Adult Reformulations of Child Errors as Negative Evidence*

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Abstract

We propose that parental reformulations of erroneous child utterances provide children with information about the locus of an error and hence the error itself. Since the *meanings* of the child utterance and the adult reformulation are the same although the forms are different, children infer that adults must be offering a correction. Analyses of longitudinal data from five children (three acquiring English and two acquiring French) show that (a) adults reformulate their children's erroneous utterances and do so significantly more often than they replay or repeat error-free utterances; (b) their rates of reformulation are similar across error-types (phonological, morphological, lexical, and syntactic); (c) they reformulate significantly more often to younger children, who make more errors, and these reformulations decrease significantly with age. Evidence that children attend to such reformulations comes from three measures: (a) their explicit repeats of such reformulations in their next turn; (b) their acknowledgements (*yeah* or *uh-huh* as a preface to their next turn, or a repeat of any new information included in the reformulation); and (c) their explicit rejections of reformulations where the adult has misunderstood them.

Adult Reformulations of Child Errors as Negative Evidence

Children don't learn language in a void. They learn it *in conversation*, as they learn how to express their intentions, interpret the intentions of others, and take turns as they accumulate new information. They need to learn how to be both speaker and addressee as they participate in communicative exchanges. Children therefore need information about the forms and functions conventional in the community, and this requires exposure to a particular language. Most accounts of language acquisition have focussed on positive evidence — information about how a language is used, for instance, and the form of its phonology, morphology, lexicon, and syntax. But some research suggests that children need negative evidence as well — information that identifies children's errors *as errors* during acquisition. But is there negative evidence available to children and can they make use of it? In this paper, we begin by reviewing two proposals about negative evidence: first, that children lack negative evidence because the speech they hear offers an impoverished guide to the language to be acquired, and they must therefore rely on innate information to acquire the adult language; second, that children receive negative evidence in the form of different reply-types given in response to ill-formed versus well-formed child utterances. We then propose a third view of negative evidence drawn from conversational exchanges between adults and children, and we show that it is plausible that children could learn from such evidence.

Negative evidence in language acquisition

Children produce many errors during acquisition, and researchers have long been concerned with how they manage to get rid of these errors as they get older (e.g., Baker 1979, Bowerman 1988, 1996, Grimshaw 1981, Pinker 1984). Some have argued that the evidence children receive from the speech around them about the forms of language is too impoverished to account for their (eventual) learning. This argument stems in part from Maclay and Osgood (1959) who made a detailed analysis of all the disfluencies and speech errors produced by psycholinguists who were giving papers and answering critical questions at a conference. These data suggested that adult speech was full of errors and so provided a poor model for children. They were used to support the

original 'poverty of the stimulus' proposal, and hence justify an innate 'language acquisition device' (e.g., Chomsky 1965). But this justification was undermined by evidence that parents make very few errors in their speech to young children (e.g., Gallaway & Richards 1994, Snow & Ferguson 1977; see also Pullum 1996, Pullum & Scholz 2002).

Further justification for innateness depended on Gold's (1967) argument that positive evidence alone (i.e., exposure only to grammatical strings) is not sufficient for a machine learning the types of language exemplified by natural languages. Negative evidence is needed so learners can identify ungrammatical strings as ungrammatical. If this argument is extended to children, as it often is, then they too would need both positive and negative evidence in order to learn and to get rid of errors. If they didn't receive any negative evidence, they would have to rely on some other (innate) source of information for learning. In making this argument, researchers relied heavily on some findings reported by Brown and Hanlon (1970) in their study of cumulative derivational complexity in tag questions. In one analysis, Brown and Hanlon looked at the rates of approval and disapproval from adults. The data consisted of exchanges from two samples for each of three children where a parent responded to the child's utterance with either explicit approval (*That's right, Correct, Very good,* or *Yes*) or explicit disapproval (*That's wrong, That's not right,* or *No*). When the child's preceding utterance was analyzed for correctness, they found no dependence between parental reactions and the grammaticality of the children's utterances. These findings were taken as showing that children received no negative evidence, but since children do eventually get rid of earlier errors, some researchers have appealed instead to innate linguistic structures, perhaps triggered by maturation, to enable language learning (e.g., Babyonyshev, Ganger, Pesetsky, & Wexler 2001, Borer & Wexler 1987, Wexler & Culicover 1980).

But it isn't clear whether only *explicit* disapproval is analogous to negative evidence. While Brown and Hanlon reported that only a few parental utterances contained explicit expressions of approval or disapproval,[1] both attitudes can be expressed in many other ways, for example through

[1] Notice that Brown and Hanlon's sample contained very little data: Table1.11 (Brown & Hanlon 1970:48) presents all the explicit positive and negative parental utterances in samples II and V respectively; these amounted to only 8 and 35 data points for Sarah; 6 and 20 for Adam; and 9 and 47 for Eve, in transcripts that contain several hundred

intonation or follow-up of a child's utterance. Further, explicit disapproval often disrupts conversational flow and so may not be the best source of negative evidence. Since young children make so many errors, parents intent on correcting them would have to devote a lot of time to explicit corrections, leaving less opportunity to attain the actual goals of the conversation (e.g., deciding what to eat, enlisting help with a game). It shouldn't be surprising, then, that adults rarely follow children's errors with explicit disapprovals.

But can we conclude that adults don't correct errors? They could correct them in less disruptive ways. Some researchers have looked for other forms of negative evidence, and have settled on reply-types (e.g., Bohannon & Stonawicz 1988, Demetras, Post, & Snow 1986, Farrar 1992, Furrow, Baillie, McLaren, & Moore 1993, Hirsh-Pasek, Treiman, & Schneiderman 1984, Penner 1987, Strapp 1999). They have proposed that parents respond to ill-formed (erroneous) child utterances by using different types of response from those they use when responding to well-formed utterances. Among the reply-types considered, for example, are expansions, requests for clarification, and repeats. For instance, a parent might consistently respond to ill-formed utterances with an expansion, as in the exchange in (1)[2]:

(1) Ben (1;11.25): Hat.

Mother: She has a hat on? [Demetras et al. 1986:284]

The type of reply would indicate to the child whether an utterance was well-formed or not; if the adult tended to expand ill-formed utterances but repeat well-formed ones, for instance, use of an expansion would signal that the child's utterance was ill-formed.

This general approach raises several questions. First, because it focusses on reply-type alone without considering whether the reply itself also contains specific corrective information, it groups replies that are corrective with those that aren't. Compare the hypothetical exchanges in (2) and (3):

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utterances from each child.

[2] All the examples we cite include the child's age (in years, months, and days), together with the published source, or the name of the corpus in the CHILDES Archive that the exchange is drawn from (MacWhinney & Snow 1985, 1990).

(2) Parent: What did you do?

Child: I go to school.

Parent: You went to school with your brother?

(3) Parent: what did you do?

Child: I went to school.

Parent: You went to school with your brother?

In both exchanges, the parent expands the child's utterance, but only in (2) does the expansion correct an error (the child's use of *go* instead of *went*). The identical expansion in (3) has no error to correct. So if children rely on reply-types to signal when they have made an error, they could be misled on those occasions where the reply-type does not, after all, flag an error.

Another problem is that this approach suggests children learn which forms are erroneous *only* after complex statistical comparisons (Marcus 1993). While both infants and older children are capable of elaborate statistical tracking (Saffran, Aslin, & Newport 1996, MacWhinney 1985), to use reply-types, children would need to reason as follows: 'Mommy replied to what I just said with an expansion. Most of the time when she replies with an expansion, it means I've said something the wrong way. I'd better watch that particular utterance, and if she continues to respond to it with an expansion, I'd better change something about it.' This strategy would require that children try out the same utterance a number of times in order to verify the reply-type it elicits. But even if they can detect erroneous utterances this way, this approach does not tell them *what error* they've made, or *how* to correct it. Reliance on reply-types alone might help signal that an utterance is erroneous, but it doesn't allow children to *identify* the actual error they've made.

In summary, if children need negative as well as positive evidence, researchers need to establish what can count as negative evidence. (Positive evidence comes from the speech addressed to children, as well as what they overhear.) They also need to show that negative evidence allows children to identify their errors and therefore (eventually) correct them. In this paper, we investigate another view of negative evidence based on conversational exchanges between adults and children, and examine adult responses to children, considered not in terms of reply-types, but in terms of

whether they *contrast* the child's error with the correct, conventional form. We also show that it is plausible that children could learn from such evidence.

Making use of conversational exchanges

We will argue that it is in the to-and-fro of conversation that children receive information about the appropriateness of their own utterances. Their adult interlocutors typically accept utterances that conform to the conventions but often check up on those that contain errors, to make sure they have understood them. In conversation, each speaker contributes in turn to the common ground of speaker and addressee, and in order to accumulate common ground, speakers have to be sure that they have understood each utterance that is contributed – that they have identified the intended referents of utterances and the speaker's intended meaning on that occasion (H. Clark 1996).

Like adults, children accumulate common ground in each exchange. In doing this, in the ideal conversation, speakers observe a general agreement – the cooperative principle – that can be summarized as: 'Make your conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged' (Grice 1989:26). This principle embodies a series of maxims that characterize how people carry on conversations. Speakers can also implicate further interpretations to be added to what they actually say. The notion of implicature comes from Grice's analysis of speaker meaning. Conversational implicatures are never stated directly by the speaker; they have to be computed in context, and the addressee's interpretation of an utterance includes any implicatures that can reasonably go along with it (Horn 1996, Levinson 1983, 2000).

One of the Gricean maxims relates to 'how what is said is to be said' (1989:27). This Maxim of Manner is made up of several parts including 'Avoid obscurity of expression' and 'Avoid ambiguity'. Speakers observing this maxim should choose the appropriate forms to express just the meaning they intend. But young children often use erroneous forms in phonology (mispronunciations), in morphology (wrongly inflected forms and wrong morphemes), in the lexicon (inappropriate words), and in syntax (wrong word-orders, omitted words). These violations

of the Maxim of Manner can obscure children's meanings, so adults may need to check up on just what they intend to convey.

How do adults check up on someone else's intentions? One way is to use a *side sequence* to clarify the meaning intended (Jefferson 1972, Schegloff 1972). These are typically used by the participants in a conversation to clarify and then ratify their understanding of what is being talked about before continuing with the conversation. They may contain an explicit acknowledgement of the clarifying question in the first segment, as in the exchange in (4) from the London-Lund corpus, where Nina initiates the side sequence by querying what Roger has said, and only after he has confirmed it, does she answer his original question. (The side sequence is indented.)

(4) Roger: now, – um do you and your husband have a j– car

Nina: have a car?

Roger: yeah

Nina: no – [Svartvik & Quirk 1980:8.2a.335]

Side sequences like this can be used to clarify pronunciation, morphology, word choice, or syntax – all domains where children make frequent errors during acquisition. In taking up the phrase containing an element that requires clarification, the inquirer presents a conventional version of that element and thereby offers a correction. The element being targetted in the side sequence is identified by the speaker's repeating the utterance or phrase where it occurs (after *have a*) but with a correction of the target form (here, *j– car* to *car*). And in acknowledging the clarification question with *yeah, uh-huh,* or the like, the original speaker accepts and ratifies the correction. In talking to children, adults make extensive use of side sequences as they check up on what they mean.

Another way to check up less directly is through an *embedded correction* (Jefferson 1982), where the second speaker corrects in the next utterance whatever seemed to be wrong in the first speaker's delivery, as in the exchange in (5):

(5) Customer in a hardware store looking for a piece of piping:

Customer: Mm, the *wales* are wider apart than that.

Salesman: Okay, let me see if I can find one with wider *threads*.

(Looks through stock) How's this?

Customer: Nope, the **threads** are even wider than that. [Jefferson 1982:63]

Here the customer takes up the embedded correction, *threads*, in lieu of his original *wales*, and thereby shows that he accepts it as the appropriate term. Again, in talking to children, adults make use of embedded corrections.

Side sequences and embedded corrections both offer ways to correct another speaker's utterance. Use of either of these options implicates that the first speaker has made an error of some sort. In both, the person offering the correction identifies the **locus** of the error by proposing an alternative form *in that locus*. The alternative form **contrasts** with the original one produced, in pronunciation (e.g., *car* in lieu of *j– car* in [4]), word choice (*threads* in lieu of *wales* in [5]), morphology, or syntax. Both these resources for correcting another speaker, then, rely critically on the pragmatic notion of contrast (Clark 1990, 1993) to identify the *locus* of the correction and hence the actual *correction* itself.

