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Adult reformulations of child errors as negative evidence*

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ABSTRACT

Parents frequently check up on what their children mean. They often do this by reformulating with a side sequence or an embedded correction what they think their children said. These reformulations effectively provide children with the conventional form for that meaning. Since the child's utterance and the adult reformulation differ while the intended meanings are the same, children infer that adults are offering a correction. In this way, reformulations identify the locus of any error, and hence the error itself. Analyses of longitudinal data from five children between 2;0 and 4;0 (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) in both languages; (c) they reformulate significantly more often to younger children, who make more errors. Evidence that children attend to reformulations comes from four measures: (a) their explicit repeats of corrected elements in their next turn; (b) their acknowledgements (*yeah* or *uh-huh*) as a preface to their next turn; (c) repeats of any new information included in the reformulation; and (d) their explicit rejections of reformulations where the adult has misunderstood. Adult reformulations, then, offer children an important source of information about how to correct errors in the course of acquisition.

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INTRODUCTION

Children don't learn language in a void; they learn it in conversation. They learn how to express their intentions and interpret the intentions of others as they use conversation to accomplish such goals as deciding what cereal to have for breakfast, getting help with a game, or finding a toy. To make themselves understood and to understand others, children need information about the forms and functions conventional in the community. Most accounts of how children acquire such forms have focused on positive evidence – information about how a language is used, for instance, and the form of its phonology, morphology, lexicon, and syntax. 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? We begin by reviewing two positions on negative evidence: first, that children lack negative evidence because the speech they hear offers an impoverished guide to the language to be acquired, entailing that they must rely on innate information to acquire the adult language; second, that children do receive negative evidence in the form of different reply-types given in response to ill-formed versus well-formed child utterances. We propose a third view that builds on Clark's (1987, 1993) theory of contrast and is related to the views put forward in Saxton (1997, 2000). We focus on negative evidence provided by the pragmatic contrasts created in conversational exchanges when adults reformulate erroneous child utterances, and we also show that children attend to such evidence.

Negative evidence in language acquisition

Children produce many errors during acquisition, and the issue is how they manage to get rid of them. Some researchers have argued that the evidence children receive from the speech around them is too impoverished to learn from (the 'poverty of the stimulus' argument), so they have postulated that children have an innate language acquisition device. But this position has been undermined by the finding that parents actually make very few errors in speaking to their young children (e.g. Snow & Ferguson, 1977). Further justification for innateness was drawn from Gold's (1967) argument that positive evidence alone (i.e. exposure only to grammatical strings) is insufficient for a machine learning the types of languages exemplified by natural languages: to identify ungrammatical strings as ungrammatical requires negative evidence as well. If so, children would also need negative evidence in order to learn, and to get rid of errors (but see Saxton, 1997); without negative evidence, they would have to rely on some other (innate) source of information for learning. To back this argument, researchers relied heavily on observations about adult approval and disapproval of child utterances.

Brown & Hanlon (1970) looked at exchanges drawn from two transcripts for each of three children where a parent responded to the child's utterance with either explicit approval (*That's right*, *Correct*, *Very good*, *Yes*) or explicit disapproval (*That's wrong*, *That's not right*, *No*). They found no relation between parental reactions and child grammaticality, and this was taken to show that children receive no negative evidence. So, since children do eventually get rid of earlier errors without such negative evidence, they must rely on some other innate linguistic device that enables language learning.

But should only explicit disapproval count as negative evidence? Because explicit disapprovals disrupt conversation, parents intent on correcting their children's errors would have to devote a lot of time to this and would have less time for the goals of the conversation. Could adults correct errors in less disruptive ways? Researchers looking at other sources of negative evidence have focussed mainly on reply-types (e.g. Hirsh-Pasek, Treiman & Schneiderman, 1984; Demetras, Post & Snow, 1986; Farrar, 1992). They proposed that parents respond to ill-formed (erroneous) child utterances by using different TYPES of responses from those they use when responding to well-formed utterances. Among the reply-types considered are expansions, repeats, recasts, and requests for clarification. For instance, a parent might respond to ill-formed utterances with expansions, as in (1):[1]

(1) Ben (1;11.25): Hat.
Mother: She has a hat on? [Demetras *et al.* 1986: 284]

Under this view, the reply-type 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 example, then adult use of an expansion would signal that the child's utterance was ill-formed.

This approach raises a number of questions. First, it focuses on reply-type alone without considering whether the replies themselves contain specific corrective information; second, it groups replies that are corrective with those that aren't. Compare the hypothetical exchanges in (2) and (3):

(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?

[1] All the examples cited include the child's age (in years, months, and days), together with the published source, or the source in the CHILDES Archive (MacWhinney & Snow, 1990).

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

Another problem here is that children can identify forms as erroneous only after complex statistical comparisons that depend on prior identification of various reply-types (Marcus, 1993). While both infants and older children are capable of elaborate statistical tracking (e.g. Saffran, Aslin & Newport, 1996), 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 requires that children already know what an expansion is, and that they try out specific utterances enough times to verify the reply-type they elicit. But even then, the reply-types still would not tell them what is wrong with the erroneous utterance, nor how to correct it (Saxton, 1997).

Some researchers have suggested that one reply-type – recasts, where the adult repeats the child's utterance with corrections – is particularly effective because it presents the child directly with the change to be made. For example, Farrar (1992) looked at adult recasts of morphological errors in children at 1;11, and found some evidence that children tried to repair their utterances after a recast. Saxton (1997) proposed a contrast theory of negative input, tested in a learning experiment with five-year-olds, where he argued that the immediate adult correction of an erroneous verb form constituted negative evidence. But neither Farrar nor Saxton specified why the adult utterance was treated as a correction, nor why the juxtaposition of two forms of the same verb (e.g. *goed* vs. *went*) should lead children to opt for just one of them. Without such specification, it remains unclear why some changes made in conversation lead to corrections, and others don't. In the approach put forward here, we present a pragmatic account of why some adult utterances are identified as corrections, and hence why children hearing two past tense forms from the same verb, for instance, (eventually) opt for just the conventional one.

Getting evidence about errors in conversation

We propose that it is in the to-and-fro of conversation that children receive information about whether their utterances are appropriate for their intended meanings. In conversation, each speaker contributes in turn to the common ground of speaker and addressee, and, to accumulate this common ground, speakers have to be sure that they have UNDERSTOOD the speaker's intended

meaning on each occasion (H. Clark, 1996). This goes for children too, in adult–child conversations.

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. Among them is the maxim of Manner, 'how what is said is to be said' (1989: 27). To observe this maxim, speakers should choose the appropriate forms to express just the meaning they intend. But young children often violate it: they mispronounce words, use the wrong inflected forms or choose the wrong grammatical morphemes, pick the wrong words, produce wrong word-orders and omit words. These violations of Manner can obscure what children mean, so adults then have to check up on just what they intend to convey.

How do adults check up on someone else's intentions in conversation? One way is to use a SIDE SEQUENCE to clarify the meaning intended (Schegloff, 1972), and then ratify their understanding of it before continuing on, as in the exchange in (4) where Nina initiates the side sequence (indented and marked with ||) by querying what Roger has said, and only after he has confirmed it, answers his original question.

(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 in early acquisition. The element targeted is identified by the speaker's repeating the utterance or phrase where it occurs but with a correction of the target form – in (4), *j– car* corrected to *car*. In acknowledging the clarification in the side sequence with *yeah*, *uh-huh*, or the like, the original speaker accepts and ratifies the correction.

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 (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*, in his next turn, and thereby shows that he accepts it as the appropriate term.

