaf father. We will also revisit her uses in the next section, and comment on her multimodal uses in more depth.

**Example 2–4**

At 1;6, as her father has just forbidden her to drink the bath water by using a very distinct IndexWave, Illana looks at the bath, at her toys and then at her father and makes a series of PalmUp gestures that seem to mean ‘what now, what can we do now?’ as if she did not know what to play with next.

Her father then takes up the gesture that seems very close to the LSF sign QUOI for ‘what?’ The pictures show him with both his hands and arms open.
Ellie uses quite a number of PalmUp gestures with no addition of shoulder shrugs at the beginning of the data when she does not yet produce many vocalizations. Both her mother and grandmother are enchanted by her early use of this conventional gesture and reinforce it by imitating her or by formulating their own interpretation. For example the grandmother says after Ellie has done the PalmUp gesture as she is looking for her basket “We don’t know where it is do we, Ellie?” and then turns to the mother to explain “She says ‘I don’t know’.” At 2;0, Ellie starts combining her PalmUp gestures with vocal productions. All Ellie’s PalmUp gestures up to 2;0 are interpreted in context as meaning ‘Where is it?’, ‘Gone,’ or ‘Done’ and are accomplished without a marked shoulder component. As of 2;6, Ellie starts diversifying her use of the components and functions of the PalmUp-Shrug. She adds shoulder shrugs and HeadTilts and some occurrences can be interpreted as meaning ‘I don’t know.’ But as of 3;0, Ellie can combine gesture and word in a complementary fashion.

**Example 2–5**

**ELLIE (3;0)**

**ELLIE:** 0 [=! making a horse noise].

**ACTION:** Plays with her horse toy.

**ELLIE:** Where’s the yellow horsey?

**GAZE:** looks up.

**GESTURE:** PalmUp gesture on the right hand.

**MOTHER:** <Oh hey Maria> [=! neighs]!

**ACTION:** Plays with a horse toy.

In the excerpt shown in example 2–5, Ellie is playing with her mother. She puts a horse toy into a small stable her mother built for her, then she looks up, flips her
right hand up and asks “Where’s the yellow horsy?” At 3:0, Ellie is able to combine her gestures with speech. The gesture she produces is less visible than the ones she used before 2:0. As Ellie grows older, her gestures are less and less distal as in this example, when she produces a hand flip with her hand held close to her body and not extended in the adult’s direction. At 3:0, Ellie’s gestures are less visibly displayed in the environment and more subtle. In this sequence, Ellie produces the gesture with speech and uses the word where. She is now able to put her thoughts into words without her mother or her grandmother’s help. However, the combination of gesture and speech is not redundant. Her spoken utterance is a question and therefore asks for missing information; the gesture shows that the referent is not within the child’s field of vision. In this combination, the speech is not syntactically or semantically negative, yet in context, the gesture is interpreted with negative meaning and expresses absence.

Madeleine does not use as many gestures as Ellie at the beginning of our data, and she only starts using the PalmUp-Shrug as a coverbal gesture. She does so as of 2:6 and at 3:0 has already become an expert at using all the semiotic resources at her disposal to express subtle nuances.

**Example 2–6**

**MADELEINE (3:0)**

**MOTHER:** Là il nous offrait un jaune et bleu (‘We need to find a yellow and blue one’)

**GESTURE:** points to a fish on the board game

**MOTHER:** Il est pas loin (‘it’s very close’)

**GAZE:** looks at the board game.

**MAD:** Je le vois c’est celui+là [=! whispers] (‘I can see it, it’s this one’)

**GESTURE:** points to a fish on the board game

**MOTHER:** Non bah o [=! smiles] (‘No’)

**GESTURE:** Shrug

**GAZE:** looks at Madeleine

**Figure 2–12. Madeleine 3:0 PalmUp-Shrug (one hand)**
In example 2–6, Madeleine is playing a board game with her mother. She is looking for a yellow and blue fish but she can’t find it. She gets upset and asks “Et lequel alors?” (‘So which one is it then?’). She asks for the fish and at the same time she produces a PalmUp-Shrug gesture. The rising prosodic contour of her utterance and the gesture forms she uses together contribute to express her exasperation. As illustrated in the textgrid and spectrogram in figure 2–14, Madeleine starts her utterance with a pitch at 149 Hz on “et” and her maximum pitch reaches 459 Hz on the second syllable of “lequel.” When Madeleine pronounces “lequel,” she starts shrugging and her palm-up gesture expands on “alors.” The combination of high pitch and a proximal gesture (shoulder-lift) ending in a distal gesture (palm-up configuration), along with the child’s gaze set on the game and not on the mother, led us to code this utterance and the gesture as an expression of both exasperation and powerlessness rather than an actual question directed at her mother.

