CHAPTER 16

The blossoming of negation in gesture, sign and oral productions

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Negation constructions in longitudinal adult-child data are an excellent source for the study of multimodality in language acquisition. First negative constructions seem to take over from early forms of rejection and avoidance, but tracing the transitions between actions and gestures, and between gestures and signed or spoken expressions in young children is quite complex. We focus on multimodal analysis of negation in the productions of five children between the ages of 0;10 and 3;6 interacting with their parents in various linguistic environments (monolingual French, monolingual English, monolingual LSF, bilingual French/LSF, bilingual French/Italian). We present the individual multimodal path of each child, illustrate the continuum between actions, gestures and signed/spoken constructions and analyze the common trend that leads children into symbolic communication through multi-semiotic means of expression.

Keywords: negation, multimodality, gestures, sign language, language acquisition

Introduction

By comparing five children acquiring one or two languages in one or two modalities, the goal of this paper is to highlight the importance of taking into consideration all semiotic means of expression when we analyze interactions in developmental studies, with a focus on forms of negation expressed through visual means.

Stern and Stern (1928) had already noticed how early “no” and its equivalents were used in language acquisition, and there has been a whole lineage of valuable

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scientific literature on that topic. However, actions and gestures interpreted as negative in dialogue have not thoroughly been included in developmental research on negation. Tracing the transitions or complementarities between actions, gestures, and verbalized/signed expressions in very young children, and apprehending the function of each modality can be quite complex. In this paper, we propose to conduct comparative analysis in children who are surrounded by speech or by sign in order to take into account the multimodal aspect of negation in dialogue and to better grasp the possible transitions and continuities between actions, gestures and words or signs.

This paper will focus on multimodal analysis of negation in the longitudinal data of five children interacting with their parents in monolingual French, monolingual English, monolingual LSF, bilingual French/LSF, bilingual Italian/French. We chose to focus on unimodal monolinguals, bilinguals, and a bimodal bilingual child in order to analyze the use of gestures of negation in those different linguistic situations. Gestures have been found to be more frequent in bilingual situations (Nicoladis 2007; Benazzo & Morgenstern 2014), and it could be even more interesting in the case of bilingual bimodal children (Kanto et al. 2015) since gestures could be addressed both to speaking and signing adults. We will first present the research issues, within an overview of the literature. We will then introduce our data and coding. The results of our analysis for each child will be followed by our concluding comments.

1. Literature review and research issues

1.1 Negation and language acquisition

All human beings (Horn 2001, xiii) use negation as a pragmatic tool for a whole set of functions, including refusal, denial, prohibition, and even affirmation in anaphoric negation (Wode 1977; Bloom 1991). The study of negation is especially fruitful in the context of language acquisition. Children learn how to use negation as a tool to express their needs, their desires, and ultimately, their will, which is part of establishing their own identity (Morgenstern 2006: 10).

The study of children’s acquisition of negation calls for a system of categorization based on the forms produced and the functions these fulfill in children’s utterances. The first studies on the topic consisted of structural descriptions of negative markers used by children (cf. Bellugi 1967). Soon thereafter, McNeill and McNeill (1968) turned the focus of analysis to the semantic content of these negative types. Bloom (1970) proposed a succinct model for the semantic values of negative markers, a model which was expanded by Choi (1988).

These models, although thorough in describing children’s development of negation in terms of the relation between syntax and semantics, did not incorporate
socio-pragmatic factors undeniably present and central in children’s interactions. The functions of negation are numerous and subsequent researchers have tried to organize them into typologies in order to account for their emergence and development. In their 1968 typology, McNeill & McNeill classified children’s spoken productions into categories dealing with the syntactic and semantic value of the negation. Their three categories were existence/truth, external/internal, and entailment/nonentailment. Volterra and Antinucci’s study (1979) was the first to propose a pragmatic typology of the acquisition of negation. It was divided into four categories and the authors convincingly demonstrated that children are able to understand the notion of polarity around 1;6. Later, Choi (1988) and more recently Cameron-Faulkner and colleagues (2007) conducted thorough multilevel corpus-driven analyses and created typologies that drew distinctions between negative functions (refusal, denial, failure, epistemic negation, non-existence, and negative assertion). In line with Volterra and Antinucci (1979), they classified the occurrences according to syntactic, semantic, and pragmatic parameters.

These studies on children’s negative spoken productions have shown that no is the most consistently used word throughout the single word utterance period (Pea 1980: 170) and that the first negative functions children express are rejection, refusal and protest (Spitz 1957; Bloom 1970; Clark 1978; Vaidyanathan 1991). Children are shown to use spoken productions for negation around 1;07 (Tomasello 2003: 228–229). Other studies analyzed children’s actions and gestures used before they speak and have shown that children express negation long before 1;07. Spitz (1957) observed that first negative constructions emerge thanks to early actions of rejection and avoidance. Guidetti (2005) demonstrated that gestures of negation are among the first symbolic gestures used by children.