Side sequences and embedded corrections both offer ways to correct another speaker's utterance. In both cases, 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 form, in pronunciation (e.g. *car* in lieu of *j– car* in [4]), word choice (*threads* in lieu of *wales* in [5]), morphology (e.g. *threw* in place of *throwed*), or syntax (e.g. *where's he sitting?* in lieu of *where he sitting?*). Both these resources for correcting another speaker rely critically on the pragmatic notion of contrast to identify the LOCUS of the error (whether it's an error of commission or omission) and the CORRECTION being offered. Notice that the repeat in conventional form of the target elements implicates that the original speaker who produced those forms made some error. Conversational implicatures are part of the speaker's intended meaning, but they are never stated directly, and have to be computed on each occasion by the addressee. The addressee's interpretation of an utterance will include any implicatures that can reasonably go along with it on that occasion (Grice, 1989; Levinson, 2000).

This computation of speaker meaning depends critically on the pragmatic principles of contrast and conventionality (Clark & Clark, 1979). Speakers and addressees rely on the conventions of the language; they communicate by virtue of languages being conventional systems, such that all members of the community know the conventions, and infer speakers' meanings on the basis of that knowledge. Speakers are assumed to choose those terms and constructions appropriate to the meaning they intend to convey, and they do this so that their addressees can make the appropriate inferences about their meaning on each occasion (Clark & Clark, 1979; Clark, 1993). If the meaning to be expressed is captured by a conventional expression, then the speaker must use that. If he uses some other term for that particular meaning, the addressee will infer that the speaker must mean something else. As a result, each choice a speaker makes contrasts with all other possible expressions that could have been used for other meanings.

This is particularly important in the context of language acquisition. Children are novices who have to learn the conventional expression for conveying each meaning. This takes time, and since children make many errors along the way, adults spend a lot of time checking up on what their children intended to say. We will call the utterances adults use in checking up REFORMULATIONS since they contain conventional forms in lieu of any child errors, and so offer children adult versions of how to say what they intended to say. These conventional adult versions CONTRAST with the erroneous forms produced by children.

But how does this contrast help children find and correct errors in their own speech? Once an adult has reformulated an erroneous utterance, the child is presented with two forms to express THE SAME MEANING – the child's and the adult's. Since these two forms do NOT contrast in meaning (they express the same intention), the one that is conventional has priority (Clark & Clark, 1979). Like adults, children observe the general pragmatic principle of contrast and do not use or accept two forms for the same meaning, but defer instead to adult speakers, the experts on the conventional forms for expressing specific meanings. They do this by giving precedence to adult forms over their own non-conventional forms (Clark & Clark, 1979; Clark, 1993). Contrast plays the critical role here, and it applies to all aspects of language. It guides children in phonology (e.g. Dodd, 1975), in morphology (e.g. Clark, 1987; Farrar, 1992), in syntax (e.g. Clark, 2003), and in word choices (e.g. Clark & Grossman, 1998).

In summary, once children become aware that two forms convey the same meaning, they will adopt the conventional one in place of their own erroneous expression.[2] 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. Central to all reformulations, we emphasize, is the adult desire to make sure they have understood what their children intend to convey.

Sameness of meaning is critical. In his contrast theory of negative input, Saxton (1997) proposed that the immediate juxtaposition of a child error and adult form should draw children's attention to any mismatch and thereby provide a basis for rejecting an erroneous form. But notice that this holds only if children realize that the two forms in question are intended to express the self-same meaning. We return to the issue of just how children manage this in the discussion.

In summary, parents often check on their children's intentions when those are unclear. In checking, adults reformulate in conventional form what they think their children intended and thereby simultaneously provide a source of corrective evidence that can alert children to the precise errors they have made. 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 that they should have used for that meaning.

Questions and hypotheses

Do parents produce such reformulations? If so, do they do so often enough to affect language acquisition? Do they produce them to children at all stages

[2] This process is seldom instantaneous; 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 is why children take a long time to master the production of irregular forms (see further Clark, 1987, 1993).

and for all kinds of errors? And, even if adults do produce them, do children make use of them? Several researchers have called attention to reformulations in spontaneous speech: Brown & Hanlon (1970) commented that parents at times repeated their children's utterances with corrections (see also Moerk, 1991). Studies of response-types have included parental repeats-with-corrections as one response type, RECASTS (e.g. Demetras *et al.*, 1986). Some of these studies were cross-sectional, but typically looked only at a narrow age range (e.g. Saxton, 1997), while others looked at just one age (Farrar, 1992). The only longitudinal data analysed come from Roger Brown's Eve, recorded from 1;6 to 2;3 (see Moerk, 1991; Saxton, 2000). While observations from these studies suggest that parents do make use of reformulations, it remains unclear under what circumstances they do this, how often, or to what aged children. Extensive longitudinal data are therefore essential for assessing the incidence of reformulations in response to different errors and different ages.

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 types of child errors. We therefore examined data from several children in depth, over a two-year period, which allowed us to track a large number of errors from each child, and at both English and French to establish whether adults provide negative evidence to a similar range of errors in different languages. If adults speaking different languages offer negative evidence, this would attest to its generality.

Does the negative evidence in reformulations change over the course of development? As children get older, they produce a larger proportion of adult-like utterances, so with age there should be fewer occasions when adults check up on what children mean. Does the frequency of adult reformulations change from age 2;6 to 3;6? And do different error types elicit different amounts of correction? Previous studies of negative evidence focussed on morphology and syntax, and generally ignored phonology and the lexicon (e.g. Farrar, 1992; Nelson, Welsh, Butkovsky & Camarata, 1996; Saxton, 1997). The longitudinal nature of our study allowed us to look at how adult speech to children changes as the children get older, and to detect general trends in response to different types of errors.

Finally, do children make use of the corrective negative evidence available? Even if adults do reformulate errors, children might not pay attention to them. Experimental data from some learning studies (Saxton, 1997; Saxton, Kulcsar, Marshall & Rupra, 1998) show that five-year-olds are attentive to negative evidence when it appears in adult utterances immediately after children have made an error (e.g. regularizations of the past tenses of novel irregular verbs), and even if they do not go on to produce the correct adult form, they are able to judge such forms as correct. This suggests that older children can take in corrective information even if they cannot access it

for immediate use in their own productions. To what extent do two- and three-year-olds attend to the negative evidence in reformulations? We 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 examined are the following:

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

METHODS

Our data were drawn from five corpora in the CHILDES Archive (the Child Language Data Exchange System; MacWhinney & Snow, 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 corpus, and Grégoire from the Champaud corpus). We chose these five children because the original taping intervals were regular, their age ranges had considerable overlap, and all five children were talking spontaneously to one or both parents most of the time during the recording sessions. Finally, we chose three children acquiring English and two acquiring French so we could compare data from two languages.

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 larger than the others). 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. For Abe, the relevant files covered ages 2;4.24 to 3;11.25; for Sarah, 2;3.7 to 3;11.29; for Naomi, 2;0.2 to 3;8.19; for Philippe, 2;1.19 to 3;3.12; and for Grégoire, 2;0.5 to 2;5.27. (Grégoire's corpus covered the smallest age range, but his data offered a comparison to Philippe's for the earliest age-slice and also contained a detailed phonological record.) The extensive data in the transcripts for each child allowed for detailed analyses of both child errors and adult reformulations.