As we will see, adults make use of these resources in correcting children's errors too. They use side sequences and embedded corrections, we propose, as ways of checking up on just what a child intended to say. So when they check up on speaker intentions, they simultaneously alert children to their errors. They identify the locus of the error, and its nature, in their offer of a contrasting form – the correction itself. These offers of directly contrasting forms we will call *reformulations* of what the child seems to have intended. The change from child to adult form implicates that the child's version contains an error, an error of commission or of omission, with its exact locus and nature signalled by the change introduced by the adult.

If children are to make use of such corrective information, they need to compare what they themselves said with the adult reformulations in the next turn. The first move occurs when a child attempts to express an intention and produces what it takes to be the requisite utterance. When this child utterance is erroneous in some way, the parent can check up, using a reformulation that expresses the same intention (as judged by the parent). The child now has two forms for the same

meaning – the child's and the adult's. Like adults, children do not use or accept two forms for the same meaning – this is the principle of contrast (Clark 1990, 1993; Clark & Clark 1979). As a result, one of these forms must (eventually) be discarded. And because children treat adults as providing the standard (the conventional forms for expressing specific meanings), they will assume that the adult version in such comparisons takes precedence – one consequence of the principle of conventionality (Clark 1993). Given this, children will eventually adopt the conventional adult form in place of their own erroneous expression.[3] Adult reformulations, then, indicate to children that (a) they have made an error; (b) the locus of that error, and (c) the form needed to correct it. But if adults have misunderstood what their children intended to convey, the children should reject the reformulation and try again. Central to adult reformulations is not the desire to correct child errors, but the desire to make sure they have understood what their children intended to convey.

To sum up, parents may need to reformulate their children's utterances to check on their intentions and so accomplish the goals of the conversation. In doing this, through side sequences or embedded corrections, they simultaneously provide a source of corrective evidence that can alert children to the precise errors in question. Comparison of their own utterance with the immediately following adult version allows children to pinpoint the locus of the error and identify the conventional form for that meaning. But do parents and other adults produce such reformulations? If so, do they do so often enough to affect language acquisition? Do they produce them to children at all stages and for all kinds of errors? And, even if adults do produce them, do children make use of them?

Hypotheses

Several researchers have called attention to reformulations: Brown and Hanlon (1970) commented that parents at times repeated their children's utterances with corrections (see also Moerk 1991). Saxton and his colleagues (Saxton 1997, Saxton, Kulcsar, Marshall, & Rupra,

[3] This process is unlikely to be instantaneous, and indeed it may take some time since the child must (a) be convinced that the same meaning is at stake, and (b) store and learn to retrieve the appropriate form when it is needed. This may explain why children can take a long time to master irregular forms in a language (see further

1998) looked at how effective reformulations were in teaching irregular nonsense verb endings, and Farrar (1992) looked at adult reformulations of morphological errors in children's speech. But there has been little detailed analysis of when, where, and how often such reformulations actually occur in conversations between adults and children over time.[4]

How general is such negative evidence? For it to be a serious factor in acquisition, it should be present in some form for all learners, regardless of language, and for all the types of errors children produce. We therefore examined data from several children in depth, over time, and from two languages.

Does negative evidence change over the course of development? As children get older, they produce more adult-like utterances, so with age there should be fewer occasions where adults feel a need to check on what children mean. Do adult reformulations occur equally often at age 2;6 and 3;6? Do different error types elicit different amounts of correction? The longitudinal nature of our study allowed us to look at how adult speech changes as children get older, and to detect any trends in response to different types of error.

Do children make use of the corrective negative evidence available? Even if adults do reformulate errors, children might not pay attention to these reformulations. So we also looked at several kinds of evidence that children both attend to reformulations, and make some use of the information they contain.

In summary, the hypotheses we tested are the following:

- Negative evidence is available in adult reformulations;
- Negative evidence is available to children learning different languages, and for different types of errors;
- More reformulations are available to younger children; and
- Children detect and make use of the corrections in reformulations.

Clark 1987, 1990).

[4] Studies that have analyzed some longitudinal data or collected cross-sectional data over a particular age span

Methods

Our data are drawn from five corpora in the CHILDES Archive (the Child Language Data Exchange System; MacWhinney & Snow 1985, 1990). Three children were acquiring English (Abe from the Kuczaj corpus, Sarah from the Brown corpus, and Naomi from the Sachs corpus) and two were acquiring French (Philippe from the Léveillé & Suppes corpus, and Grégoire from the Champaud corpus). We chose these corpora because the original taping intervals were regular, the age ranges similar, and because the children were talking spontaneously rather than in response to any elicitation tasks.

We included in our analyses all the transcripts in each corpus for ages 2;0 to 4;0 (inclusive) for Abe, Naomi, Philippe, and Grégoire; for Sarah, we took all the even-numbered files for this age span (her corpus was much larger than the others). For Abe, the relevant files covered ages 2;4.24 to 3;11.25; for Sarah, ages 2;3.7 to 3;11.29; for Naomi, ages 2;0.2 to 3;8.19; for Philippe, ages 2;1.19 to 3;3.12; and for Grégoire, ages 2;0.5 to 2;5.27. We chose this age range to capture the widest variety of error types from young children, and to capture any changes with age in the adult speech addressed to them. The broad range of data and large number of instances for each child allowed for very detailed analyses of both child errors and adult reformulations.

For the analyses of child errors, we included every spontaneous[5] child utterance in the transcripts, except for utterances with unintelligible speech, and child utterances preceded or followed by unintelligible speech on the part of the adults. Each child utterance included was first evaluated for conventionality, and if it contained an error, it was coded for error-type (one or more per utterance): *phonological* (e.g., 'girl **d**ere*?*' rather than 'girl **th**ere?'), *morphological* (e.g., 'I like carrot' rather than 'I like carrot**s**'), *lexical* (e.g., '**suit**' rather than '***coat***'), and/or *syntactic* (e.g., 'sun gone' rather than '**the** sun **is** gone'), and for whether the error was corrected by the adult. The next adult utterance was coded as a reformulation if it repeated in corrected form the portion of the child's utterance that had contained an error. Each reformulation was coded to indicate what change

include Hirsh-Pasek et al. (1984), Morgan & Travis (1989), and Saxton and his colleagues (1997, 1998).

[5] That is, we excluded utterances elicited by another speaker, such as repetitions of adult speech, song lyrics, nursery

had been made, and whether the reformulation introduced a side sequence and hence a brief diversion in the conversation, or an embedded correction as part of the on-going exchange. Finally, where the adult had reformulated, the child's next utterance was coded for whether the child took up and repeated the change that had been made, rejected it, or tacitly accepted it (with or without acknowledgment), by continuing on to produce the next turn in the conversation[6]. For this study, we looked only at the adult speakers who were the child's parents, and not at other adults.

For the analyses of conventional child utterances, we took a random sample of 200 utterances from every age slice for each child, identified all the conventional (error-free) child utterances in the sample, and tabulated how many of these were replayed by the adult in the next turn. If the adult repeated just what the child had said, the adult utterance was coded as what we will call a *replay*. The numbers we found may well be too high since some utterances transcribed as conventional may have contained minor errors, or been said too softly (information not recorded in the transcripts). So it is possible that some of the replays we counted were really reformulations.

Two researchers coded each transcript (except for several of Naomi's files, which were coded and rechecked by one person only); any discrepancies in coding were resolved through discussion. To check on reliability, two researchers coded a subset of the transcripts independently and compared their codings. They agreed 90% of the time (Cohen's K = 0.66) about the conventionality of the child's utterance (whether it contained an error, or was error-free); 91% of the time (Cohen's K = 0.81) about whether an error in the child's utterance was reformulated by the parent, and 91% of the time (Cohen's K = 0.85) about what error type(s) the child's utterance contained (phonological, morphological, lexical, or syntactic). They agreed 89% of the time both on the child's response to a reformulation (uptake, reject, or continuation), and on whether the adult's reformulation moved the conversation forward (a side sequence or an embedded correction) (Cohen's K = 0.74 and 0.75, respectively). All these figures are at or above the level required for high reliability.

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rhymes, etc.

[6] Utterances to which adults did not respond, or where they indicated they did not understand what the child had said (e.g., by saying 'what?') were not included in this analysis.

Once we coded the transcripts, we extracted the coded lines for detailed analysis. The number of coded lines from each corpus is shown in Table 1 below.

Table 1. Number of coded lines in each child's data

	Abe	Sarah	Naomi	Philippe	Grégoire
Total lines coded	6276	5029	2242	2421	511
Total erroneous utterances.	2911	2194	1095	1363	229

We divided the data into four age slices to track developmental trends. Each slice contained data for a six month period; these periods covered the ages 2;0-2;5, 2;6-2;11, 3;0-3;5, and 3;6-3;11 (inclusive). Some of the children did not have data sets for all four periods, so age trends were examined for only four of the five children. We also excluded from specific analyses any age slice that contained fewer than 10 data points.

Results

We present the findings pertinent to each of the hypotheses in turn, and take up several more general issues in the overall discussion**.** In the analyses that follow, all the Chi-squares were computed by log-linear analysis, and all the *p*-levels were less than 0.001, except where indicated.

§1. Negative evidence is available in adult reformulations

We calculated the percentage of child utterances that were replayed or reformulated by an adult in each age slice for each child. The percentages are shown in Tables 2 and 3 for the children's conventional and erroneous utterances for the corpora from English and French. The data for each child are displayed in Figures 1 to 3 for the children acquiring English, and Figures 4 and 5 for the children acquiring French. It's useful to compare rates of adult replays after conventional child utterances with reformulations after erroneous child utterances for two reasons: first, the comparison allows us to evaluate whether replays and reformulations are characteristic of

all parental speech, in which case the rates should be similar. If instead, adults use reformulations to check up on children's meanings, their rate of reformulations after errors (where the meaning is often unclear) should be higher than their rate of replays after conventional utterances. While any statistical difference between adult replays versus reformulations could be useful for children, the theoretical point here is that reformulations offer information about the locus and the nature of any errors. Second, this comparison allows us to compare reformulations for each error-type against the replay-level in adult-child exchanges (see further §2).

As Tables 2 and 3 show, there were reformulations of erroneous utterances in all the age-slices examined, for all five children. Moreover, these reformulations occurred in response to as many as two-thirds of the children's erroneous utterances. The overall rates of reformulation after erroneous utterances were very similar across children and also across the two languages.

Reformulations were much more likely to occur following an erroneous utterance from the child than replays were after a conventional utterance, as the data in the Tables and Figures show. This held for each of the children – Abe ($X^2(4) = 125$), Naomi ($X^2(4) = 67$); Sarah ($X^2(4) = 55$); Philippe ($X^2(3) = 126$), and Grégoire ($X^2(1) = 45$, by simple Chi-square). Adult speakers, then, reformulate much of children's erroneous speech, and in doing so present them with negative evidence.

Table 2. Percent and numbers of conventional utterances replayed vs. erroneous utterances reformulated overall by age (English corpora).

	Abe		Sarah		Naomi	
Age	Conven.	Erron.	Conven.	Erron.	Conven.	Erron.
2;0–2;5	**19** (154)	**67** (120)	**38** (66)	**65** (268)	**18** (120)	**48** (368)
2;6–2;11	**10** (134)	**36** (1194)	**26** (134)	**56** (521)	**10** (162)	**48** (205)
3;0–3;5	**4** (151)	**36** (601)	**23** (139)	**47** (409)	**16** (179)	**35** (65)
3;6–3;11	**2** (182)	**28** (424)	**21** (156)	**41** (205)	**13** (101)	**20** (10)

Note: The figures in boldface are percentages; those in parentheses show the number of instances analyzed for each cell. Calculations for conventional utterances were based on random samples of 200 utterances, except for Naomi at age 3;5-3;11, where only 112 utterances were available for the entire age slice.