The necessity for the advent of functional categories in children’s use of negation was first approached from a purely syntactic perspective, and later from a syntactic/semantic perspective, before being considered through a more integrative model which includes pre-verbal categories and takes gesture into account. Gesture is a cornerstone in the development of negation, and should not be neglected. Clark and Clark (1977) report that the first expressions of negation are gestural, possibly combined with one word (op.cit.: 348).

1.2 The action-gesture-word relation

According to Darwin (1872), habitual gestures, such as the headshake, have become associated with the movement of certain muscles. Darwin argues that the association between the intention behind the movement and the movement itself is so strongly imprinted in the mind that it becomes natural to perform that gesture with its corresponding intention. Mimetic schemas for imitable actions,
shared representations of objects that can be manipulated, ground the acquisition of children’s first gestures and first words or signs (Zlatev et al. 2005). In addition, evidence from brain and behavioral studies shows that language use engages motor representations and that through complex imitation, manual-gestural communication in social interaction leads to spoken language (Arbib 2012). Despite the links drawn between actions, gestures and words, the literature has focused mostly on words and (less frequently) on gestures.

Some researchers claim that there is an initial period when children produce communicative symbolic gestures independent of speech. In this initial stage, gestures are unaccompanied by speech sounds (cf. Bates et al. 1979; Butcher & Goldin-Meadow 2000). However, gestures are not a sole modality of expression for long – as soon as children can break into the verbal realm, they learn to coordinate the two modalities within a single utterance. This shift from the gestural to the verbal does not necessarily attest to the child’s preference for one modality over the other, but more likely takes place because of the abundance of verbal information in the child’s input (Bates et al. 1979) and how adults reformulate children’s actions and gestures into speech in their own conversational turns (Morgenstern & Beaupoil 2015).

Other studies on the gesture-word relation have highlighted that symbolic gestures tend to develop in tandem with early words, which could mean that they are a manifestation of the same cognitive development (Kita & Özyürek 2003). For a number of children, gestures seem to represent an alternative means of expression until the verbal means for the same function are available (Acredolo & Goodwyn 1988). In the same vein, it has been observed that cross-modal combinations (1 word + 1 gesture) allow the child to overcome what the authors call “linguistic limitations” in the transition to the two-word stage (see Capirci et al. 1996 on Italian children aged 1;04 – 1;08).

In the continuity of these studies on the use of the gestural modality as complement or in the place of the spoken modality, Guidetti (2005) demonstrates that, aside from pointing, gestures of agreement and refusal are the first symbolic gestures used by children, although the verbal modality for such functions takes precedence already by 2;00.

1.3 Gestures of negation and signs

The study of the expression of negation via gesture is gaining ground, as is shown in Kendon’s (2002) study of the headshake, or Calbris (2005) and Harrison’s (2010) studies of manual gestures of negation. Of particular interest in these studies are the semantic values associated with adult gestures. However, in children’s first uses of gesture, the forms are not this finely articulated – a horizontal movement of the hand will not be as clear-cut as the adult version – perhaps because these are
cultural acquisitions that serve as intensifiers in speech or as an expression of attitudes about what is said, or as a form of meta-language (as Kendon 2002 argues). It is only once the foundations of speech have been acquired that children can supplement their expressions with the specific co-verbal gestures described in the analysis of adult negations such as the palm down horizontal sweeping gestures (Harrison 2010). The child’s frequent and stubborn refusals are often accompanied by body movements and actions that cannot be analyzed easily with the tools developed by authors specialized in adult interaction and very specific co-verbal gestures.

The first symbolic intentional gesture expressing negation with more controlled movements and without any contact with an object is the headshake (Beaupoil-Hourdel 2015). The headshake, like all movements recognized as “gestures”, is an excursionary movement, wherein the body returns to its initial position after the gesture is completed (Kendon 2004: 149). This distinguishes headshakes from head turns, which are not considered gestures, but rather gesticulations (following Kendon’s Continuum, Kendon 1988; McNeill 1992).

The headshake is one of the most widely recognized head gestures. It is an emblematic gesture – a gesture that has “a direct verbal translation or dictionary definition, usually consisting of a word or two or perhaps a phrase” (Kendon 2004: 96).