For the analyses of child errors, we included every spontaneous child utterance in the transcripts, except for utterances with unintelligible speech, or child utterances preceded or followed by unintelligible speech on the part of the adults. (Also excluded were utterances elicited by another speaker, e.g. words of songs, nursery rhymes, etc.) Each child utterance 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

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'girl **th**ere?'),[3] *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').[4] The subsequent 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 had been made, and whether the reformulation introduced a side sequence or an embedded correction. 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. (Utterances to which adults did not respond, or where they responded to the child by saying 'what?', were not included in this analysis.) 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 six-month age slice for each child, identified all the conventional (error-free) child utterances in the sample, and tabulated how many of these were repeated by the adult in the next turn. If the adult repeated just what the child had said (i.e. a grammatical utterance), the adult utterance was coded as a REPLAY. The numbers we report for replays may actually be too high since some utterances transcribed as conventional may have contained minor errors, been said too softly, or been inappropriate to the context in some way (information often not recorded in the transcripts). So some utterances counted as replays were probably 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 about the conventionality of the child's utterance – whether it contained an error, or was error-free (Cohen's $K = 0{\cdot}66$); 91% of the time about whether an error in the child's utterance was reformulated by the parent (Cohen's $K = 0{\cdot}81$), and 91% of the time about what error type(s) the child's utterance contained – phonological, morphological, lexical, or syntactic (Cohen's $K = 0{\cdot}85$). They agreed 89% of

[3] Most tapes for the children's sessions were not transcribed phonetically (except for Grégoire), so we relied on non-conventional spellings (e.g. *dat* for *that*) and comments about pronunciation and intelligibility to identify phonological errors. Data on such errors were available for four of the five children.

[4] A few studies have focused on smaller categories within morphology (e.g. Farrar, 1992; Saxton, 2000), but to track the history of individual errors and their correction requires a combination of daily diary observations and experimental elicitation. Such data are not available at this point, although the work on dense observations at the MPI in Leipzig may prove useful here (e.g. Lieven, Behrens, Speares & Tomasello, 2003).

TABLE 1. *Number of utterances coded in each child's corpus*

	Abe	Sarah	Naomi	Philippe	Grégoire
Total utterances coded	6276	5029	2242	2421	511
Total erroneous utterances for each child	2911	2194	1095	1363	229

the time both on the child's response to a reformulation (uptake, rejection, 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 show acceptable levels of reliability in the coding.

Once we had coded the transcripts, we extracted all coded lines for detailed analysis. The number of coded utterances (child and adult) from each corpus is shown in Table 1.

We divided the data into four age slices to track developmental trends for the numbers of errors produced and reformulated. 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. Grégoire 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 cell for the age slice that contained fewer than 10 data points, since these contained too few instances for statistical reliability.

RESULTS

We present the findings pertinent to each of the hypotheses in turn, and then take up several more general issues in the Discussion. In the analyses that follow, all the chi-squares were computed by log-linear analysis on the actual frequencies, and all the *p*-values were 0·001 or less, except where indicated.

Negative evidence is available in adult reformulations

We counted the numbers of child utterances that were replayed (in the case of conventional utterances) or reformulated by a adult (in the case of erroneous utterances) in each age slice for each child. The data for both conventional and erroneous utterances are displayed, as percentages, in Figures 1–3 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

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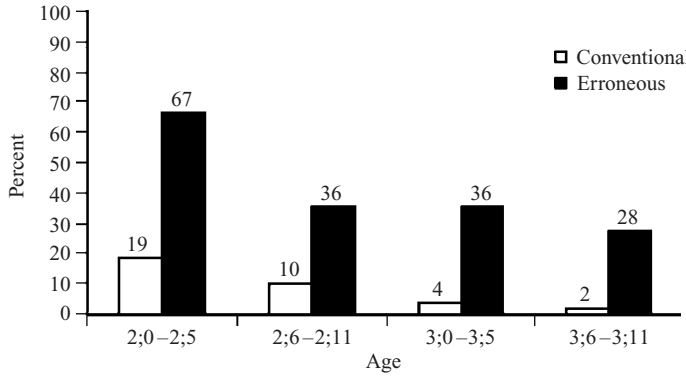

Fig. 1. Percentage of Abe's conventional utterances replayed and erroneous utterances reformulated.

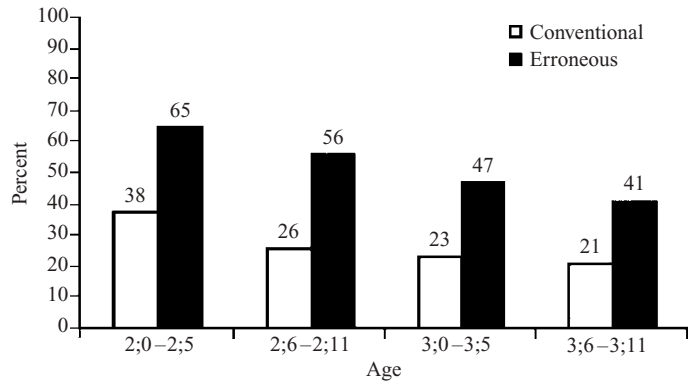

Fig. 2. Percentage of Sarah's conventional utterances replayed and erroneous utterances reformulated.

their children's meanings, their reformulation-rate after errors should be higher than their replay-rate after conventional utterances. Second, this comparison allows us to assess reformulations for each error-type against the general replay-level in adult–child exchanges (see further below). But note that while any statistical difference for adult replays versus reformulations could be useful for children, this is not the source of information of interest here. The theoretical point here is that adult reformulations offer information about the locus and the nature of child errors independently of any statistical differential available to children.

As the Figures 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

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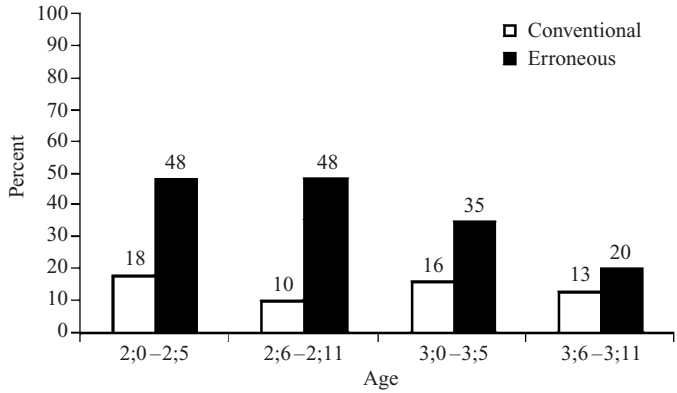

Fig. 3. Percentage of Naomi's conventional utterances replayed and erroneous utterances reformulated.

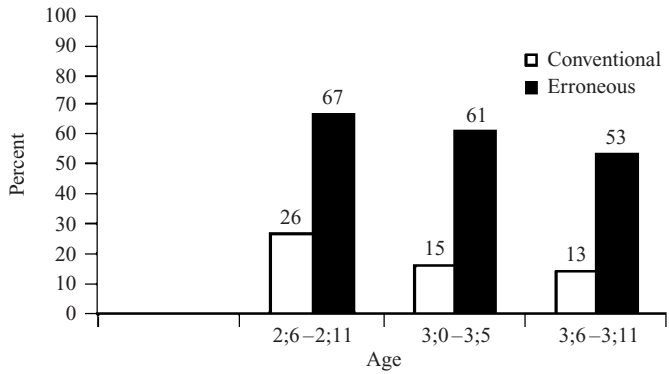

Fig. 4. Percentage of Philippe's conventional utterances replayed and erroneous utterances reformulated.

erroneous utterances. The overall rates of reformulation after erroneous utterances were very similar across all five children and 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 Figures show. This held for each of the children – Abe ($\chi^2(4) = 125$), Naomi ($\chi^2(4) = 67$), Sarah ($\chi^2(4) = 55$), Philippe ($\chi^2(3) = 126$), and Grégoire ($\chi^2(1) = 45$, by Chi-square). Adult speakers, then, reformulate much of children's erroneous speech, and in doing so present them with conventional ways to express their intended meaning.