Table 3. Numbers of conventional utterances replayed vs. erroneous utterances reformulated overall by age (French corpora)

	Philippe		Grégoire	
Age	Conven	Erron.	Conven	Erron.
2;0-2;5	**26** (111)	**67** (325)	**14** (74)	**60** (197)
2;6-2;11	**15** (169)	**61** (223)	--	--
3;0-3;5	**13** (197)	**53** (19)	--	--

Note: Numbers in boldface are percentages; those in parentheses show the number of instances analyzed for each cell. Calculations for conventional utterances were based on random samples of 200 utterances.

Figure 1. Percentage of Abe's conventional utterances replayed and erroneous utterances reformulated

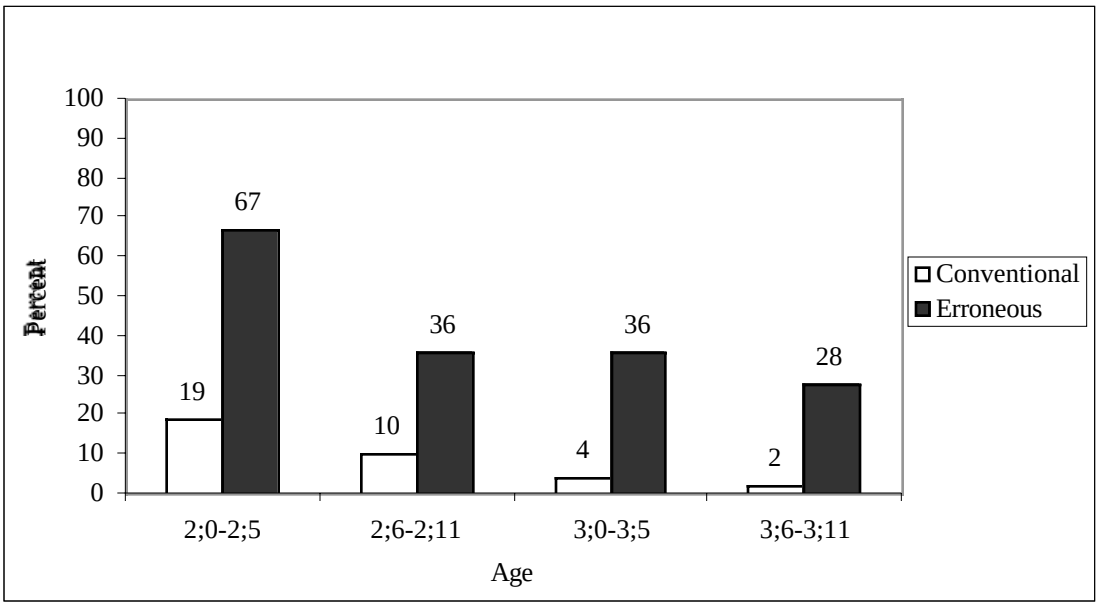


Figure 2. Percentage of Sarah's conventional utterances replayed and erroneous utterances reformulated

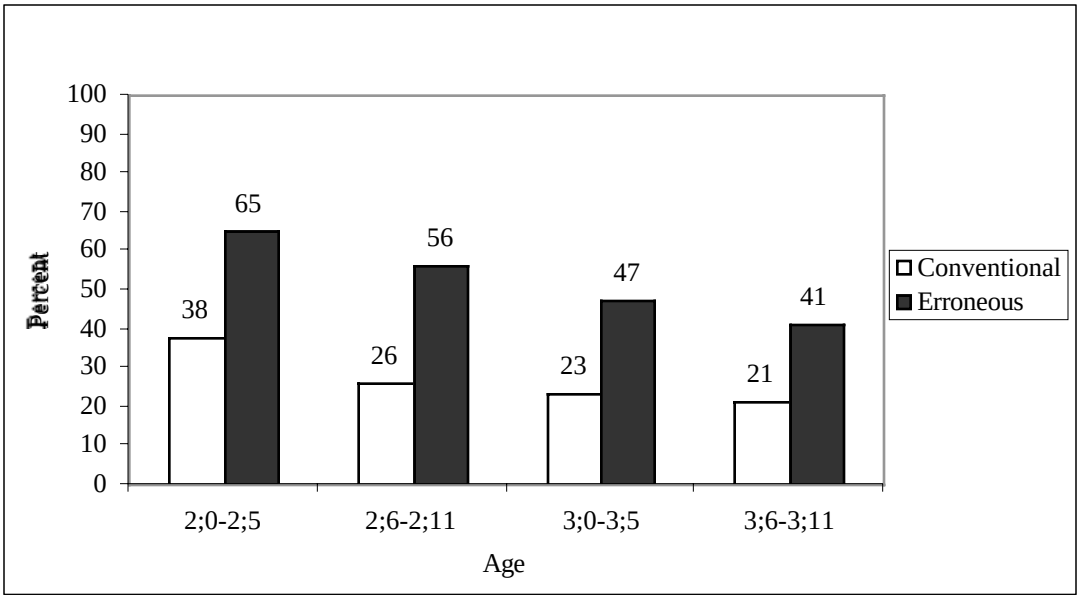


Figure 3. Percentage of Naomi's conventional utterances replayed and erroneous utterances reformulated

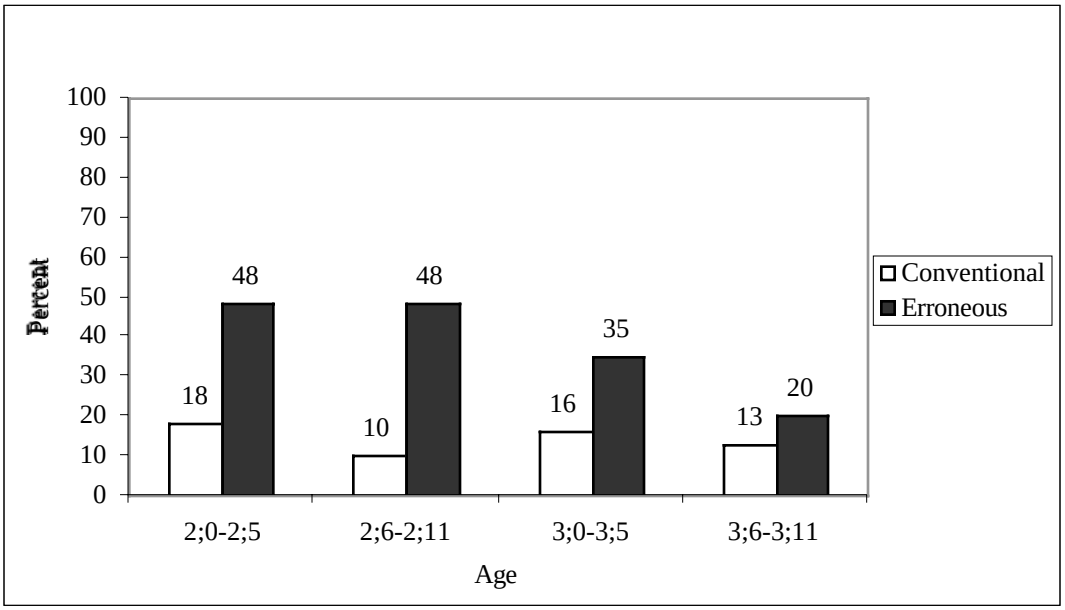


Figure 4. Percentage of Philippe's conventional utterances replayed and erroneous utterances reformulated

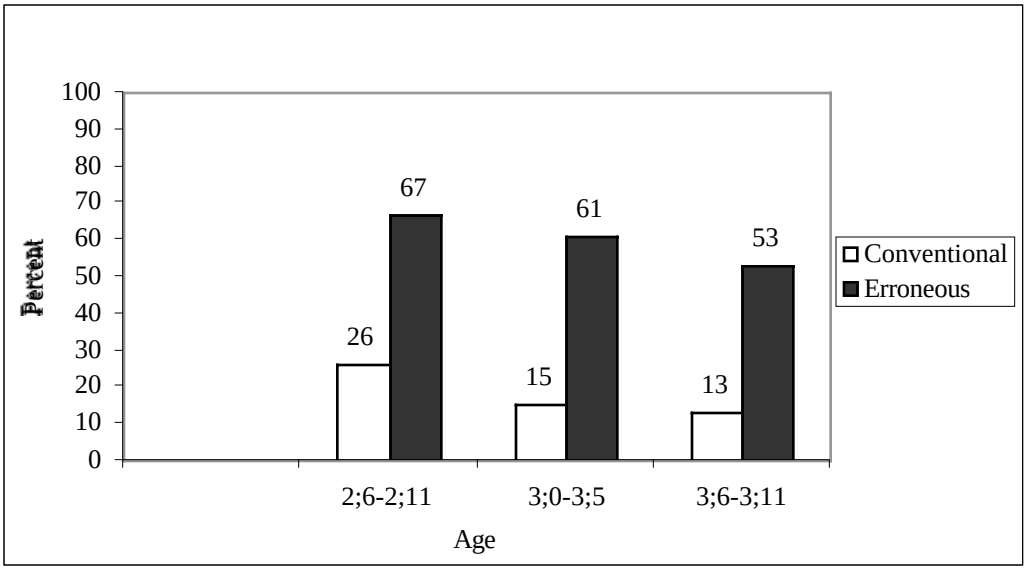
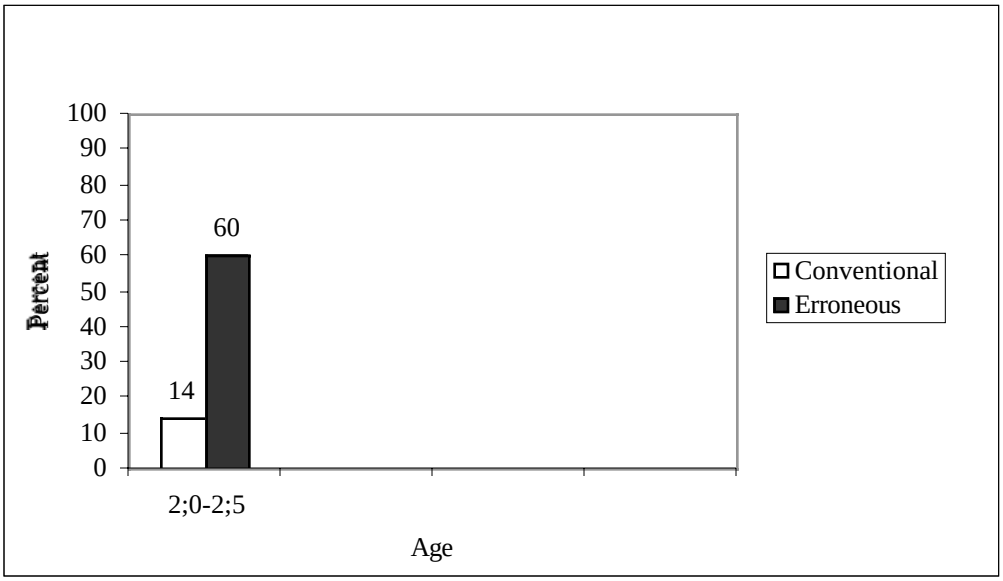


Figure 5. Percentage of Grégoire's conventional utterances replayed and erroneous utterances reformulated



As we have already pointed out, while the statistical difference in the number of replays versus reformulations might be useful, we are not arguing that this differential is where the important information lies for children learning language. What is important here is the contrast created when the child's erroneous utterance is immediately followed by the adult's reformulation: it is the difference between the two forms at the locus of the error that is informative for learners.[7] For all the children, for each age-slice, the rates of reformulation after erroneous utterances are high, and up to two-thirds of the children's erroneous utterances are reformulated. These rates are more than high enough to be valuable for learning; we pursue this point in more detail in the discussion.

When we analyzed adult reformulations, we also looked at their role in the flow of conversation. Up to age three-and-a-half, most reformulations took the form of side sequences (Jefferson 1972, Schegloff 1972), where the adult speaker checked on precisely what the child had

[7] Notice that this contrast only occurs with the reformulations of erroneous utterances. There can be no such contrast in form when the child's utterance is conventional. There the parental replay of a child's utterance is just that – a replay or repeat of the same form. These replays, of course, have a range of conversational functions (Clark 2002).

intended to say and thereby pinpointed the locus and nature of the error. These reformulations don't directly advance the flow of the conversation, but they are essential to its smooth conduct as the adult makes sure that a child has been understood.