Other gestures are also used by children to express negation, but these occur less frequently in the data. There are a few instances of the shrug, which has been called an “emblem” (Ekman & Friesen 1969) or a “quotable gesture” (Kendon 2004: 335) with a stable, conventionalized meaning that can be reformulated by a spoken phrase within a given culture. The shrug is defined not only as an instance of lifted shoulders but more broadly as a “compound enactment” (Streeck 2009: 189) which can combine palm-up flips, lifted shoulders, and a lateral head tilt. We have a few occurrences of shoulder shrugs and/or open arms palms up open hands that indicate lack of knowledge or absence. In British and American Sign Languages, shrugs and palm ups are not classified as signs (Sutton-Spence & Woll 1999 for BSL; Shaw 2013 for ASL) but as a gesture. We observed the same use in our LSF data and have adopted the same classification. We have also coded some instances of index waves, which are conventional gestures of negation in French and Italian and are incorporated in LSF as signs of negation. They were counted as Shared Gesture Sign (SGS). According to Emmorey (2002: 184), only the headshake is used by both hearing and deaf children to mean “no” during their first year. As the form of the headshake used as a gesture in isolation during the first year is similar to the sign used in ASL (and LSF), one hypothesis is that it should, therefore, be used in signed productions as soon as children enter signed syntax. However, Anderson & Reilly (1997) found that the deaf children in their study first used index waves around 18 months in their signed productions. Headshakes are only produced sporadically and in isolation at first and then added to the manual sign of negation between 1;07
and 3;04. In adult LSF, the headshake and index wave are very often used together in negative productions. Limousin (2011) found that Charlotte, the deaf little girl analyzed in this paper, used headshakes and index waves as early as 1;00 but always in isolation and never at the same time. At 2;00, she started combining these with predicates, she used negative verbs with incorporated negations expressed in the direction of the movement (NE-PAS-AIMER ‘don’t like’, NE-PAS-VOULOIR ‘not want’, NE-PAS-SAVOIR ‘not know’), and she also combined headshakes and index waves in synchrony as in adult language.

The ‘No’ headshake and the shrug combined with palm up (signaling ‘all gone’ (disappearance), ‘I don’t know’ or ‘there is no X’) are conventional gestures, first, since their meaning is culturally specific and they must be learned as such by children in the same types of situations as words or signs, but also because they are produced without contact with objects and are thus ‘decontextualized’.

1.4 First expressions of negation: The role of actions

Volterra et al. (2004: 9) suggest that vocal and gestural symbols emerge around the same time. Groundbreaking work has been done, notably by Pea (1980), whose aim was to describe the transition period from nonverbal to verbal negation. He was also one of the few researchers to treat both on equal terms. However, the earliest manifestations of negation are not “gestural”, or representational and symbolic, but more accurately described as bodily movements that derive from natural expressions and will become re-organized as culturally specific gestures later on (Morgenstern & Beaupoil 2015). These forms of negation have largely been ignored in the modern psycholinguistic approach. There is a need to clarify the difference between children’s actions, interpreted as negative and reformulated in their speech turns by their interlocutor, and symbolic gestures which are used by the child’s surrounding cultural and linguistic community to convey negative meaning.

In this study, we are particularly interested in children’s non-conventional body movements expressing negation, which we call “actions”, that are interpreted in dialogue by their addressees as negations. Those actions interpreted as negative are non-conventional body movements that are primarily non-communicative and are used either to act on an object or on a person, or to move away, kick away, or avoid.

The aim of this paper is to trace children’s pathways from actions interpreted as negations in context to multimodal expression of negation in full bloom. Despite semiotic and linguistic factors of variation such as the expressive modality (spoken or signed) or the environment (monolingual or bilingual), we will try to point to possible common trends in children’s entry into the use of negation.
Chapter 16. The blossoming of negation

2. Data and method

2.1 Data

We will focus on multimodal analysis of negation in the productions of five children – Madeleine (monolingual French), Ellie (monolingual British) Antoine (bilingual French/Italian), Charlotte (Limousin 2011), a deaf signing child with input in French Sign language (LSF langue des signes française), and Illana (Tuller et al. 2007), a hearing bilingual bimodal child in contact with French and LSF. Longitudinal data were collected from four of the children between the ages of 0;10 and 3;00, and for one from 1;5 to 3;6. The children were filmed during interaction with their parents in various linguistic environments. Four children were filmed once a month for one hour including Illana who was mostly filmed in a bilingual, bimodal environment. Antoine (Benazzo & Morgenstern 2014) was filmed once a month with his French father and once a month with his Italian mother and recordings started six months later than for the other children. We used the videos and the transcriptions when they were available. The entire data is 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 analysis of the functions of the different forms of negation according to context in dialogue.