What is important in each of these reformulations is the immediate comparison created when the child's erroneous utterance is followed by the adult's reformulation: because the two forms are used for the same meaning,

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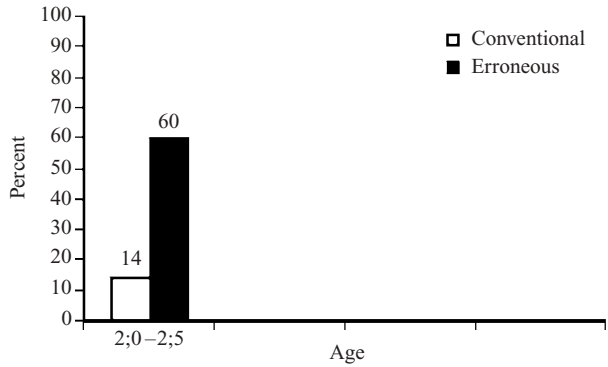

Fig. 5. Percentage of Grégoire's conventional utterances replayed and erroneous utterances reformulated.

the locus of this difference signals what the error is, and so is potentially informative for learners. Notice that there is a contrast between the two forms only with reformulations of erroneous utterances. With conventional child utterances, there is no such contrast because parental replays are simply repeats of the SAME form. (These replays, of course, also have conversational functions (see Clark, 2003).) For all the children, for each age-slice, the rates of reformulation after erroneous utterances are high, with up to two-thirds of the children's erroneous utterances being reformulated. These rates are more than high enough to be valuable for learning; we follow this up in the discussion.

Side sequences and embedded corrections. When we analysed 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, where the adult speaker checked on precisely what the child had intended to say and in doing so 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 adults make sure that they have understood their children. Side sequences accounted for the larger share of reformulations for all five children, with Abe, Sarah, Naomi, Philippe, and Grégoire hearing 57%, 70%, 70%, 73%, and 62%, respectively. Most of the remaining reformulations maintained the flow of conversation more directly by using embedded corrections.

Negative evidence is available to children for different types of errors and in learning different languages

The children's errors were classified into one of four categories: phonology, morphology, lexicon, or syntax. The distribution of adult reformulations

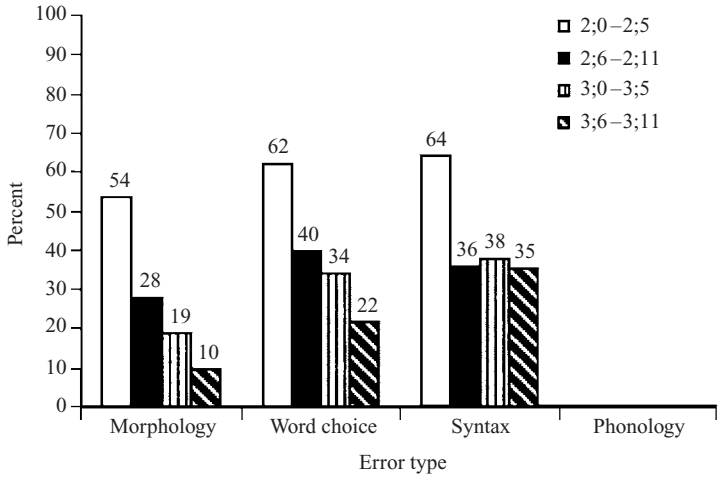

Fig. 6. Percentage of Abe's erroneous utterances for each error type that were reformulated for that error.

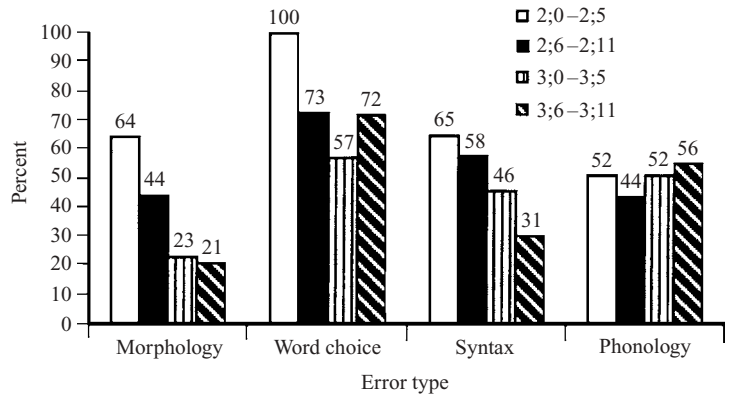

Fig. 7. Percentage of Sarah's erroneous utterances for each error type that were reformulated for that error.

for each error is shown in Figures 6–8 for children acquiring English, and in Figures 9 and 10 for French. 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 error-type (lexical, morphological, and syntactic; no phonological data were available for Abe) were all significantly higher than the numbers for replays of conventional utterances (by general log-linear analyses, lexical, $\chi^2(4) = 110$; morphological, $\chi^2(4) = 53$; syntactic, $\chi^2(4) = 131$).

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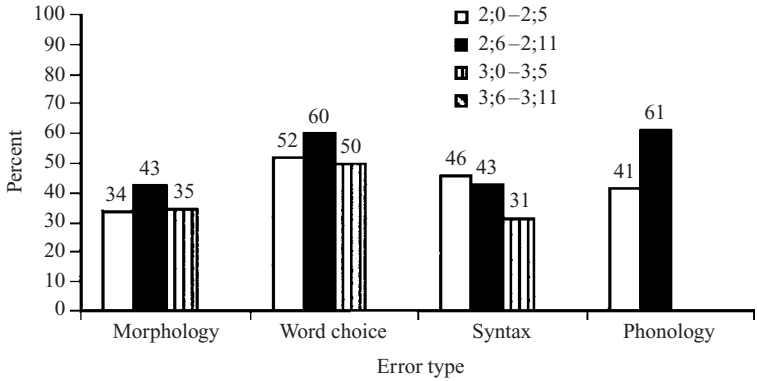

Fig. 8. Percentage of Naomi's erroneous utterances for each error type that were reformulated for that error.

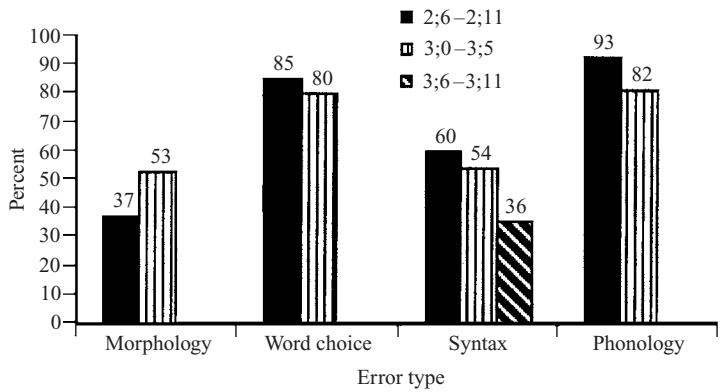

Fig. 9. Percentage of Philippe's erroneous utterances for each error type that were reformulated for that error.