In the present data, most adult reformulations appear to check up on the child-speaker's intended meaning, as in (6):

(6) Abe (2;6.4): milk. milk.
Father: you want milk?
Abe: uh-huh.
Father: ok. just a second and I'll get you some. [Kuczaj, Abe 12:6]

Other reformulations maintain the flow of conversation more directly by using an embedded correction in the next turn, as in the adult–child exchange in (7):

(7) Abe (2;5.10): I want butter mine.
Father: ok give it here and I'll put butter on it. [Kuczaj, Abe 4:66]

When we compared side sequences to embedded corrections, we found that side sequences, like that in (6), accounted for the larger share for all the children, with Abe, Sarah, Naomi, Philippe, and Grégoire hearing 57%, 70%, 70%, 73%, and 62%, respectively. That is, these reformulations were all side sequences designed to check on what the child had meant

§2. Negative evidence is available to children learning different languages, and for different types of errors

The children's errors were classified into one of four categories: phonology,[8] morphology, lexicon (word choice), or syntax. Tables 4 and 5 show the distribution of adult reformulations for each of the error types.. The data for the children acquiring English are shown in Figures 6 to 8, and for French in Figures 9 and 10.

[8] The phonological errors children made were most likely only partially represented when they were represented at all. Since the tapes for the children's sessions were not transcribed phonetically, we relied on the comments in the text about pronunciation and intelligibility. Such data were available only for four of the five children.

Table 4. Number of adult reformulations to each type of error (English)

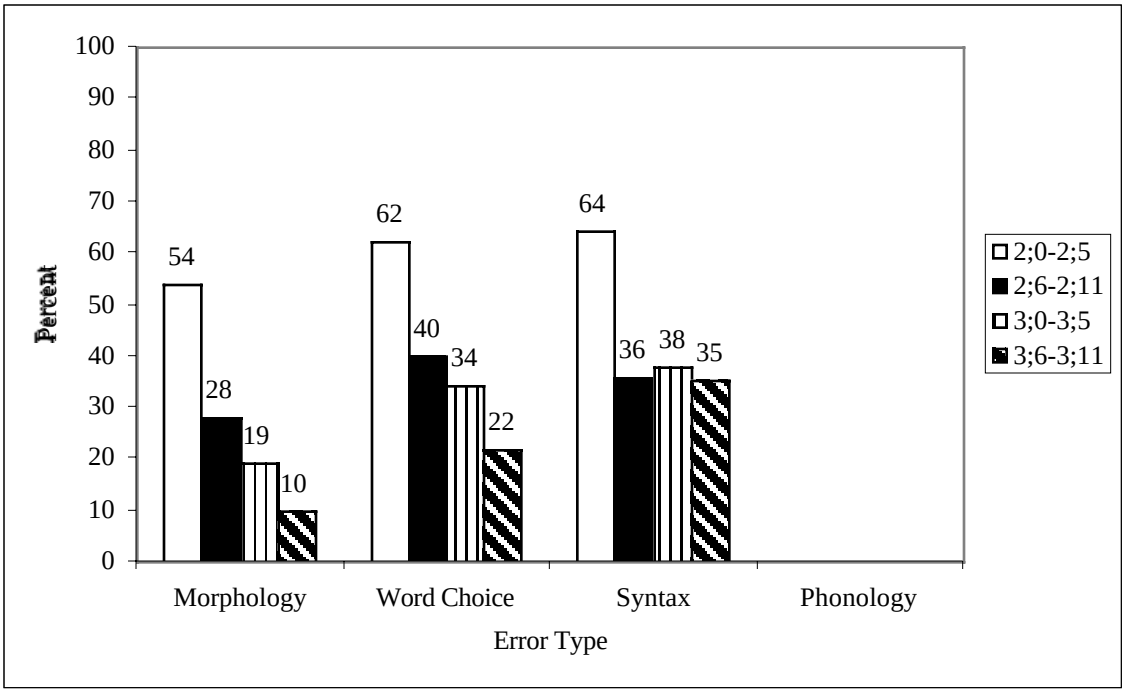
Abe	Phonology	Morphology	Lexicon	Syntax
2;0-2;5	—	**54** (26)	**62** (21)	**64** (83)
2;6-2;11	—	**28** (301)	**40** (292)	**36** (767)
3;0-3;5	—	**19** (188)	**34** (238)	**38** (296)
3;6-3;11	—	**10** (122)	**22** (233)	**35** (170)
Sarah				
2;0-2;5	**52** (102)	**64** (42)	**100** (12)	**65** (112)
2;6-2;11	**44** (191)	**44** (89)	**73** (55)	**58** (312)
3;0-3;5	**52** (143)	**23** (40)	**57** (23)	**46** (153)
3;6-3;11	**56** (54)	**21** (43)	**72** (18)	**31** (104)
Naomi				
2;0-2;5	**41** (46)	**34** (80)	**52** (60)	**46** (281)
2;6-2;11	**61** (18)	**43** (53)	**60** (48)	**43** (126)
3;0-3;5	**†67** (3)	**35** (17)	**50** (16)	**31** (36)
3;6-3;11	**†50** (2)	**†33** (3)	**†66** (3)	**†0** (4)

Note: Numbers in boldface are percentages; those in parentheses show the number of instances analyzed in each cell. Cells with fewer than 10 observations (**†**) were excluded from the statistical analyses.

Adults produced reformulations for all the error types we examined, at rates that were significantly higher than the rates for their replays after conventional utterances. For Abe, the numbers of reformulations for each type of error — lexical, morphological, and syntactic[9] — were all significantly higher than the numbers for replays of conventional utterances (by general log-linear analyses, lexical, $X^2(4) = 110$; morphological, $X^2(4) = 53$; syntactic, $X^2(4) = 131$). For

Naomi, reformulations were also significantly higher for each error type than for replays of conventional utterances (lexical, $X^2(3) = 106$; morphological, $X^2(3) = 44$; phonological, $X^2(2) = 69$; syntactic, $X^2(3) = 52$). For Sarah, the findings were the same (lexical $X^2(4) = 217$; morphological, $X^2(4) = 20$; phonological, $X^2(4) = 54$; syntactic, $X^2(4) = 49$).

Figure 6. Percentage of Abe's erroneous utterances that were reformulated for each error type



[9] No phonological information was available for Abe.

Figure 7. Percentage of Sarah's erroneous utterances that were reformulated for each error type

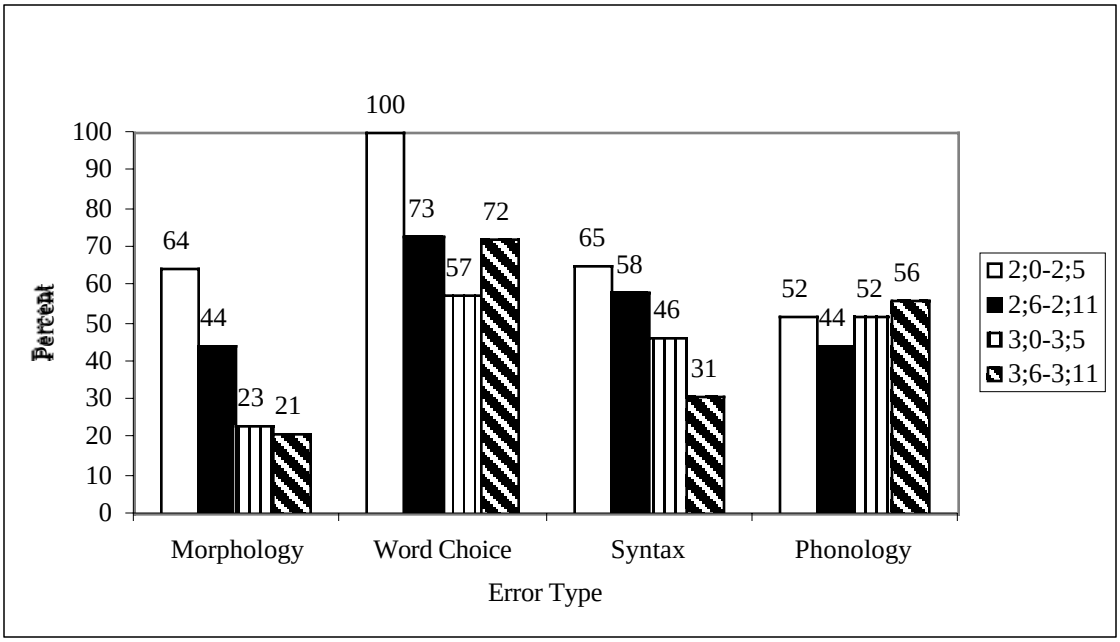
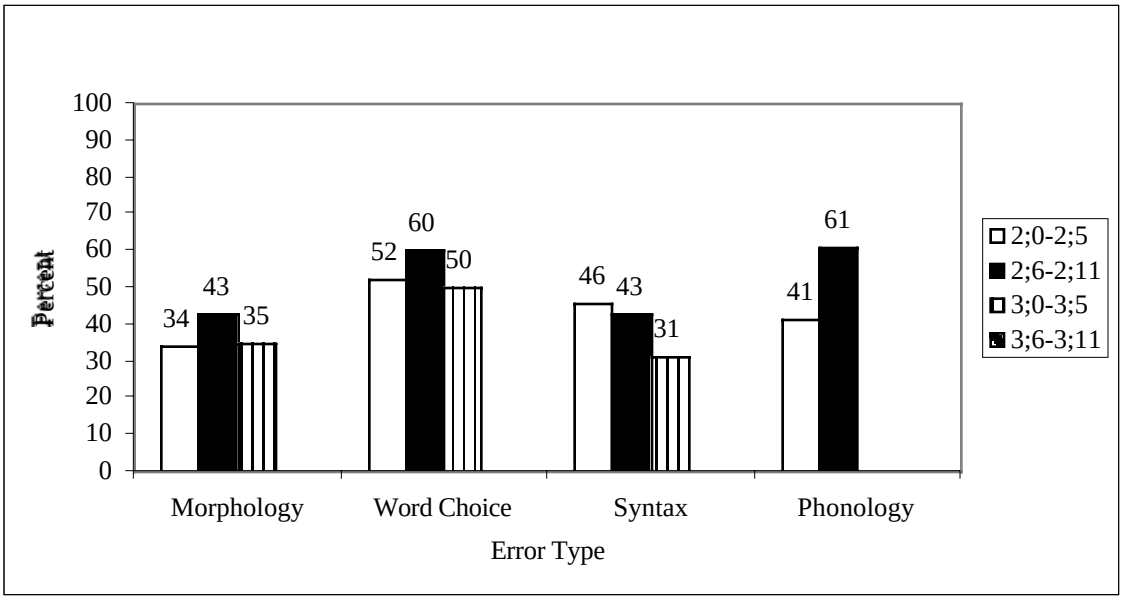


Figure 8. Percentage of Naomi's erroneous utterances that were reformulated for each error type



The two French-speaking children showed similar effects. For Philippe, reformulations of each error type were significantly more frequent than reformulations of conventional utterances (lexical, $X^2(2) = 155$; morphological, $X^2(2) = 35$; syntactic, $X^2(3) = 72$, and phonological, $X^2(2) = 183$). And for Grégoire, the results were the same (phonological, $X^2(1) = 51$; lexical, $X^2(1) = 58$, and syntactic, $X^2(1) = 26$).[10] Overall, then, adults reformulated after morphological and syntactic errors as well as errors of phonology and word choice for all the children and for both languages.

Table 5. Number of adult reformulations to each type of error (French)

Philippe	Phonology	Morphology	Lexicon	Syntax
2;0-2;5	**93** (41)	**37** (65)	**85** (41)	**60** (249)
2;6-2;11	**82** (33)	**53** (15)	**80** (49)	**61** (133)
3;0-3;5	**†50** (2)	**†100** (1)	**†57** (7)	**36** (11)
Grégoire				
2;0-2;5	**63** (153)	**† 75** (8)	**67** (18)	**47** (75)

Note: Numbers in boldface are percentages; those in parentheses are the instances analyzed in each cell. Cells with fewer than 10 observations (†) were excluded from the statistical analyses.

[10] The cell for reformulations of Grégoire's morphological errors contained too few exemplars for reliable analysis (see Table 5).