For this study we restricted the data to a one hour session every six months (two sessions for Antoine, one in each language), between the ages of 1 and 3 years for the five children, (except for Antoine for whom sessions started at 1;6). Consequently, we were able to code 30 hours of data.

Table 1. Recordings and negative productions of the five 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>Antoine</td>
<td>174</td>
</tr>
<tr>
<td>Total</td>
<td>965</td>
</tr>
</tbody>
</table>

1. The data used in this study is part of the Projet ANR CoLaJE <http://colaje.scicog.fr>, a project funded by the French National Agency, see Morgenstern & Parisse 2012.

2. The data in sign language was not entirely glossed but was tagged for negations.
2.2 Method

We followed a three-step coding process:

1. Recordings and transcriptions were analyzed in CLAN (spoken data) and ELAN (signed and spoken data) to find all forms of negation. They were all listed in a shared document and circulated among the members of the Negation Project\textsuperscript{3} who coded the data.

2. Coding was done in excel grids in order to make micro and macro analysis of the type of modality functions of the different forms of negation according to context in dialogue.

3. Detailed analysis was conducted for certain extracts in ELAN for gestures or their timing with vocal productions; in our follow-up study we will try to correlate forms and functions with prosodic contours using PRAAT and phonological content using PHON.

Coding was done collectively for 20\% of the data by the authors, a dynamic coding guide was devised and shared, and any issues raised by each coder were solved collectively during our regular meetings. The only forms included in the quantitative and qualitative analysis were those that could be interpreted in the dialogic context as being negations. Headshakes that were not interpreted as instances of negations but as movements of the head from right to left with no specific negative meaning, for example, were not counted. We used our own interpretation in context and the adults’ previous and subsequent turns in order to code the data.

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

a. Actions such as pushing away an object.

\begin{itemize}
    \item (1) Ellie 1;2
        \begin{itemize}
            \item Mother: Do you want some milk?
            \item Ellie: pushes the glass of milk away
            \item Mother: No? OK.
        \end{itemize}
\end{itemize}

b. Symbolic conventional gestures (headshake for refusal, shoulder shrug and extended arms and palms up for epistemic negation and for absence);

c. Speech or sign in each language included, for example, in French: \textit{non, pas, y a plus, rien}; in Italian: \textit{no, non, più, niente}; in English: \textit{no, don’t, not anymore, nothing}; in LSF: \textit{IL-N-Y-A-PAS ‘none’} or \textit{NE-PAS-VOULOIR ‘don’t want’}.

3. All the authors of this paper were part of the Negation Project. The forms coded were based on our literature review and then enriched thanks to Beaupoil-Hourdel’s PhD dissertation (2015), and the various studies on negation published by the members of the project (Benazzo & Morgenstern 2014; Beaupoil-Hourdel et al. 2015; Morgenstern & Beaupoil 2015; Morgenstern et al. 2015).
We thus made a distinction between actions and gestures, but the difference between the two categories is not always easy to draw when it comes to young children. We coded the child’s behavior as an action when the movement produced by the child was a reaction to the environment rather than being intentional and conventionalized, as in the following example:

(2) Ellie, 1;10 with MOT (mother) and GDM (grandmother)
*MOT: How many are there Ellie?
*GDM: Shall we count?
*CHI: 0.5
%act: CHI moves forward and looks at the book GDM is holding.
*GDM: one +...
*CHI: 0.
%act: CHI touches the book and tries to take it.
*GDM: Two (.) oh no!
*CHI: 0.
%act: CHI takes the book in her hands and closes it.

In the example above, Ellie is engaged in a shared book reading activity with her grandmother. The grandmother suggests they count the number of horses on the page and the child’s actions show her intention not to get involved in this activity. Her actions have a negative meaning for the addressee and we coded them as a refusal and then as a protest. She uses her body to express her refusal to start the activity but her postures and movements are not part of the systematic conventional system used by her cultural community to express disagreement. Therefore, we coded these occurrences as actions and not as gestures.

In Example (3), however, Ellie does not use actions to convey her negations but the gestural modality in the shape of a headshake. Kendon (2002) has shown that this gesture is culturally understood as negative and the cultures in which the children in this study have been brought up have all conventionalized that gesture. In the corpus, we considered that the child and the mother produced a gesture when the movement was (1) intentionally communicative, (2) culturally understood as expressing a negation, and eventually (3) understood in context by the interlocutor as expressing a negation.

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4. The CHAT (McWhinney 2000; <http://childes.psy.cmu.edu> transcription system includes main tiers indicated by * and a three letter name for the speaker (MOT: mother; CHI: child and GDM: grand-mother) and secondary tiers indicated by %act describing the actions).