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

The two French-speaking children showed similar effects. For Philippe, reformulations of each error type were significantly more frequent than replays of conventional utterances (lexical, $\chi^2(2)=155$; morphological, $\chi^2(2)=35$; syntactic, $\chi^2(3)=72$, and phonological, $\chi^2(2)=183$). And for Grégoire, the results were the same (phonological, $\chi^2(1)=51$; lexical, $\chi^2(1)=58$; and syntactic, $\chi^2(1)=26$). (The cell for reformulations of Grégoire's morphological errors contained too few exemplars for analysis.) Overall,

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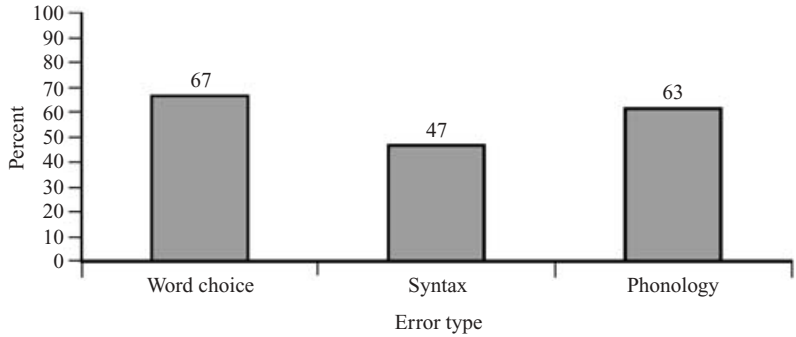

Fig. 10. Percentage of Grégoire's erroneous utterances for each error type that were reformulated for that error (2;0–2;5).

adults reformulated after morphological and syntactic errors as well as errors of phonology and word choice for all the children and for both languages.

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, 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 ($\chi^2(4) = 1{\cdot}93$, $p = 0{\cdot}748$) and syntactic errors ($\chi^2(4) = 1{\cdot}42$, $p = 0{\cdot}84$); Naomi – morphological errors ($\chi^2(3) = 4{\cdot}56$, $p = 0{\cdot}21$), phonological errors ($\chi^2(2) = 4{\cdot}40$, $p = 0{\cdot}11$), and syntactic errors ($\chi^2(3) = 0{\cdot}95$, $p = 0{\cdot}81$); Sarah – syntactic errors ($\chi^2(4) = 2{\cdot}27$, $p = 0{\cdot}69$); and Grégoire – lexical ($\chi^2(1) = 1{\cdot}06$, $p = 0{\cdot}50$) and syntactic errors ($\chi^2(1) = 3{\cdot}40$, $p = 0{\cdot}10$).

In five cases, the reformulation rates were significantly higher than the overall rates. They were: for Naomi, lexical errors ($\chi^2(3) = 7{\cdot}82$, $p < 0{\cdot}05$); for Sarah, lexical errors ($\chi^2(4) = 73$); for Philippe, phonological ($\chi^2(2) = 32$) and lexical errors ($\chi^2(2) = 18$); and for Grégoire, phonological errors ($\chi^2(1) = 50{\cdot}7$).

And in a further five cases, reformulations were significantly lower than the overall rates: for Abe, morphological errors ($\chi^2(4) = 23$); for Sarah, phonological ($\chi^2(4) = 11{\cdot}36$, $p < 0{\cdot}023$) and morphological errors ($\chi^2(4) = 25$), and for Philippe, morphological ($\chi^2(2) = 19$) and syntactic errors ($\chi^2(3) = 7{\cdot}91$, $p < 0{\cdot}048$). (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 Figures 5–10), and, most important, all were still 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. In their efforts to understand what their children are saying, adults reformulate all types of child errors.

More reformulations are available to younger children

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 four children – Abe ($\chi^2(3)=37$), Naomi ($\chi^2(3)=23$), Sarah ($\chi^2(3)=13{\cdot}26$, $p<0{\cdot}004$), and Philippe, ($\chi^2(2)=9{\cdot}42$, $p<0{\cdot}009$). 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, $\chi^2(3)=35$; morphological, $\chi^2(3)=54$; syntactic, $\chi^2(3)=24$), and Sarah (lexical, $\chi^2(3)=42$; morphological, $\chi^2(3)=52$, and syntactic, $\chi^2(3)=27$).[5] For Naomi, there was a marginal decrease in the reformulations for syntactic errors ($\chi^2(2)=5{\cdot}25$, $p<0{\cdot}072$), and for Philippe, there was a significant decrease with age in reformulations for phonological ($\chi^2(1)=5{\cdot}53$, $p<0{\cdot}019$) and syntactic errors ($\chi^2(2)=12{\cdot}48$, $p<0{\cdot}002$), but no change for lexical errors ($\chi^2(1)=0{\cdot}87$, $p=0{\cdot}35$).

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 ($\chi^2(1)=5{\cdot}17$, $p<0{\cdot}02$). 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 ($\chi^2(1)=8{\cdot}0$, $p<0{\cdot}005$) increased significantly with age. There was no significant change for either her lexical or morphological errors (lexical, $\chi^2(2)=2{\cdot}25$, $p=0{\cdot}32$; morphological, $\chi^2(2)=2{\cdot}08$, $p=0{\cdot}35$). Although Naomi's data showed an overall age trend (Figure 3), this did not hold across all error types (see 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 (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

[5] The decrease in reformulations to Sarah's phonological errors was not significant (χ^2 (3) = 3·04, $p=0{\cdot}385$).

TABLE 2. *Child responses (%) to adult reformulations (English)*

	N	Overt uptake	Rejection	Acknowledge-ment	Repeat of new info.	Bare continuation
Abe						
2;0–2;5	86	14	7	30	5	44
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						
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						
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	—	—	—	—	—	—

ahead or behind the other two. 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).

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 to a reformulation in their next conversational turn, for evidence that they have noticed the change presented by the adult speaker. Uptakes with repeats, rejections, acknowledgements, and mentions of new information all present evidence of overt attention by children to adult reformulations. Overall, children made use of information in adult reformulations between 10% and 50% of the time, explicit evidence of attention. Bare continuations represent only tacit acceptances of reformulations, and so offer weaker evidence for attention than the other types of child responses.

The percentages of responses where children took up or rejected a reformulation, as well as those where they acknowledged a reformulation or repeated new information, are shown in Tables 2 and 3. These responses offer a measure, for each child, of the overt attention they paid to adult reformulations. For Abe, this ranged over time 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, it amounted to 25%.

TABLE 3. *Child responses (%) to adult reformulations (French)*

	N	Overt uptake	Rejection	Acknowledge-ment	Repeat of new info.	Bare continuation
Philippe						
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						
2;0–2;5	109	9	0	11	1	80

When children TAKE UP a reformulation, they repeat the adult form and, in doing so, correct at least part of their original utterance, as in (6) and (7):

(6) 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]

(7) Philippe (2;1.26): une petit de lait.
'a little of milk'
Mère: une petite boîte de lait.
'a little carton of milk'
Philippe: **petite boîte de lait**.
'a little carton of milk' [Léveillé, Phil 2: 116]

Such uptakes, where the child's repeat of a word or phrase signals recognition of the adult's use and ratification of it on that occasion, are common in lexical acquisition when children are offered unfamiliar words (e.g. Clark, 2002). They have also been observed after adult corrections of morphological inflections (Farrar, 1992) and after recasts of grammatical errors more generally – word order, morpheme omissions, and agreement errors (e.g. Strapp & Federico, 2000).

When they REJECT an adult reformulation, they signal that the parent has misinterpreted what the child intended, as in (8):

(8) 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]

Children learn very early to reject adult misinterpretations of their desires and intentions. They do this non-verbally at age one (e.g. Golinkoff, 1986) and may participate in quite elaborate negotiations after an adult failure to understand, to make clear what their intention is. Rejections offer evidence

that the child has both detected the change in the reformulation and understood it.

When children ACKNOWLEDGE a reformulation, they do so at the start of the next turn in the conversation, as in (9):

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

Such acknowledgements are a further indication that children monitor whether or not their intention has been captured accurately in a reformulation. The children used a range of forms to acknowledge a reformulation before going on with their turn. Abe used *uh-huh*, *uh-uh*, *hunh-uhn*, *no*, *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 and the two French-speaking children between 11% and 25% of the time.