Figure 9. Percentage of Philippe's erroneous utterances that were reformulated for each error type

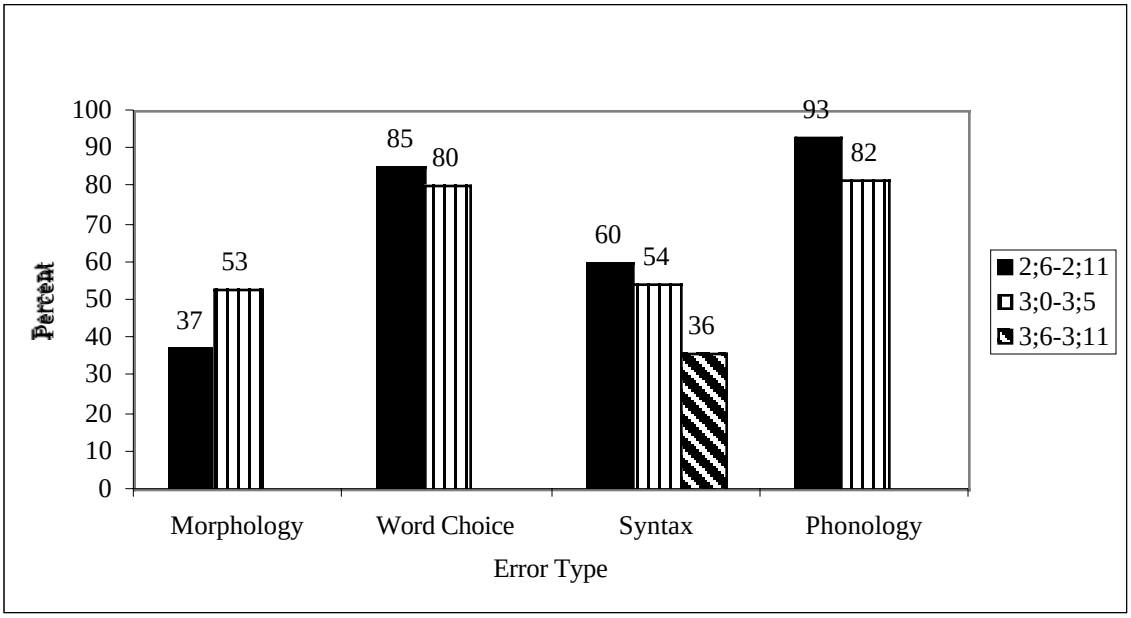
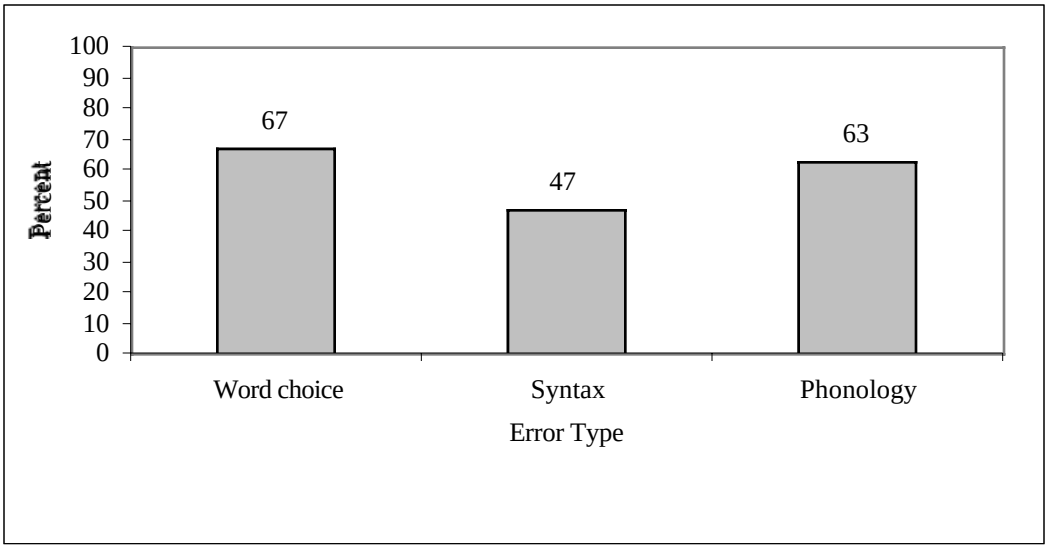


Figure 10. Percentage of Grégoire's erroneous utterances that were reformulated for each error type (2;0 – 2;5)



As we have already noted, we are not taking up the statistical difference between adult reformulations of errors and their replays of conventional utterances on its own; however, this analysis provides a general baseline for comparing rates of reformulation for each error-type. Did any one error-type account for the overall level of reformulations presented to each child? No. The levels of reformulations for each error type were comparable statistically to the overall rates (Tables 2 and 3), with reformulations of each error type nearly all the same as that rate. There were no statistical differences for the following comparisons with overall rates: Abe – lexical errors ($X^2(4) = 1.93$, $p = 0.748$) and syntactic errors ($X^2(4) = 1.42$, $p = 0.84$); Naomi – morphological errors ($X^2(3) = 4.56$, $p = 0.21$), phonological errors ($X^2(2) = 4.40$, $p = 0.11$), and syntactic errors ($X^2(3) = 0.95$, $p = 0.81$); Sarah—syntactic errors ($X^2(4) = 2.27$, $p = 0.69$); and Grégoire – lexical ($X^2(1) = 1.06$, $p < 0.50$) and syntactic errors ($X^2(1) = 3.40$, $p < 0.10$).

In five cases, the reformulation rates were significantly higher than the overall rates. They were: for Naomi, lexical errors ($X^2(3) = 7.82$, $p < 0.05$); for Sarah, lexical errors ($X^2(4) = 73$); for Philippe, phonological ($X^2(2) = 32$) and lexical errors ($\mathcal{X}^2(2) = 18$); and for Grégoire, phonological errors ($X^2(1) = 0.2$, $p < 0.7$).

And in a further five cases, reformulations were significantly lower than the overall rates: for Abe, morphological errors ($X^2(4) = 23$); for Sarah, phonological ($X^2(4) = 11.36$, $p < 0.023$) and morphological errors ($X^2(4) = 25$), and for Philippe, morphological ($X^2(2) = 19$) and syntactic errors ($X^2(3) = 7.91$, $p < 0.048$). (We return to Philippe's morphological data in the next section.) Yet even where the rate of reformulation for a particular error-type was significantly lower than the overall rate, the rates are still very high (see Tables 3 and 4, Figures 5 – 10), and all were significantly higher than the rates of replays for any conventional utterances. In summary, no one error type accounts for the figures in the overall reformulation rates. Adults reformulate all types of child errors.

§3. More reformulations are available to younger children

As Tables 2 and 3 show, adults used more reformulations when the children were younger and making more errors. For every 100 errors that a child makes, adults reformulate fewer and fewer of them as the child gets older. In the present data, reformulations decreased significantly with age for all four children — Abe ($\mathbf{X}^2(3) = 37$) and Naomi ($\mathbf{X}^2(3) = 23$); Sarah ($\mathbf{X}^2(3) = 13.26$, $p < .004$), and Philippe, ($\mathbf{X}^2(2) = 9.42$, $p < 0.009$). (There was no age trend information available for Grégoire.) So as children's errors become few and far between, adults become less likely to reformulate those few that do occur.

The same trend can be seen in each category of error types for these children. Reformulations decreased significantly with age for all error types for Abe (lexical, $X^2(3) = 35$; morphological, $X^2(3) = 54$; syntactic, $X^2(3) = 24$), and Sarah (lexical, $X^2(3) = 42$; morphological, $X^2(3) = 52$, and syntactic, $X^2(3) = 27$).[11] For Naomi, there was a marginal decrease in the reformulations for syntactic errors ($X^2(2) = 5.25$, $p = 0.072$), and for Philippe, there was a significant decrease with age in reformulations for phonological ($X^2(1) = 5.53$, $p = 0.019$) and syntactic errors ($X^2(2) = 12.48$, $p < 0.002$), but no change for lexical errors ($X^2(1) = 0.87$, $p = 0.35$).

There were only two exceptions to this pattern. One was the level of reformulation found for Philippe's morphological errors, which appeared to increase somewhat with age ($X^2(1) = 5.17$, $p = 0.02$). This could well be an artifact of the difficulty of detecting one particular morphological error he may have been making. Because of the number of homophones in French, it was impossible to tell whether he was correctly using the polite imperative form of regular verbs (e.g., *mangez* 'eat!') or incorrectly using the infinitive of the verb (e.g., *manger* 'to eat'), since both forms are pronounced in the same way. The second exception came from Naomi, for whom reformulations of phonological errors ($X^2(1) = 8.0$, $p < 0.005$) increased significantly with age. There was no significant change for either her lexical or morphological errors (lexical, $X^2(2) = 2.25$, $p = 0.32$; morphological, $X^2(2) = 2.08$, $p = 0.35$). Although Naomi's data showed an overall age trend (Table

2 and Figure 3), this did not hold across all error types (see Table 4 and Figure 8). In effect, Naomi's parents, if anything, increased their reformulations of phonological errors as Naomi got older, and continued at the same level for lexical and morphological errors. To check whether this pattern reflected some difference in early language skills in Naomi's case, we looked at MLU for the three English-speaking children in the first age slice (2;0 – 2;5). Abe was the most advanced of the three (MLU 3.14), with Naomi next (MLU 2.87), and then Sarah (MLU 1.78). So the smaller age trend in Naomi's data can't be attributed to her being either ahead or behind the other two. If the age range had included one or two further age-slices, we would probably have seen a decrease then in the reformulations in Naomi's data. The difference here probably reflects some of the early individual variation that has been well documented in language learning rates (Bates, Marchman, Thal, Fenson, Dale, Reznick, Reilly & Hartung, 1994).

§4. Children detect and make use of the corrections in reformulations

Even when parents reformulate children's errors, there is no guarantee that children take note of these reformulations, or use them in any way. To find out whether they do, we looked at how children respond, in their next conversational turn, to a reformulation. Is there any evidence that they have noticed the change presented by the adult speaker? Do they pick up on the change, and use it in their next utterance? Do they acknowledge the adult utterance (confirming its meaning) and then continue with the conversation?

Children could respond to an adult reformulation in one of several ways. First, they can *take up* the reformulation explicitly by repeating it and, in doing so, correcting at least part of their original utterance. When they do this, one might hear something like the exchange in (8):

(8) Abe (2;5.10): I want butter mine.
Father: ok give it here and I'll put butter on it.
Abe: I need butter **on it.** [Kuczaj, Abe 4:66]

[11] The decrease in reformulations to Sarah's phonological errors was not significant ($^{-2}$ (3) = 3.04, $p < 0.385$).

Here Abe's father's utterance contains a reformulation that adds the preposition *on* that Abe had omitted. The evidence that Abe noticed this change comes from the fact that he incorporated the *on* into his next utterance.

Second, children may overtly *reject* the adult's reformulation, thereby signaling that the parent has misinterpreted what the child intended, as shown in (9):

(9) Abe (2;5.7): the plant didn't cried.
Father: the plant cried?
Abe: **no.**
Father: oh. the plant didn't cry
Abe: uh-huh. [Kuczaj, Abe 3:163]

Here Abe noticed that what his father meant did not match what *he* meant, so he rejected his father's reformulation. His father tried again, and this time got Abe's meaning right.

Third, after hearing a reformulation, children may *acknowledge* it at the start of the next turn in the conversation, as in the exchange in (10):

(10) Abe (2;5.14): my momma cry.
Father: mommy cried.
Abe: uh-huh you yelling. [Kuczaj, Abe 5:1]

Here Abe made an error, his father reformulated it, which Abe acknowledged with *uh-huh*[12], and then went on with his turn. The acknowledgement is a further indication that children monitor whether or not their intention has been captured accurately in a reformulation.

Even when children do not issue an acknowledgement, they sometimes indicate explicitly that they have been attending in another way. Parents sometimes add a piece of new information to the utterance when they reformulate, and children repeat this *new information* in their next turn – again, evidence that they have been monitoring what the adult just said. Finally, children can simply *continue* with the conversation without overtly acknowledging the change or taking it up. Such continuations could be counted as tacit acceptances of adult reformulations.