5. 0 is a convention from the CHAT format that indicates that the participant does not utter a word but makes an action or a gesture that is coded in the following lines. Actions are signaled by %act and gestures by %gpx.
In Example (2) the child's negations are unimodal because she only uses actions to negate, whereas in (3) she uses multimodal means of expression as well. In the first negative utterance combining `<no + headshake>` simultaneously, both the gesture and the spoken production are negative, we thus coded this multi-channel utterance as a combination of modalities: speech and gesture. When the child uses several modalities but with only one that expresses negation, we coded which modality conveys negation and we added what accompanies the negative message in another category.

The children have a complex system at their disposal that includes symbolic and non-symbolic means of expressing negation. They can use the visual modality with actions, symbolic gestures, and signs, or the auditory modality with vocal productions, onomatopoeia and speech. The only child who uses all those resources including both speech and sign is Illana, who was brought up bilingual French/LSF. As far as the two signing children are concerned, we did not think it was relevant to categorize certain forms of negation as either conventional gestures or signs. Headshakes and index waves, for example, are both used as conventional gestures by hearing and signing adults but they are incorporated as signs in LSF grammar. We thus included them in a category we called Shared Gesture/Sign (SGS).

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6. We used %sit in the transcriptions to mark descriptions of the situational context.

7. MAR is MARIANNE and LAU is LAURA, Ellie's aunts.

8. This convention is used to signal that two participants are speaking or making an action at the same time. It is a marker for overlapping utterances.

9. This convention is used whenever the coder cannot understand what a participant says.
Table 2. Coding sample

<table>
<thead>
<tr>
<th>Session</th>
<th>Timing</th>
<th>Loc</th>
<th>Previous context</th>
<th>Verbal prod.</th>
<th>Action</th>
<th>Gesture</th>
<th>Subs. context</th>
<th>Function</th>
<th>Modality</th>
<th>Structure</th>
<th>Place in dialogue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:00,23 fr</td>
<td>33'25</td>
<td>CHI</td>
<td>Nanny offers dessert</td>
<td>manon²</td>
<td>Pushes Head shake</td>
<td>Nanny looks rejection dessert</td>
<td>Action+ Gesture+ Verbal</td>
<td>isolated resps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:00,23 fr</td>
<td>35'30</td>
<td>CHI</td>
<td>Nanny asks if he is going to watch the Aristocrats</td>
<td>Head shake</td>
<td>Obs asks if he is going to watch another movie</td>
<td>Gesture isolated resps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Codes used Fr: French; CHI: Child; Obs: observer; resps: response
2 manon is a mixture of French and Italian (ma in Italian means but, non in French means no).

Illustration 1. (Shared gesture sign) of negation: Charlotte (top, Deaf child) and Ellie (bottom, hearing child) at 2:00 making an IndexWave
3. Results per child

In this study, we focus our analysis 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. The figures illustrate the percentages of each type of forms out of the total number of occurrences per session, the tables show the number of tokens per session.

3.1 Ellie's longitudinal data (monolingual English)

![Figure 1. Percentage of actions, gestures, and speech and number of occurrences per category in Ellie's data.](image)

At the beginning of data collection (1;0), action seems to be sufficient for the child to express negation. Beaupoil et al. (2015) have shown that the child begins to use gestures and enters a symbolic mode of expression at 1;2. But, as early as 1;6, she is already using an important proportion of symbolic means of expression, predominantly with gestures (over 30% gesture in isolation and 35% combinations of speech and gesture). After 1;6, speech is the predominant modality either in isolation (over 35%) or combined with gestures (20%) or actions (15%). At 2;6, there is a decrease in the use of gestures (less than 10% and always in combination with speech). However, the use of gestures makes a comeback at 3;00 in combination with speech (almost 20% of all negative productions) and in isolation. Overall, the child uses actions in 35% and gesture in almost 30% of her productions of negation. Even though 71% of the child's productions involve speech, just 35% of them are only verbal, 36% of the productions of negation coded for this study are combinations of speech and either an action or a gesture.
Speech becomes predominant and Ellie’s spoken negative utterances are more and more complex. We observe that her spoken productions for negation are constantly getting more elaborate. At 3;00 the child’s negative utterances have an MLU (mean length of utterance) a little below 3, which is high for an average as there is a great number of occurrences of no in isolation. At 1;00, she only uses the grammatical marker no. At 2;00, she can produce the frozen expressions all gone or couldn’t do it. At 3;00, she is producing more elaborate utterances such as he can’t push the baby, no, 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;00, an analysis of negations restricted to speech would ignore a great proportion of Ellie’s productions and the role of the visual-gestural modality in her pathway. The comeback of the visual modality in the role of co-verbal actions and gestures at 3;00 also seems to indicate that once Ellie has acquired the verbal means to express negation, she can still resort to actions and gestures to complement her speech.