Even when children do not issue an acknowledgement, they sometimes indicate explicitly that they have been attending by repeating some piece of NEW INFORMATION, taken from the reformulation, in their next turn – again, evidence that they have been monitoring what the adult just said. They did this between 1% and 17% of the time.

Lastly, children simply continue on with their next turn (a bare continuation), thereby tacitly appearing to accept 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 several ways, of overt attention to reformulations.

In short, the children's responses in their next turn provide considerable evidence of overt attention to adult reformulations (Tables 2 and 3). While their immediate concern is whether they have been understood as they intended, at some point children must also resolve any discrepancies between their own expression of an intention and the adult expression that they have understood as conveying that same intention, that same meaning. After all, they want to be understood. And since adults are the experts, children do 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, as they check on what children mean, they reformulate child utterances and

in doing so simultaneously present a conventional version of any erroneous parts of the child utterance. The issuing of a reformulation implicates that the child has not produced 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, in repeating it, ratify the adult interpretation as correct. In so doing, they also 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 acknowledging it and continuing with the conversation. These findings strongly support the view that children monitor what adults say to them, and, in particular, attend to and respond to adult reformulations of their intended meanings.

Like many previous researchers, we have argued that there IS negative evidence available for young children learning to speak. While previous analyses have looked mainly at reply-types, we have looked instead at how adult reformulations of child errors identify the *locus* of the child's error and thereby contrast the error directly 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 these findings.

How available are reformulations in the speech children hear?

How often do reformulations of child errors occur in the course of conversation between adults and children? As Figures 1–5 show, they occur in large numbers. They also occur significantly more often in response to erroneous utterances than replays do to conventional ones. This suggests that it is children's errors that elicit adult reformulations; adults are trying to clarify the child's intention in order to get on with their conversational goals. Indeed, the majority of adult reformulations introduce side sequences designed to mutually establish what the child's intention is before moving on. Whether parents intend an utterance to be corrective or not is unimportant. What IS important is that adults often reformulate when children make errors and frequently thereby make corrective information available. We have shown both that such information is available and that children pay overt attention to it.

Are the levels of reformulation high enough to help children learn? As many as two-thirds of their erroneous utterances are reformulated (see Figures 1–5). Even Naomi at 2;0–2;5, with the lowest level of reformulations, had 48% of her errors corrected. For children producing many erroneous utterances in a day, having between 50% and 70% of them

reformulated would provide extensive negative evidence over time. As Bohannon, MacWhinney & Snow (1990) pointed out, not all errors need be followed by corrective information in order for learning to occur. In fact, in discrimination tasks, Estes (1959) and Levine (1963) found that learning occurred when hypotheses were confirmed or disconfirmed on fewer than 25% of trials. So the actual numbers required for learning could be quite small.

This view is also supported by experimental work on the learning of novel irregular verbs. Saxton and his colleagues (1997, Saxton *et al.*, 1998) taught five-year-olds novel present tense verb forms (e.g. *streep*, *pell*) over several weeks, then tested them on the irregular past tense forms, with either positive evidence alone (the irregular past tense offered directly by the experimenter before any erroneous regularized child uses), or with negative evidence (corrective adult utterances immediately following any child uses of regularized past tense forms). With negative evidence, fewer than 20 exposures were enough to learn target irregular past tense forms. By this measure, the level of negative evidence in the present conversational data would be more than high enough to support learning.

The presence of reformulations in everyday conversational exchanges shows that negative evidence is indeed available to very young children. Although adults may not be consciously designing reformulations in order to correct their children's errors, reformulations can nonetheless fulfill this function, and very likely promote language learning as a result.

How general are reformulations?

Negative evidence, to be generally useful in acquisition, should be present for all children, for all error-types, regardless of setting or language. In the present data, adult reformulations provided negative evidence about errors in phonology, morphology, lexicon, and syntax. Similar levels of reformulation occurred in adult speech to all five children, and in both English and French. This suggests that reformulations, used in conversation to check up on someone else's intended meaning, could be quite a common source of negative evidence during acquisition.

A sample of five children is relatively small, but we analysed a large amount of longitudinal data for each child. In some corpora, there was an observer present (Sarah, Philippe, Grégoire), in the others not (Abe, Naomi), and this made no difference to the presence of reformulations. Reformulations may be a more prevalent source of negative evidence for some social groups than others, but since four of the five children had at least one parent with a college degree, we lack any real comparison across social class. However, our findings were similar for the three males and two females across both languages. While the fact that reformulations are used with a similar function in both languages allows us to generalize across languages about

sources of negative evidence, this comparison represents only a first 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 differ in their attitudes to child rearing and in their behaviour towards young children just learning to talk. Such differences are found within cultures as well. As a result, children in different social and cultural settings may be exposed to and 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 or European families (Ochs & Schieffelin, 1984).

Yet despite the differences in interactional style, parents and other adults do present negative evidence, but in a somewhat different form, some of which looks strikingly like the explicit negative feedback considered by Brown & Hanlon (1970). The adult strategy is to tell children exactly what to say on different occasions (Schieffelin, 1979). They do this by modelling the pertinent utterance along with the instruction *elema* 'say like that'. For instance, when 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. Adults in the Samoan culture act in a similar way, showing children directly when and how to say an utterance, and expecting them to repeat such utterances verbatim. So, adult speech in these cultures does present children with negative evidence. Similar findings exist for American families of lower socioeconomic status (e.g. Hart & Risley, 1995).

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 options probably represent two points on a continuum of possibilities, where different cultures probably invoke different kinds of negative evidence until children 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 also no *a priori* reason to expect the same type of negative evidence to be present in every language. Nor is there any a priori reason to expect adults to supply only one type of negative evidence. So far, the data suggest that language communities in fact provide negative evidence of several kinds to children learning to speak. Once we know more about the mechanisms essential to language acquisition, we may be better able to identify the different kinds of information that promote learning, including a full range of sources of negative evidence.

What do reformulations look like developmentally?

Adults reformulate child errors much more frequently for two- to two-and-a-half-year-olds than they do for older children. What accounts for the decrease in adult reformulations of erroneous utterances? Although it accompanies a decrease in the number of errors children make, it would seem reasonable to expect that adults would continue to reformulate the same percentage of errors at each age, but they actually reformulate less often as children get older (see Figures 1–5).

One explanation could be that, even if they are unaware of it, parents are generally sensitive to their child's level of linguistic ability. They adjust automatically to this, so once their child usually gets the past tense forms of verbs right, for example, they may well stop reformulating after the occasional error of omission (*I* see *the dog yesterday*) or commission (*He* goed *away*). This would result in a general decrease in reformulations with age. Alternatively, parents might 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. But even if parents get used to their children's errors, they are still attentive to the conventions of the language and what it takes to get others to understand, so one might expect them to continue to reformulate when their children's meanings are unclear. We propose a third explanation, consistent with the communicative motive for reformulations and the decline in children's errors, namely that, because children use a larger number of adult-like forms as they get older, adults don't *check up* as often on what they mean – they can now understand them nearly all the time. This increase in comprehensibility makes children's intended meanings more accessible, and this in turn leads to a reduction in the number of reformulations used.

What does this imply for the process of acquisition? First, the decrease in children's errors is consistent with their growing skill and mastery of language. That in turn helps account for the smaller number of adult reformulations elicited with age. Notice that the negative evidence in reformulations could also be serving slightly different functions at different stages in development. At first, children may need a lot of negative as well as positive evidence so they can set up the appropriate representations in memory for comprehending other speakers (mainly adults). Even once they have done this for certain forms, they can't necessarily produce those same forms yet, so they still need some negative evidence, now perhaps as a prompt to remind them which form to produce for a specific meaning. While we have no direct measure of this in the present study, this account receives some support from an analysis by Saxton (2000). In the study of children's acquisition of some 14 grammatical morphemes, Brown (1973) set a criterion of 90% use for each morpheme in obligatory contexts to mark mastery.