[12] We spell the form *uh-huh* with a hyphen, following the usage in conversational analysis and in the current edition

Tables 6 and 7 summarize all the children's responses to adult reformulations of their erroneous utterances. The data that demonstrate explicitly that children attend to reformulations are shown in Figures 11 to 13 for the three English-speaking children, and in Figures 14 and 15 for the two French-speaking ones. According to Tables 6 and 7, the children made overt use of the information in the adult reformulations between 10% and 50% of the time. When they took up and corrected a form they had used earlier, they incorporated the relevant change into their very next utterance. In fact, these incorporations often took place in a newly designed utterance, rather than in an exact repeat of what the parent had said. When they rejected an adult reformulation (which they did up to 14% of the time[13]) , they would often try, once again, to state the original intention they had tried to convey. Again, to detect any mismatch between the adult reformulation and what they themselves had intended requires that children attend closely to whether the adult has understood them, as evidenced by the reformulation itself.

Children also gave further evidence of attending closely to adult reformulations in the form of other responses shown in Tables 6 and 7. The data from all five children were analyzed further for how often they *acknowledged* reformulations with terms like *uh-huh, okay,* or *yeah*; *repeated* a piece of new information added by the adult to the reformulation (without any other acknowledgement); or simply went on with the conversation, with a *bare continuation.*

Table 6. Child responses (%) to adult reformulations (English)

		Overt uptake	Rejection	Acknow-ledgement.	Repeat of new-info.	Bare continuation
Abe	N					
2;0-2;5	86	14	7	30	5	44

of the American Heritage Dictionary; the transcriptions give this form as *uhhuh*.

[13] The small numbers are not surprising as children can only reject reformulations where the adult has guessed wrongly at what the child was trying to say, and adults are rather skilled at using the context to figure out what the child means.

2;6-2;11	451	8	9	41	4	39
3;0-3;5	215	13	7	41	1	38
3;6-3;11	117	9	9	51	3	27
Sarah	N					
2;0-2;5	117	16	3	2	17	62
2;6-2;11	246	15	2	10	6	67
3;0-3;5	176	13	1	11	0	74
3;6-3;11	80	25	1	10	1	63
Naomi	N					
2;0-2;5	155	21	1	14	7	57
2;6-2;11	89	26	2	11	2	58
3;0-3;5	22	23	14	14	0	50
3;6-3;11	–	–	–	–	–	–

The children used a variety of forms to acknowledge a reformulation before going on with their turn. Abe used *uh-huh, uh-uh, hunh-uhn, no*[14]*, yeah, yep, right*, and head-nods; Sarah used only head-nods at first (up to age 2;7.5) and then also *yes, yeah, yep*, and *no*; Naomi used *yeah, yup, yep, yes*, and *no*; Philippe used *ouais, beaucoup, non, oui, si*, and *je sais pas dire ça*; and Grégoire used *oui*. (Neither French corpus included information on head-nods.) The three English-speaking children produced such acknowledgements between 2% and 51% of the time (Table 6) and the two French-speaking children, between 11% and 25% of the time (Table 7).

[14] Nearly all the children on occasion used *no* (or its equivalent) when they were accepting an adult reformulation of a child utterance that had contained a negation.

Table 7. Child responses (%) to adult reformulations (French)

		Overt uptake	Rejection	Acknow-ledgement.	Repeat of new-info.	Bare continuation
Philippe	N					
2;0-2;5	189	28	2	0	8	62
2;6-2;11	126	12	3	25	0	60
3;0-3;5	8	50	0	25	0	25
Grégoire	N					
2;0-2;5	109	9	0	11	1	80

On occasion, the children would repeat just the new information the adult had included in the reformulation (between 1% and 17% of the time). This too is an indication that the children must have been attending to the reformulation itself. Lastly, they would simply continue on with their next turn in the conversation (a bare continuation), thereby tacitly accepting the adult reformulation. This happened between 25% and 80% of the time. While the children differed in how often they gave each type of response to an adult reformulation, they all gave evidence, in these ways, of attending to reformulations.

The percentages of responses where children acknowledged a reformulation or repeated new information, alongside those where they either took up or else rejected the reformulation, are shown in Figures 11 to 15. Together, these offer a measure, for each child, of the overt attention they paid to adult reformulations. For Abe, they ranged from 56% to 72%; for Sarah, from 25% to 38%; for Naomi, from 39% to 100%; for Philippe, from 39% to 75%, and for Grégoire, they amounted to 25%.

Figure 11. Abe's responses to parental reformulations

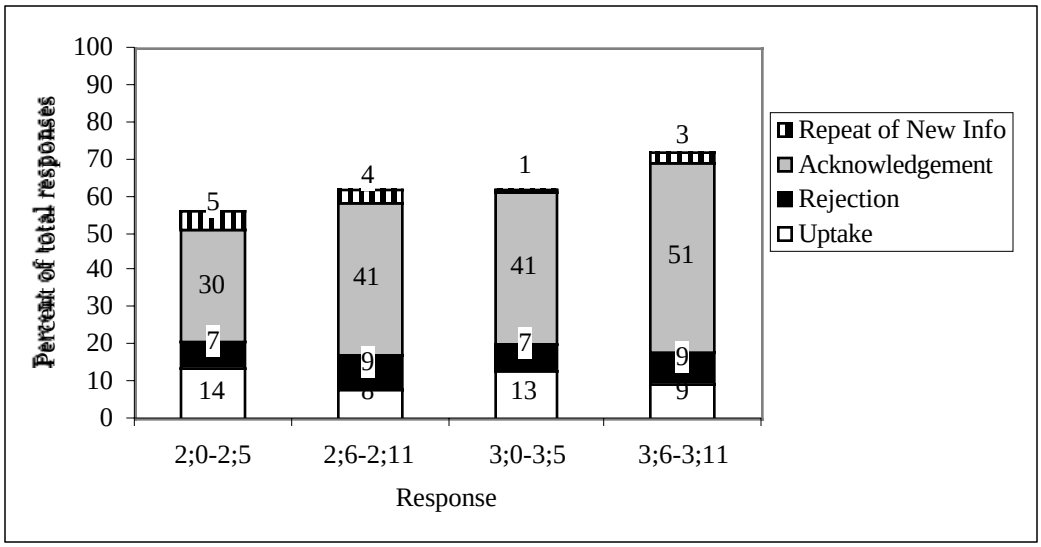


Figure 12. Sarah's responses to parental reformulations

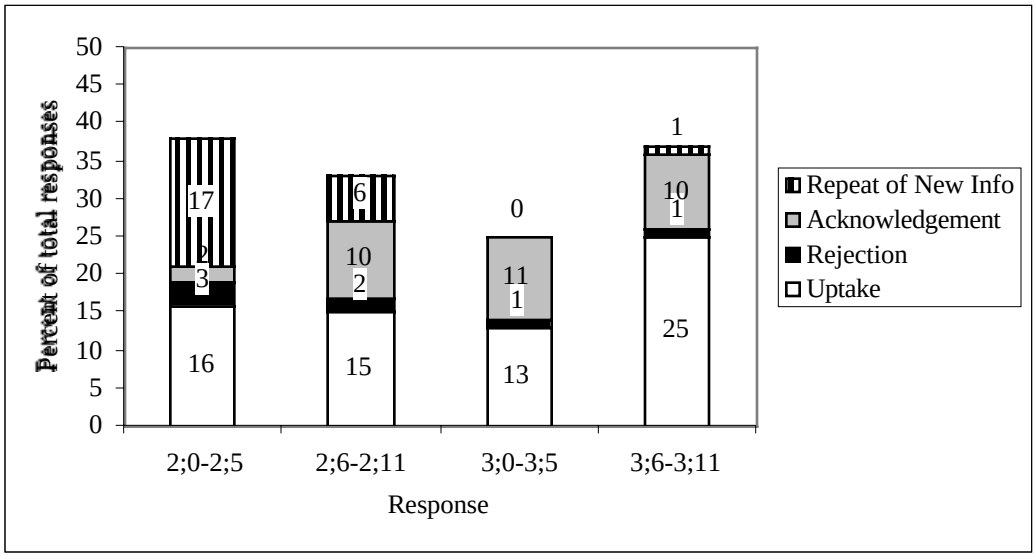


Figure 13. Naomi's responses to parental reformulations

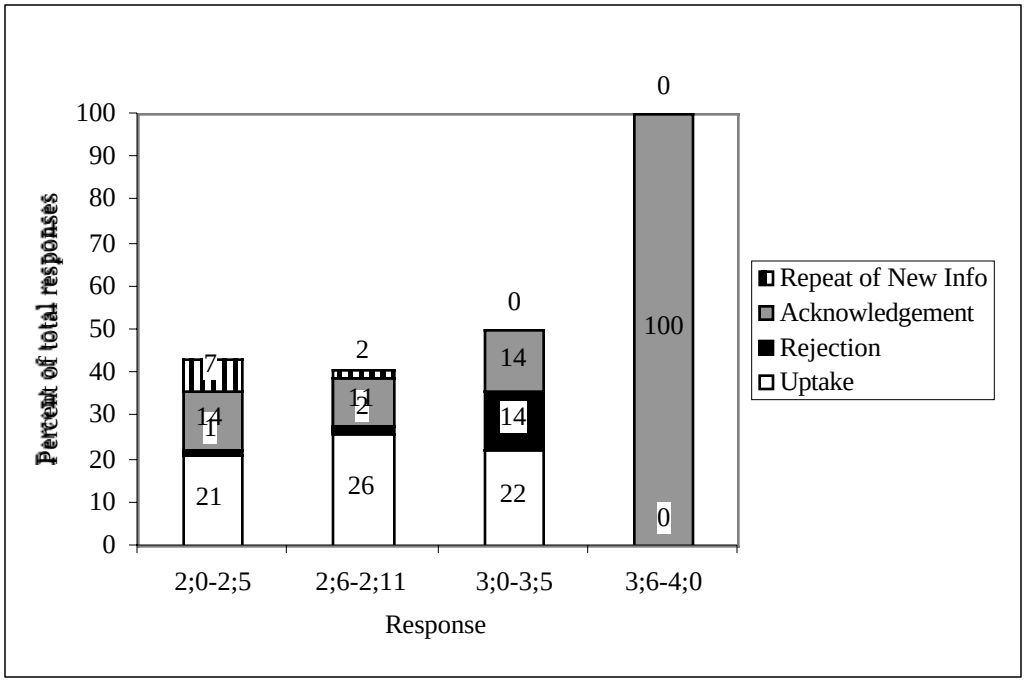


Figure 14. Philippe's responses to parental reformulations

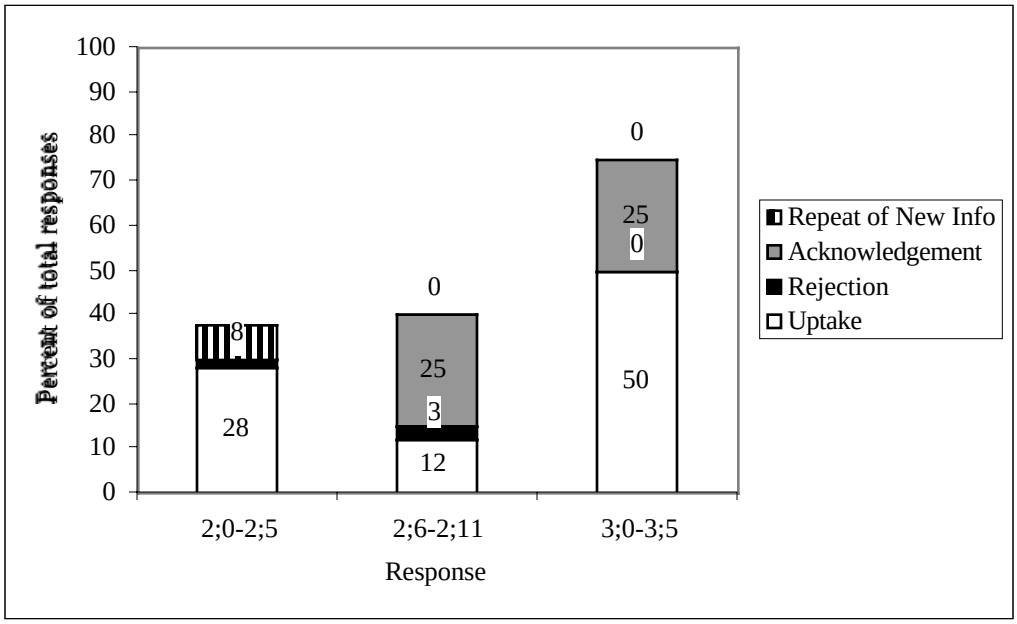
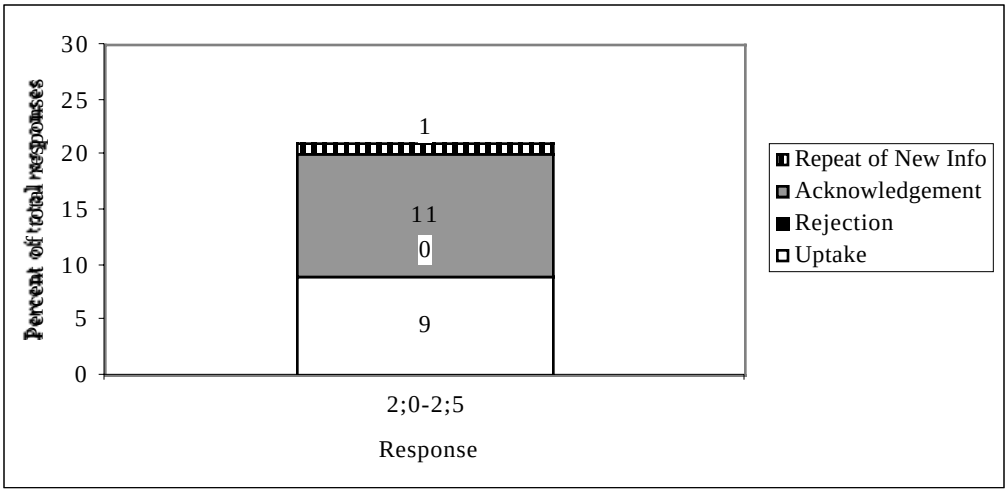