3.2 Madeleine’s longitudinal data (monolingual French)

Figure 2. Percentage of actions, gestures, and speech, and number of occurrences per category in Madeleine’s data

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 data collection (at 1;0), 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;00, her speech in isolation is highly predominant (over 90% of her productions). However, co-verbal gestures start emerging and are part of 45% of her productions at 3;00. Gestures seem to be used by Madeleine 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 & Parisse 2012) and that as of 2;03 she has acquired the French phonological system (Yamaguchi 2012), she uses quite a variety of grammatical tenses (Parisse & Morgenstern 2012), produces three argument clauses, prepositions and connectives (Sekali 2012), she refers to herself in the first person (Caët 2013), starts using complex sentences (Sekali 2012) and can self-repair her utterances (Morgenstern et al. 2013).

At 1;00, Madeleine uses the grammatical marker non in isolation. The phonological realization of her productions of non is not yet complete as she pronounces them /næ/. At 2;00, 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 (‘non, not the broccolis’), 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;00, 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’).

3.3 Charlotte’s longitudinal data (monolingual LSF)

Zeshan (2006) introduces negation as one of the “very suitable candidates for sign languages typology” (p. 28) since the expression of negation is present in all sign languages as well as home-signs analyzed so far and can be studied at the lexical, morphological and syntactic levels. She also highlights that “the relation between signing and gesturing with both manual and non-manual aspects is important […] in negation” (p. 29–30). Indeed, the numerous lexical and morphosyntactic forms

![Figure 3](image-url). Percentage of actions, shared gestures/signs, and core-LSF and number of occurrences per category in Charlotte’s data.
involved in the sign languages studied so far are tightly linked to the signers’ gesture systems in the signing community the signers live in. The coding for Charlotte’s data is, therefore, different from the coding in the hearing children’s data, since a number of LSF signs used to express negations are shared with the gestural repertoire used by of both signers and speakers in the French community. We coded them in the SGS category. This includes mostly index waves and headshakes for negations. Charlotte benefits from input through a single modality, the visual modality; actions, gestures and signs, as well as visual input derived from the vocal modality – mouthing.\textsuperscript{10} 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 ‘no’, IL-N-Y-A-PAS ‘none’, and the predicative signs incorporating negation such as NE-PAS-VOULOIR ‘don’t want’ or NE-PAS-AIMER ‘don’t like’. SGS forms such as the waving of the index finger or the headshake are quite frequent in the adult input. We therefore observe a larger number of SGS productions (in black) throughout the data than of signs that are not SGS. Specific LSF core lexicon (such as NE-PAS-VOULOIR ‘don’t want’ or IL-N-Y-PLUS ‘no more’) is only used as of 2;00 and predominantly combined with other gestures in the same production (between 20\% and 30\% of overall productions combine SGS signing and a typical LSF sign after 2;00).

Charlotte’s LSF productions during that period are richer and progressively becoming more complex (Limousin 2011). At the beginning of the data Charlotte mostly expresses rejection like the other children studied in our project through what we categorized as actions. She also expresses refusal with the headshake and her index finger. During that period, all her actions and gestures/signs are produced in isolation. As she gets older, Charlotte produces those same forms but in combination with facial expressions in 2 or 3-sign utterances such as frowns and wrinkled nose. At 1;6 she starts using negative predicates as well, for example, PT1 NE-PAS-VOULOIR (‘I don’t want’) and PT1 NE-PAS-SAVOIR (‘I don’t know’). Between 2- and 3-years-old, her signed productions become more sophisticated, as in NE-PAS-SAVOIR (‘don’t know’) SPORT GRIMPER (‘climb’) and include up to four signs stringed together as in Neg-index PT1 VOULOIR (‘want’) PT(food) PT1 PT(food) when she is 3;00.

\textsuperscript{10} We have categorized Charlotte as being monolingual in contrast to Illana, but LSF is a language in close contact to French. Its lexicon and structure incorporate forms that derive from this contact, especially mouthing.
3.4 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 SGSs plays a predominant role in her productions, especially when her deaf father is present during the recordings.