This required tracking whether each child used the morphemes in each obligatory context, over time. In his case study of Eve (1;6–2;3), Saxton focussed on nine types of morphological errors, and compared the child's responses to negative evidence (our reformulations), negative feedback (general clarification questions), and adult move-on's. Overall, she was more likely to produce the correct form after negative evidence than after an adult move-on. Saxton also noted that once she herself produced that morphological feature 50% of the time when it was required, she became more responsive to negative evidence, repeating the correct adult form more often. To be able to produce a feature 50% of the time, though, requires that it already be represented in memory. This suggests that even when children have stored target forms in memory, they may continue to find negative evidence helpful, perhaps because it makes the relevant conventional form more accessible.

In summary, adults reformulate many more errors – up to 70% – for children aged about two than they do for older children. In each age slice in the present data, adults reformulated all four types of error tracked (phonological, morphological, lexical, and syntactic) at about the same level. But as children got older, they made many fewer errors, and adults reformulated proportionately fewer of the errors there were. This drop in reformulation-rates occurs because adults can understand what children say much better as they get older, and so feel less need to check up on what their children intend. This would be a natural outcome of the communicative role of reformulations in conversational exchanges.

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 that difference 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 their grammatical productions following either recasts in general or what they characterized as 'minimal recasts' (responses that only corrected the child's error). Their longer-term time series analyses

of the effects of recasts and minimal recasts, they concluded, did not show children were using negative evidence. However, problems with those analyses cast doubt on this conclusion (see Bohannon, Padgett, Nelson & Mark, 1996; Saxton, 1997; Saxton *et al.*, 1998).

But the absence of immediate changes in children's systems – 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 in speech production takes both 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 in memory for how to express those meanings. But while comprehension has long been found to be ahead of production (Clark, 1993), we still know relatively little about how often children need to hear new forms before they can retrieve and produce them themselves.

To make use of negative evidence, children must first attend to it. What evidence is there that children monitor adults and 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. Infants elaborate and even alter their communicative attempts systematically if their intention hasn't been understood (Golinkoff, 1986; Marcos, 1991). It should not be surprising, then, that children continue to attend to how well they have been understood once they start to talk.

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 a 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 they are attending, detect the change and its meaning, and are checking on whether the adult has understood what they intended to say.[6] Second, on other occasions, they reject some adult reformulations as misinterpretations of their intended meanings. These rejections also show that they monitor adult reformulations and understand the changes made. The fact that their rejections are often followed by new attempts at expressing what they mean provides further evidence that

[6] Young children frequently take up adult offers of new linguistic forms, and they also repeat words to get the pronunciation right (e.g. Clark, 2002; Strapp & Federico, 2000). The conversational function of these repeats appears to be to both acknowledge and ratify what the adult speaker has proposed (Clark, 2002; McTear, 1985).

children are checking on whether they have been understood. Third, at other times, children continue with the conversation but acknowledge the reformulation by prefacing their continuation with *yes*, *yeah*, or *uh-huh*. These acknowledgements add still further evidence that children attend to the reformulations adults produce. When they don't acknowledge a reformulation, they may still have noticed it, indicating that they have done so *by* continuing on the same topic, just as in conversations among adults (H. Clark, 1996). But we can't be sure that children are attending in this case, so bare continuations at best provide only weak support for attention.

Are children STORING the corrective information available in adult reformulations? Do they in fact learn from these reformulations? Children clearly monitor the differences between what they intended and what their parents then say, as shown by their explicit acceptance or rejection of the adult version. Given this, there could be learning even when children don't take up a reformulation overtly. It has long been observed that children store adult-like linguistic forms in memory well before they can produce them themselves. They consistently recognize words heard in adult form yet fail to recognize their own incorrect pronunciations of those same words (Dodd, 1975); they also spontaneously repair their own utterances from as young as 1;6. In both cases, children use word-forms stored in memory as target-models both for recognition and for checking on their own productions (Clark, 1993). In acquisition, comprehension both precedes and guides production. It seems likely, then, that children TAKE IN corrective information from reformulations even when they don't make immediate use of it.[7]

Finally, several experimental studies have shown that older children do learn from negative evidence (e.g. Saxton, 1997). Moreover, children exposed to negative evidence in a learning task were able to judge that the irregular forms rather than the regularized ones were correct, even if they did not use those forms themselves (Saxton *et al.*, 1998). These findings are further supported by training studies with SLI children (Special Language Impairment), and with both SLI and younger normal-language children. In both cases, recasts, where the adult speaker provides negative evidence, are more effective in teaching than positive evidence alone (e.g. Nelson *et al.*, 1996). Recasts result in faster learning and in a greater number of spontaneous uses of the targeted forms. These results, together with the present findings, support the interpretation that reformulations can play a role for children learning which forms are conventional in a language and which are not.

[7] It is possible that children need to be exposed to a certain number of instances, depending on how much they have already mastered, before they are willing to try out a new or corrected form, with a threshold based on familiarity for production (Marchman & Bates, 1994; also Saxton, 2000).

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 they simply took every response to what they said as being potentially corrective, they would continually draw inappropriate conclusions. As Marcus (1993) 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. Like adults, children monitor on-going speech in general (e.g. Postma, 2000). 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). And two- to three-year-olds respond differently when parents don't answer or refuse to comply with the goal, compared to when parents misunderstand (Shwe & Markman, 1997). This suggests that young children monitor at both levels too, and can tell the difference between them.

Children attend to what reformulations implicate. If the adult's change doesn't express the same meaning but rather moves the conversation on to further the current goal, that change will not contrast directly with the form the child produced. But if the adult's change expresses the SAME meaning as the child, then it WILL contrast directly with the child's original utterance. It is in just these cases that a 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. They are then faced with having to choose between two distinct forms for the same meaning. Since any difference in form signals a difference in meaning (by the principle of contrast), where the meanings are the same, one of the forms eventually has to go. And since established forms take priority and pre-empt any others (by the principle of conventionality), under such circumstances children will opt for the conventional adult form (Clark, 1993). The instant availability of a comparison between the child error and the adult reformulation is what confers special status on reformulations as negative

evidence: children can identify the intention they themselves had in speaking AND observe any change(s) in form that the adult has made. Other changes in conversation (as in Marcus' example) do not express the child's own intentions, so are not treated as equivalent to the intention expressed in the child's immediately preceding utterance.

Gaining full mastery of an adult form can take time. Recognition that a conventional form is conventional doesn't guarantee instant changes in children's systems. This is because an erroneous form may have become so well established in a child's articulatory programme for language production that it remains the first form retrieved and articulated for that meaning long AFTER the child has stored the conventional form in memory. Learning the correct forms and representing them in memory may occur weeks or even months before children succeed in retrieving them whenever needed, because they must over-ride earlier, well-entrenched erroneous forms in their own language production.

Are reformulations really negative *evidence?*

Do reformulations really constitute negative evidence, or are they merely another form of positive evidence? In our account, an adult sentence uttered on one occasion could present positive evidence about conventional forms, simply by 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, from that point on, the pragmatics of the ongoing conversation determines whether the adult's utterance serves 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 to communicate, 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, 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. And this fits 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 they change the form. What the adult says appears to be critical in getting children to infer that the form they have used is wrong in some way. In fact, this is a common function for repetition in conversation more generally (see Walker, 1996). Older children

react to a question being repeated, for instance, by assuming that the first answer they gave was wrong or inappropriate, so they offer a different one the second time round (e.g. Siegal, 1997). This strongly suggests that they take the speaker's repeat as implicating that they must say something different.