Figure 15. Grégoire's responses to parental reformulations



In short, the children's acknowledgements and their uses of new information both provide additional evidence of their attention to adult reformulations, even where they did not give an overt uptake or rejection. So such utterances, just as much as overt acceptances and rejections, show that children are attending closely to adult interpretations couched as reformulations. While their immediate concern is whether they have been understood as they intended, at some point children must also resolve the discrepancies between their own expression of an intention and the adult expression that they have taken as conveying that same intention. After all, they do want to be understood. And since adults are the experts here, children eventually adopt the conventional forms that adults use.

General Discussion

Our findings show that adults present negative evidence in response to children's errors during the early stages of language acquisition. In particular, they reformulate child utterances as they check on what the child meant, and in doing so also present the child with a conventional version of the erroneous parts of the utterance apparently attempted. The reformulation, with whatever changes in form it contains, signals that the child did not produce quite the right form for the meaning intended. Children consistently respond to such reformulations in several ways. Some

of the time, they take up the adult's correction and thereby ratify the adult interpretation as correct. In so doing, consciously or not, they correct their own earlier error. On other occasions, they reject the reformulation because the adult has misunderstood what they intended; they often follow a rejection with a further attempt at conveying their intended meaning. And on other occasions still, they accept the adult's interpretation of what they had meant by continuing with the conversation, with or without an acknowledgement of the adult reformulation. In short, our findings strongly support the view that children monitor what adults say to them, and, in particular, attend to and respond to adult reformulations of the child's intended meaning.

Like many previous researchers, we have argued that there *is* negative evidence available for young children learning to speak. While previous analyses have relied mainly on reply-types, we looked instead at whether adult responses to child errors identify the *locus* of the child's error and thereby contrast the error with the conventional adult form; whether adult reformulations present negative evidence, whether such evidence is available for all error-types, and whether children make use of this information. We turn now to the significance of our findings for these issues.

How frequent are reformulations in the speech children hear?

Do reformulations of child errors occur in the course of conversation between adults and children? As Tables 2 and 3 show, they occur in rather large numbers, and they occur significantly more often in response to erroneous utterances than replays do to conventional ones. This suggests that it is the erroneous nature of children's utterances that elicits these reformulations. The majority of adult reformulations introduce *side sequences* designed to mutually establish what the child's intention is before moving on.

Yet parents are unlikely to be correcting their children consciously and deliberately. They are more likely to be seeking to clarify the child's intention in order to get on with the conversation and its goals. But whether or not parents intend an utterance to be corrective is unimportant. What matters is that corrective information is present and available, and we have shown that it often is, and that children can and do make use of such information, and we have shown that they often do.

Are the levels of reformulation high enough to help children learn? As many as two-thirds

of their erroneous utterances are reformulated (Table 2). Even Naomi at 2;0–2;5, with the lowest level of reformulations was still at 48%. For children producing many erroneous utterances in a day, having between 50% and 70% of them reformulated would provide extensive negative evidence over time. In discrimination tasks, for instance, Estes (1959) and Levine (1959, 1963) found that learning occurred when hypotheses were confirmed or disconfirmed on fewer than 25% of trials. So, as Bohannon, MacWhinney and Snow (1990:224) pointed out, not all errors need be followed by corrective information in order for learning to occur: "Learning does not require that every trial should affect the balance." The actual numbers needed may be quite small.

This proposal is supported by some experimental work. Saxton and his colleagues (1997, Saxton et al. 1998) taught children novel irregular nonsense verbs (e.g., *streep, pell*) over the course of several weeks, using either positive evidence alone, or positive evidence combined with negative evidence (corrective adult utterances equivalent to reformulations in the present study). They found that, with negative evidence, fewer than 20 exposures were enough for children to learn a target form. The level of negative evidence in the present data, then, appears more than high enough to allow learning.

Are reformulations general?

Negative evidence, to be generally useful in acquisition, should be present for all children, regardless of setting or language, and for all error-types. In the present data, adult reformulations contained negative evidence about phonology, morphology, lexicon, and syntax. Similar levels of reformulation occurred in speech to all five children, and for both English and French.

A sample of five is relatively small, but we analyzed a large amount of longitudinal data for each child. Our findings were similar for the three males and two females. In some corpora, there was an observer present (Sarah, Philippe, Grégoire), in the others not (Abe, Naomi), and that made no difference. At the same time, four of the five children had at least one parent with a college degree, so we lack any real comparison across social class. Furthermore, the two cultures represented here are similar in certain respects and so do not represent a full test of the requirement that negative evidence be present under the full range of circumstances conceivable across cultures.

As many anthropologists have pointed out, cultures have different attitudes to child rearing and behaviour towards young children just learning to talk. Such differences are found within cultures as well (e.g., Heath 1983, Miller 1979). As a result, children in different settings may learn their first language in rather different ways. In the Kaluli and Samoan cultures, for instance, parents don't converse with children who are not yet competent users of language, and so don't participate in the conversational turn-taking with children characteristic of middle-class American families (Ochs & Schieffelin 1984).

Do such cultures provide negative evidence to the children learning languages within them? Despite the differences in interactional style, parents and other adults do present negative evidence, but in a somewhat different form. In fact, some of it looks strikingly like the explicit negative feedback considered by Brown and Hanlon (1970). As Ochs and Schieffelin (1984:293) reported:

> Kaluli mothers pay attention to the form of their children's utterances. Kaluli correct the phonological, morphological, or lexical form of an utterance or its pragmatic or semantic meaning.

In effect, the adult strategy is to tell children exactly what to say on different occasions (Schieffelin 1979; see also Gleason 1988). They do this by modeling the pertinent utterance along with the instruction *elema* 'say like that'. Where the child has failed to get what he wants (a plaything removed by an older sibling for instance), the parent or another adult will face the child towards his sibling and speak for him, thereby telling him how he should ask for the plaything to be given back. Samoan culture functions in a similar way, with children being shown directly when and how to say an utterance, and being expected to repeat such utterances verbatim.[15] So adult speech in these cultures also presents children with negative evidence.

In much the same way, American families of lower socioeconomic status use somewhat different patterns of verbal interaction with their young children compared to middle-class American families (e.g., Hart & Risley 1992, 1995, Heath 1983), but they still seem to make negative evidence available. Post (1994), for instance, reported that the parents of three children from lower class

[15] The younger children may also get feedback that is closer in form to the reformulations analyzed here from the

families that she studied provided considerably higher levels of explicit feedback than the middle class families observed by Demetras et al. (1986). In short, adults appear to provide negative evidence in response to erroneous utterances in both lower and middle class American families.

So across cultures, the form such evidence takes and the way it is presented may range from reformulations to explicit directions about what to say when. These probably represent two points on a continuum of options, where different cultures probably invoke different kinds of negative evidence so children eventually become conversant with the conventions of their language. Nor are the speakers of any one language restricted to using just one option. For instance, in our data, from about 1% to 13% of reformulations were prefaced by an overt adult rejection of the child form (e.g., "*No, ….*" or "*Non, on dit ….*"). There is no a priori reason to expect the *same* form of negative evidence to be present in every language. Only *some* form need be available for all children. So far, the evidence suggests that language communities do in fact provide negative as well as positive evidence to children who are learning to speak.

What do reformulations look like developmentally?

Adult reformulations of erroneous utterances decrease in number as children get older. What accounts for this decrease? Since it is also accompanied by a decrease in the number of errors children make, it would seem reasonable to expect that the same percentage of errors would be reformulated at each age, but adults in fact reformulate a lower percentage of child errors as children get older. One explanation for this could be that, even if they are unaware of it, parents are generally sensitive to the level of their child's linguistic ability. They adjust automatically to their child's level, so once they know that their child generally gets the past tense forms of verbs right, they may stop reformulating after the occasional error of omission (*I <u>see</u> the dog yesterday*) or commission (*He <u>goed</u> away*). Another explanation, proposed by Morgan and Travis (1989), is that parents simply get used to their children's errors (e.g., over-regularizations of strong verbs or failures to invert auxiliary verbs in questions) and stop bothering to correct them as the children get older. This account, though, assumes incorrectly that errors continue at the same rates regardless of

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older children who take care of them.

age, when children in fact produce many *fewer* erroneous utterances as they get older (Tables 2 and 3). Finally, a third explanation, one that is consistent with the decline in children's errors, might be that since children use more and more adult-like forms as they get older, adults don't have to *check* as often on what they mean because they can now understand them.

Higher levels of negative evidence in the earlier stages, when children are making more errors of every type, could be helpful as they try to analyze different systems in the language around them. Children struggling to pronounce their words properly, to add the right morphological inflections in the right places, to choose the right words, and to put those words together into constructions, are in greater need of negative evidence than children who can say words, have mastered much of the morphology, have a larger vocabulary, and can combine words into many phrases and clauses. And because younger children are hard to understand, parents will naturally spend more time trying to discern what their children intend to say, and so produce more reformulations than they do to older children.

Can children make use of the information in reformulations?

Reformulations are only useful if children can both detect and capitalize on the information they contain. Because of this, we need some measure of whether children can and do make use of the information in reformulations. For them to be effective, children should be able to detect, first, that a reformulation captures the intention in question, and secondly, that it differs in form at one or more points from the version the child-speaker produced. Ideally, children should then take in whatever the difference is and store it in memory for later, if not for immediate, use as the conventional way to say ***X*** in that language.

Some researchers have argued against this view after looking at possible consequences of recasts for children's later grammatical performance. Morgan and his colleagues (1995), for instance, argued that, relative to children's baseline responses to conversational continuations, there were no short term differences in children's grammatical productions following either recasts in general or what they characterized as "minimal recasts" (responses that *only* corrected the child's error and were therefore equivalent to reformulations in the present study). But the absence of

immediate overall changes in the child's system – the fact that they often perseverate on errors they have been producing for a long time – should not be surprising. Children (like adults) rely on well-established paths for the retrieval and articulation of forms when they speak. Changing these paths and articulatory patterns takes time and practice. The fact that children *attend to* the changes adults make, and the fact that they *repeat* or *acknowledge* these changes strongly suggests that they are adding the conventional forms to their representations for how to express those meanings. But for this information to show up in their speech production may take a long time.

Morgan and his colleagues also proposed some longer-term time series analyses of the effects of recasts and minimal recasts, and here too concluded that the adult utterances could not be being used as negative evidence. However, Saxton and his colleagues (1998) have pointed out a number of problems with those analyses that cast some doubt on this conclusion. In addition, Saxton showed experimentally both that children were responsive to negative feedback in the form of corrective utterances and that they learnt from them while not learning from positive evidence alone (see also Bohannon, Padgett, Nelson, & Mark 1996).