Illana did not produce any specific LSF lexical signs of negation during the 5 sessions chosen for this paper. We have noted that she does use the sign for NONE twice at 2;05, and a few instances of negative predicates such as NOT WANT in other sessions. However, her input is predominantly in French during the sessions, and at 2;00 and 3;00, her deaf father is not present during the recordings; consequently, forms in French take up 50% of her productions. In other words, she uses LS much less when her father is not present, which shows that she can accommodate her audience, as shown by other CODA children (Kanto et al. 2015). She signs quite fluidly by the end of the data when her father is present (see Tuller et al. 2007, Blondel 2009 for a more detailed description of her signing) and she uses SGS forms proportionally more often than the other children. These make up 37% of her productions across the entire data set (combined or in isolation). When her father is present, isolated French occurs in only 20% to 25% of her productions and her use of the visual modality amounts to 73% of productions. The visual forms do not decrease in favor of the vocal forms since Illana continues to use headshakes, index finger negations and various symbolic gestures (Morgenstern et al. 2016).

In the following examples Illana, aged 2;07, answers her father while addressing both her father and mother. They play cards with animal pictures, and the child mixes vocal and labial French with negative symbolic gestures.
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(3) FAT CROCODILE (crocodile)

CHI Neg-index / ñan t(r)ompé c’ est pas ... c’ est un crocrodile (‘no, you are wrong this is not... it’s a crocodile’)

(4) FAT SE-TROMPER ILLANA (‘you’re wrong Illana’)

CHI palm-down gesture/ nan crocrodile! (‘let’s give up, no, a crocrocrodile’)

(5) FAT BALEINE (‘whale’)

CHI nan/Headshake baleine (‘no, this is not whale’)

(6) her father takes one card

CHI call gesture/nan c’est à pa(pa), c’est à maman (‘hey, this is not your turn, this is Mummy’s’)

The majority of her productions are accessible to all her interlocutors, 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 several of the bimodal semiotic resources at her disposal to express her negations. French (in its multimodal nature) is her strong language (and could be compared to Antoine’s use of French), and therefore she is predominantly a bimodal child who makes use of the visual modality to adjust to her bilingual bimodal environment.

3.5 Antoine’s pathway (bilingual French/Italian)

Graph 5 gives an overview of the forms Antoine used over time to express negation, in accordance with his age (from 1;05 to 3;6) and to the language of the session (French when he interacts with his father and Italian with his mother).

![Figure 5. Percentage of actions, gestures, and speech and number of occurrences per category in Antoine’s data](image)

We note that there is a long transitional period from the visual to the spoken modality between 2;00 and 2;6 when cross modal combinations are quite frequent, before the spoken modality becomes dominant. Antoine’s negation gestures are not
qualitatively different in French and Italian (mostly headshakes) and his gestural behavior does not seem to be overall linked to an “Italian bias” towards gestures. We also observe a high number of spoken negations at 2;06 during the French session (Antoine develops his dominant language first), while we find a sort of regression at the same period in the Italian session (his weak language). When interacting with Italian-speaking interlocutors, Antoine code switches to French or accompanies his Italian negative utterances with gestures as in Example (3). His verbal production in the Italian sequences contains several code-mixed constructions like the utterance \( \text{pas nonna} \), with the French negative \( \text{pas} \) and the Italian word for grandmother, which is, moreover, accompanied by a headshake.

At 3;06, Antoine is much more at ease in the verbal modality of his two languages, but his phonological system is still incomplete both in French and in Italian. In addition, he still produces a lot of code-mixing in his weaker language, as in Italian \( \text{la mia maestra è grondata} \) (‘my teacher yelled at me’) with nonce \( \text{grondata} \) borrowing French \( \text{gonder} \) (‘scold’) with Italian conjugation (the Italian past participle would be \( \text{sgridata} \) from the verb \( \text{sgridare} \)) or the mixed utterance \( \text{fatto di} \) (It.) \( \text{bêtises avec Carmen} \) (Fr.) (‘I was naughty with Carmen’).

Gestures are practically no longer used to negate except when he is eating, but punctuating co-verbal gestures (such as “beat gestures”, cf. McNeill 1992) start to emerge. This is in line with previous findings according to which beats develop with increasing MLU and varying stress patterns (Nicoladis, Mayberry & Genesee 1999; Mayberry & Nicoladis 2000). Towards the end of our collection period, speech in Italian and French has become his dominant modality.