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 was, 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. And reformulations of the same types and with the same conversational functions occur in both English and French. Further, our findings show that children can detect differences between their own utterance and the adult reformulation, and 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). 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 what children mean in just those child utterances that contain errors. As a result, children receive added information, after making an error, about the conventional way of saying what they apparently wanted to say.

REFERENCES

Bates, E., Marchman, V., Thal, D., Fenson, L., Dale, P., Reznick, J. S., Reilly, J. & Hartung, J. (1994). Developmental and stylistic variation in the composition of early vocabulary. *Journal of Child Language* **21**, 85–123.

Bohannon, J., MacWhinney, B. & Snow, C. E. (1990). No negative evidence revisited: beyond learnability or who has to prove what to whom. *Developmental Psychology* **26**, 221–6.

Bohannon, J., Padgett, R., Nelson, K. E. & Mark, M. (1996). Useful evidence on negative evidence. *Developmental Psychology* **32**, 551–5.

Brown, R. (1968). The development of WH questions in child speech. *Journal of Verbal Learning & Verbal Behavior* **7**, 279–90.

Brown, R. (1973). *A first language: the early stages*. Cambridge, MA: Harvard University Press.

Brown, R. & Hanlon, C. (1970). Derivational complexity and the order of acquisition in child speech. In J. R. Hayes (ed.), *Cognition and the development of language*. New York: Wiley.

Clark, E. V. (1987). The principle of contrast: a constraint on language acquisition. In B. MacWhinney (ed.), *Mechanisms of language acquisition*. Hillsdale, NJ: Erlbaum.

Clark, E. V. (1993). *The lexicon in acquisition*. Cambridge: CUP.

Clark, E. V. (1997). Conceptual perspective and lexical choice in acquisition. *Cognition* **64**, 1–37.

Clark, E. V. (2002). Adult directions and children's uptake in the early acquisition of meaning. Paper presented at the 9th Congress of the International Association for the Study of Child Language (IASCL), Madison, WI.
Clark, E. V. (2003). *First language acquisition*. Cambridge: CUP.
Clark, E. V. & Clark, H. H. (1979). When nouns surface as verbs. *Language* **55**, 767–811.
Clark, E. V. & Grossman, J. B. (1998). Pragmatic directions and children's word learning. *Journal of Child Language* **25**, 1–18.
Clark, H. H. (1996). *Using language*. Cambridge: CUP.
Demetras, M. J., Post, K. N. & Snow, C. E. (1986). Feedback to first language learners: the role of repetitions and clarification questions. *Journal of Child Language* **13**, 275–92.
Dodd, B. (1975). Children's understanding of their own phonological forms. *Quarterly Journal of Experimental Psychology* **27**, 165–72.
Estes, W. (1959). The statistical approach to learning theory. In S. Koch (ed.), *Psychology, a study of a science*, vol. 2. New York: McGraw-Hill.
Farrar, M. J. (1992). Negative evidence and grammatical morpheme acquisition. *Developmental Psychology* **28**, 90–8.
Gold, E. M. (1967). Language identification in the limit. *Information & Control* **16**, 447–74.
Golinkoff, R. M. (1986). 'I beg your pardon?' The preverbal negotiation of failed messages. *Journal of Child Language* **13**, 455–76.
Grice, H. P. (1989). *Studies in the way of words*. Cambridge, MA: Harvard University Press.
Hart, B. & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore, MD: H. Paul Brookes.
Hirsh-Pasek, K., Treiman, R. A. & Schneiderman, M. (1984). Brown and Hanlon revisited: mothers' sensitivity to ungrammatical forms. *Journal of Child Language* **11**, 81–8.
Jefferson, G. (1982). On exposed and embedded correction in conversation. *Studium Linguisticum* **14**, 58–68.
Levine, M. (1963). Mediating processes in humans at the outset of discrimination learning. *Psychological Review* **70**, 254–76.
Levinson, S. C. (2000). *Presumptive meanings: the theory of generalized implicature*. Cambridge, MA: MIT.
Lieven, E., Behrens, H., Speares, J. & Tomasello, M. (2003). Early syntactic creativity: a usage-based approach. *Journal of Child Language* **30**, 333–70.
MacWhinney, B. & Snow, C. E. (1990). The child language data exchange system: an update. *Journal of Child Language* **17**, 457–72.
Marchman, V. & Bates, E. (1994). Continuity in lexical and morphological development: a test of the critical mass hypothesis. *Journal of Child Language* **21**, 339–66.
Marcos, H. (1991). Reformulating requests at 18 months: gestures, vocalizations, and words. *First Language* **11**, 361–75.
Marcus, G. F. (1993). Negative evidence in language acquisition. *Cognition* **46**, 53–85.
McTear, M. (1985). *Children's conversation*. Oxford: Blackwell.
Moerk, E. (1991). Positive evidence for negative evidence. *First Language* **11**, 219–51.
Morgan, J. L., Bonamo, K. L. & Travis, L. L. (1995). Negative evidence on negative evidence. *Developmental Psychology* **31**, 180–97.
Nelson, K. E., Camarata, S., Welsh, J., Butkovsky, L. & Camarata, M. (1996). Effects of imitative and conversational recasting treatment on the acquisition of grammar in children with specific language impairment and younger language-normal children. *Journal of Speech & Hearing Research* **39**, 850–9.
Ochs, E. & Schieffelin, B. B. (1984). Language acquisition and socialization: three developmental stories. In R. Schweder & R. Levin (eds), *Culture theory: esssays in mind, self and emotion*. Cambridge: CUP.
Postma, A. (2000). Detection of errors during speech production: a review of speech monitoring models. *Cognition* **77**, 97–132.
Saffran, J. R., Aslin, R. N. & Newport, E. L. (1996). Statistical learning by 8-month-old infants. *Science* **274**, 1926–8.

Saxton, M. (1997). The contrast theory of negative input. *Journal of Child Language* **24**, 139–61.
Saxton, M. (2000). Negative evidence and negative feedback: immediate effects on the grammaticality of child speech. *First Language* **20**, 221–52.
Saxton, M., Kulcsar, B., Marshall, G. & Rupra, M. (1998). Longer-term effects of corrective input: an experimental approach. *Journal of Child Language* **25**, 701–21.
Schegloff, E. A. (1972). Notes on a conversational practice: formulating place. In D. Sudnow (ed.), *Studies in conversational interaction*. New York: Free Press.
Schieffelin, B. B. (1979). Getting it together: an ethnographic approach to the study of the development of communicative competence. In E. Ochs & B. B. Schieffelin (eds), *Developmental pragmatics*. New York: Academic.
Shwe, H. & Markman, E. M. (1997). Young children's appreciation of the mental impact of their communicative signals. *Developmental Psychology* **33**, 630–6.
Siegal, M. (1997). Knowing children: experiments in conversation and cognition (2nd edn.). Hove: Psychology Press.
Snow, C. E. & Ferguson, C. A. (eds) (1977). *Talking to children: language input and acquisition*. Cambridge: CUP.
Strapp, C. M. & Federico, A. (2000). Imitations and repetitions: what do children say following recasts? *First Language* **20**, 273–90.
Svartvik, J. & Quirk, R. (eds) (1980). *A corpus of English conversation*. Lund: Gleerup.
Walker, M. A. (1996). Inferring acceptance and rejection in dialog by default rules of inference. *Language & Speech* **39**, 265–304.