To make use of negative evidence, children must first attend to it. What evidence is there that children monitor adult speech? Even before they begin to speak, children give evidence of monitoring parental responses to their pre-linguistic gestures and vocalizations to make sure they have been understood. Marcos (1991, Marcos & Kornhaber-le Chanu 1992), for instance, found that infants would elaborate and even alter their communicative attempts systematically if their intention hadn't been understood (see also Wilcox & Howse 1982). Golinkoff (1986) reported a number of non-verbal negotiations that support the view that infants both monitor parental responses and show remarkable persistence and creativity in trying to convey their own intentions. Once they begin to produce their first words, this persistence in making sure they have been understood can be quite remarkable. Consider this episode where Brenda (1;8) tried to introduce *car* as a new topic when she heard a car pass on the street outside (Scollon 1976:109). When she was not understood, she then persisted, using two other words (*go, bus*) from the same conceptual domain. We give the ensuing exchange in normal orthography:

(12) Brenda: Car. Car. Car. Car.
Observer: What?
Brenda: Go. Go.
Other Adult: [unintelligible]
Brenda: Bus. Bus. Bus. Bus. Bus. Bus. Bus. Bus. Bus.
Observer: What? Oh, bicycle? Is that what you said?
Brenda: No.
Observer: No?
Brenda: No.
Observer: No – I got it wrong. [16]

It should not be surprising, then, that children continue to attend to how well they have been understood as they move on to produce more elaborate utterances.

One reason children attend to adult reformulations is because these utterances can indicate whether the adult has understood what they said. Within a conversational exchange, speakers seek to *ground* each utterance as they go along. In adding to common ground, they keep track of what is already known and what is new information, and whether their addressee is attending and has understood what they have just said. Addressees therefore need to signal their understanding in some way. They can do this in several ways: through back-channel signals such as *uh-huh* or *mm*, from the addressee; through explicit uptake of (some of) the new information in the prior speaker's utterances, or through an acknowledgement (*uh-huh, yes, yeah*) followed by a continuation on the same topic (see H. Clark 1996, Clark & Schaefer 1987). These devices all offer evidence that the addressee has attended to and understood the last speaker's utterance well enough for the exchange to continue.

Children's checking on whether their intention has been grasped is critical when it comes to mismatches between their own child utterances and the adult reformulations that follow. In the present study, we used children's responses to reformulations as one measure of their attention to what the adult speaker had *changed* in going from the child's utterance to a reformulation of it. First, the fact that they sometimes take up the change in their next utterance gives clear evidence that

[16] Upon transcribing the tape of this exchange, Scollon noticed the sound of a car in the background just before

they are attending, and are checking on whether the adult has understood what they intended to say. Second, on other occasions, they reject some adult reformulations as misinterpretations of their intended meanings. These rejections show they monitor adult reformulations. In addition, since their rejections are often followed by new attempts at expressing what they mean, these offer further evidence that children are checking on whether they have been understood. Third, at other times, children simply go on with the conversation, thereby accepting the reformulation as appropriate. Even here, though, children often acknowledge the reformulation by prefacing their continuation with *yes*, *yeah*, or *uh-huh*. These acknowledgements add still further evidence that children are attending to the reformulations adults produce.

Are children storing the corrective information available in adult reformulations? Do they learn from these reformulations? Children clearly monitor the differences between what they intended and what their parents then say, and, some of the time, use the changes of form in a reformulation when they explicitly accept or reject the adult version. Given this, there could well be learning even when children don't take up a reformulation overtly. It has long been known that children store adult-like linguistic forms in memory before they can produce them themselves. In phonology, for example, children consistently recognize words heard in adult form but fail to recognize their own incorrect pronunciations of the same words (see Dodd 1975, Smith 1973). They also spontaneously repair their own utterances from as young as 1;6 (Clark 1982, Käsermann & Foppa 1981). In both cases, children use word-forms already stored in memory as a target-model for recognition on the one hand and for checking on their own productions on the other (see also Clark 1993). They make use of the same stored targets whenever they try to understand any adult utterances. In acquisition, comprehension precedes and guides production. It seems likely, then, that children can take in corrective information from reformulations even when they don't make immediate use of it.

Although the present study didn't investigate how soon children make use corrective information, several recent studies have shown that children do learn from negative evidence. Saxton

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Brenda initiated this conversation.

and his colleagues (1997, Saxton et al. 1998), for example, taught children novel verb endings for nonsense verbs (e.g., *zib*) either with positive evidence alone or with positive evidence combined with negative evidence in the form of recasts (equivalent to reformulations). Learning was more successful in the recasts condition, and only the children who heard negative evidence were later able to make grammaticality judgments about which forms were acceptable and which were not. Training studies with children suffering from SLI (Special Language Impairment), and with both SLI and younger normal-language children, also suggest that recasts, where the adult speaker reformulates what the child said, are more effective teaching forms than positive evidence alone (Camarata, Nelson, & Camarata 1994, Nelson, Camarata, Welsh, Butkovsky, & Camarata 1996). Recasts resulted in faster learning and in a greater number of spontaneous uses of the targeted forms (see also Baker & Nelson 1984; Nelson, Denninger, Bonvillian, Kaplan, & Baker 1984). These studies, together with the present results, support the interpretation that reformulations are important in enabling children to learn which forms are conventional in the target-language and which not.

How do children distinguish corrective changes from other changes adults make?

How do children know which changes made by adults should be treated as corrections, and which should not? If children simply took every response to what they said as being potentially corrective, they would continually draw incorrect conclusions. As Marcus (1993:77) put it:

> "[…] a child might say *I want a cookie* and the mother might naturally reply, *No, you've already had three cookies.* […] children who changed their grammars every time the parent said something different would radically damage their languages"

The answer to this objection lies in the pragmatics of conversation. First, children monitor what adults say and recognize when they are checking on what *the child's own intention* was in saying something. This, of course, assumes that children, like adults, monitor on-going speech in general, an assumption for which there is extensive empirical evidence (e.g., Clark 1982, Levelt 1983, 1989).

To monitor whether one's own intentions have been understood, though, requires that speakers be able to make use of evidence for comprehension from whoever they are talking to.

Adults monitor their conversations at two levels, one for keeping track of the goals in the current exchange, the other for checking on whether the forms being used have been understood by the addressee (H. Clark 1996). Monitoring at the level of form ensures that speakers are successful in communicating their intentions, so that the two partners can be seen to have understood each successive utterance. Children's attention to reformulations in the present study suggests that they do likewise. They too appear to track both the goals of the exchange and the forms they themselves have used. Even pre-linguistic children alter their failed messages in systematically different ways depending on whether the parent misunderstood the message (the form), or refused to comply with it (the goal) (Marcos 1991, Marcos & Kornhaber-le Chanu 1992). In those studies, infants responded differently when the parent didn't answer or refused to comply with the goal, compared to when the parent misunderstood. This suggests that, just like adults, even infants monitor at both levels too, and can tell the difference between them.

Second, children attend to what reformulations implicate. Comparison of their original utterance with the adult reformulation identifies the locus of the error being corrected and presents children with another way of expressing the self-same intention. Children are then faced with having to choose between two distinct forms for the same meaning. Since any difference in form must signal a difference in meaning (by the principle of contrast), where there is no such difference, one of the forms has to go. And since established conventional forms take priority and pre-empt others (by the principle of conventionality), under such circumstances children will opt for the conventional adult form (Clark 1990, 1993). This instant comparison between the forms of child error and adult reformulation is what confers special status on reformulations as negative evidence: children can identify the intention they had in speaking *and* observe any change(s) in form that the adult has made. Other changes in conversation (as in the Marcus example) do not express the child's own intentions, so will not be treated as relevant to the form of the child's immediately preceding utterance.

A related issue arises when one asks how children identify elements added to an utterance by adults as obligatory or optional. Take the hypothetical example in (13):

(13) Child: I went to the park.

Parent: You went to the park today?

How can children tell that the addition of *today* is optional, rather than obligatory?[17] First, notice that they don't have to make these decisions on the basis of one replay or reformulation alone. In the course of acquisition, they will hear many such utterances. Cumulatively, these will allow children to come to an appropriate decision about each added element, since obligatory elements will never be missing from adult reformulations while optional ones will sometimes be there and sometimes not in adult replays and reformulations. Second, children use negative evidence in concert with positive evidence and with all sorts of pragmatic information about language use as they learn more and more about the particular language they are exposed to. Together, these sources of information contribute to children's (eventual) selection of the conventional form for conveying each specific meaning in a language.

Recognition that a conventional form is conventional, of course, doesn't guarantee instant changes in children's systems. Gaining full mastery of an adult form, whether this is a matter of pronunciation, morphological inflection, or syntactic construction, can take time. This is because an erroneous form may have become established enough in a child's articulatory program for language production that it remains the first form retrieved and articulated for that particular meaning even *after* the child has stored the appropriate conventional form in memory. Learning what the correct forms are and representing them in memory may occur weeks or even months before children succeed in retrieving them whenever needed, and so over-riding earlier, well-entrenched erroneous forms in their own production.

Are reformulations really *negative* evidence?

[17] What is optional versus obligatory, of course, differs from language to language, depending on the grammatical structures involved.

Do reformulations really constitute negative evidence, or are they merely another form of positive evidence? In our account, the same adult sentence uttered on one occasion could present positive evidence about conventional forms, by simply providing an utterance appropriate for a particular meaning. On another occasion, used as a reformulation of an erroneous child utterance, the same utterance could provide negative evidence in a side sequence or an embedded correction. This potential duality for any adult utterance is a strength of the present proposal because it links the role assigned to each utterance to what the child intended to say. And, at that point, the pragmatics of the ongoing conversation determines whether the adult's utterance is to be taken as positive or as negative evidence.

What is critical is that reformulations are made in *direct contrast* to what the child has just said. Their primary function is to allow adults to check up on precisely what the child intended, and, in doing so, they present a form for the expression of that intention that differs from the child's utterance in just the locus where the child's utterance was erroneous. Since, like adults, children attend to contrasts in form (Clark 1990, 1993), any change in form that does not mark a distinct, different, meaning will signal to children that they may have produced something that is not acceptable in the target language — the classic definition of negative evidence.

Reformulations are attempts to represent the child's intention. They express the meaning the child had in mind, but change the form. What the adult says appears to be critical in letting children know that the form they have used is wrong in some way. In fact, this is a common function for repetition in conversation more generally (Walker 1996). Children's reaction to hearing a question repeated, for instance, is to assume that they need to alter the answer they gave the first time. This strongly suggests that they take the speaker's repeat as implicating that they must now say something different. This is just what researchers have observed in conservation tasks, for example, where the adult consistently repeats certain questions as a way of making sure children really know the answer. The children's usual response to this is to change their first answer to something else (see further Rose & Blank 1974, Siegal 1997, Siegal, Waters, & Dinwiddy 1988).

With reformulations, the adult utterance presents a conventional rendition of precisely what the child had intended to say. Just as in the conservation studies, this implicates that the form of the child's utterance has something wrong with it. Inspection of the adult rendition provides the target model for what the child should have said had he been able to produce the conventional form. This is why reformulations are not just another kind of positive evidence. Because they contrast directly with the child's utterance in expressing the same intention, they alert children to the locus of the error and hence to the error itself. And because reformulations contain the conventional form, they help children to eventually eliminate erroneous, non-conventional forms.

Conclusion

The goals of the present study were to find out whether there was negative evidence in adult reformulations of erroneous child utterances, and, if there were, whether children made use of that evidence. Our findings show that adults reformulate erroneous child utterances often enough for learning to occur. Their reformulations are found for all kinds of child errors – errors of phonology, morphology, syntax and word choice. Further, our findings show that children can not only detect differences between their own utterance and the adult reformulation, but that they make use of that information.

In 1968, Roger Brown observed, with his customary prescience, that: "The changes produced in sentences as they move between persons in discourse may be the richest data for the discovery of grammar" (1968:288). In this paper, we have argued that it is indeed in the to-and-fro of conversation that children receive information about the appropriateness of their own utterances. Adults often check up on those child utterances that contain errors. One result is that children receive added information about the conventional way of saying what they apparently wanted to say, after they have made an error.

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