However, as we have seen in the other hearing but monolingual children, the spoken modality already prevails, typically, between 20 and 24 months. Antoine’s more intensive use of gestures of negation therefore seems to extend longer than the other hearing monolingual children previously studied, especially in the sessions with his Italian mother. Interestingly enough, there are very few co-verbal gestures of negation even at 3;6, unlike Ellie and Madeleine. Compared to Guidetti’s study (2005) and to the monolingual children in our study, Antoine relies on the
visual modality longer than other children raised in oral languages. His turning point into verbal modality is between 2;0 and 2;6, (depending on his use of his dominant or weak language), while verbal modality already prevails at 2;00 for the monolingual hearing children. It is also useful to underline that Antoine’s linguistic production is very approximate phonetically and difficult to understand over a long period. This could be in line with the observations that bilingual children may be delayed in their phonological inventories (Oller & Jarmulowitz 2007). By age at 3;6, towards the end of the data collection period, his phonological system in French still lacks a number of phonemes, which is quite late compared to the children in the Paris corpus (Morgenstern et al. 2013). Gestures might have developed as a reinforcement function for efficient communication, allowing Antoine to overcome his linguistic limitations. However, his propensity to rely on gestures might also have been encouraged by an additional factor, namely input processing in a bilingual environment. Exposure to two languages implies dealing with linguistic forms in two codes vying for the same function. Even if there seems to be no specific delay in lexicon development when child production in both languages is considered, it takes some time for the bilingual child to elaborate equivalents in French and Italian. By contrast, the symbolic gestures analyzed in this study represent stable forms, shared in both the Italian and the French input, accessible to all his interlocutors whatever the situation might be, and therefore they might have been easier to adopt and difficult to abandon. As mentioned by Nicoladis (2007), we found no specific advantage for gestures to compensate for lack of vocabulary in his weaker language, Italian, as opposed to his dominant language, French. However, gestures seem to be a useful resource to give more pragmatic strength to his negations and might also be a convenient semiotic device to package his opposition (see Nicoladis 2007).

4. Discussion and conclusion

The analysis of each child’s individual pathway into negation clearly demonstrates their differences, but there are common features. All the children in this study who have access to both the gestural-visual and auditory-vocal modalities use both. However, they do not start expressing their rejections and refusals with conventional gestures shared with their cultural community, but with actions (pushing away an object, avoiding a spoonful of zucchini, wriggling away from their mother’s arms) that are clearly interpreted by their interlocutors and integrated as if they were intentional communicative forms in the ongoing dialogue, often reformulated by the parents with spoken forms of negation.
The hearing children with no sign-language input first enter negation through actions, but then follows a period when they either use symbolic gestures (Ellie, Antoine and Illana) or speech (Madeleine). Those who get more or less rapidly involved in speech or sign seem to abandon gestures for a while, but gestures remain an excellent resource for the bilingual children, and also make a comeback with the use of co-verbal or co-sign gestures when speech or sign are already elaborated.

Charlotte, the deaf child, also expresses negation using bodily actions first, then uses symbolic gestures that are incorporated as signs in the linguistic system of LSF and are thus present in her input from the beginning (SGS). Illana, the bimodal child, uses progressively more complex combinations of forms simultaneously in both modalities, especially when her deaf father is present. She uses very few specific lexical signs for negations, as opposed to Charlotte; French is her strong language and although she does use signed utterances, they are less complex than her spoken utterances. However her SGS stay predominant and, along with salient facial expressions, are combined with speech.

Antoine and Illana, the bilingual children, have created efficient transitional systems during their developmental path both by combining modalities and mixing their two native languages. The need to acquire two languages at once might have an influence on the management of the visual-gestural modality, which is a stable resource to rely on in all types of linguistic environments Antoine and Illana experience. The visual modality is, of course, crucial for Illana when she wants to address her deaf father, but both bilingual children seem to rely on gestures during a transitional period when their weak languages (Italian for Antoine, LSF for Illana) are not yet fully mastered. Other studies of bilingual children would of course be needed in order to confirm whether bilingualism does correlate with a reinforcement of the use of gestures (see Benazzo & Morgenstern 2014 for a more complete study of Antoine’s negations).

The children studied in this project, be they hearing or deaf, and regardless of the language or languages in their environment, make use of all the resources available to their bodies and in the input to express themselves in an environment that is favorable to language acquisition. They all have a shared repertoire of gestures as they belong to very similar cultures, with headshakes, index waves, palm up, or sweeping palm down gestures.

Yet, they constantly use the multi-semiotic resources at their disposal and progressively enrich the complexity of their productions.

At the beginning of the data sets, they all seem to be more involved in non-conventional bodily movements to express rejection or avoidance, and will then use the conventional gestures that surround them, or signs. If they are non-signing children, their vocal productions (even screaming and crying) are going to develop into symbolic spoken productions. Interestingly enough, each child follows a
different pathway. Madeleine enters the verbal modality very early and co-verbal gestures are added as soon as her speech is established. Ellie uses more symbolic gestures before she masters speech. Detailed analysis of the forms used leads us to observe how all children are multimodal from the very beginning but also how the use of multimodality differs according to the stage they are in, in their cognitive, motor and linguistic development. The multimodal resources are first used in an
integrative manner in the service of a global communicational intent and will then be subtly mastered. The productions are going to become more complex and each modality can then be used with specific different functions, which either reinforce or complement each other.

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