The second instance of Madeleine’s gesture is combined with the spoken utterance “Moi je sais pas!” (‘I don’t know’) and is composed of three distinct forms: a PalmUp on both hands, a Shrug, and a HeadTilt. This gesture, because it is coupled with the spoken utterance ‘I don’t know,’ has an epistemic meaning but like the previous one it appends powerlessness and exasperation to the whole meaning of the spoken utterance. Interestingly, we note that the second instance of the gesture is more emphatic than the previous one and is composed of three components.
The three speaking children thus make expert uses of the PalmUp-Shrug gesture they have replicated and learned in specific relevant contexts from their linguistic and cultural environment. Its forms and functions evolve according to the children’s age. On the other hand, in her mono-modal LSF interactions, Charlotte does not use the PalmUp-Shrug before her signing becomes more complex in order to express disengagement and lack of knowledge. This may be due to the facts that she is less exposed before 2;0 to the outside hearing community’s conventional gesture system, and that her signing parents use the sign to mean ‘Where?’ or ‘I don’t know,’ which she takes up in the middle of her second year.

The role of gestures in Illana’s multimodal productions
Illana uses fewer French or core LSF negations than her monolingual peers but she exploits a wide range of shared gesture and bimodal combinations. She is always aware of the visual information she has to maintain in her output when her father is part of the conversation. In examples 2–7 and 2–8 she uses both an IndexWave and a PalmUp-Shrug gesture in a very short period of time.

Example 2–7

At 2;0, Illana is playing with her deaf father and her bilingual hearing mother with a memory game. The mother has just pretended to associate the cards with a picture on the board and Illana indicates her disagreement by saying “Non non non” (‘no, no, no’) associated with a salient IndexWave.
Example 2–8

A little later, Illana’s father takes advantage of the game to check that his daughter understands the signs for different animals represented on the cards. He points towards the picture of an animal with an inquisitive gaze towards her. Illana does not know the answer and uses a PalmUp-Shrug to express her ignorance.

Even though Illana’s signed repertoire is not as rich as her spoken one during the length of the data, she seems to have perfectly understood how to construct a multimodal system to communicate with both her hearing mother and deaf father simultaneously by combining speech with very clear shared conventional gestures and some signs. We make the hypothesis that she derives the PalmUp-Shrug mainly from the French cultural input but uses it more often than the other hearing children for her father’s benefit. She learns the IndexWave with its wider range of functions mainly from the signed input and uses it a little less than the deaf signing child. The total of her negative gestures is quite higher than the other children in a wider variety of functions and contexts.

Conclusion

Ellie, Madeleine, Charlotte, and Illana follow four very different pathways into negation, but for all four children, gestures play an important role in their itineraries. Ellie enters conventional negation through her use of gestures. Once she masters speech, gestures are used to reinforce or complement her spoken utterances. Madeleine enters the verbal modality from the very beginning of the data, but she starts combining coverbal gestures with her speech in a complex manner sooner and gives quite subtle indications as to her affects and positioning thanks to multimodal means. Charlotte also enters conventional negation through gestures. Most of those gestures are then incorporated in her signed grammar but she continues to produce ‘co-signed’ gestures. Bilingual bimodal Illana’s use of gestures is quite special. She enters conventional negations through gestures as well, but her use of gestures does not decrease during the recordings as she maintains them as a communication mode suitable both for hearing and deaf interlocutors.

The four little girls we have studied follow trajectories that are logically linked to the repertoire of resources available in the input. They all have a common gestural inventory available in the input but the deaf-signing child does not resort to PalmUp-Shrugs and the non-signing children do not use the IndexWave gesture for communicative purpose during the period of the study. We do find those gestures more often in the data we filmed when they are older.
This shared gestuality needs to be explored further and with older children as it is integrated very differently in the four types of input and in the linguistic systems that each child constructs in interaction. Gestures are part of the fabric of language. A more thorough investigation of their role in language development and language use could lead to a better understanding of such stuff as both spoken and signed language are made on.

Acknowledgement
This study was supported by the Education, Audiovisual, and Culture Executive Agency (EACEA), Project number 543264-LLP-1-2013-1-IT-KA2-KA2MP, Sign Language. We are grateful to Fanny Limousin, who defended the first PhD in France on sign language acquisition and collected the first longitudinal dataset of a deaf signing little girl, which she allowed us to use for this chapter. We thank our anonymous reviewer for his or her precious comments on our chapter and the editors of this volume for their constant care and help along the editing process.

Notes
2. The data was collected in the framework of the CoLaJE project (Communication Langagière chez le Jeune Enfant) ANR-08-COM-O21 funded by the Agence Nationale de la Recherche: http://colaje.sicog.fr/.
3. PT represents pointing. PT1 is a self-point.
4. Madeleine produces two IndexWaves when she repeats a French nursery rhyme with the conventional gestures associated with it on the word guère (old French for ‘not much’). Even though the use of that gesture in a song might have an impact on her later use of the same gesture, we have decided to only code communicative gestures in interaction.

References


