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## **Maternal responses to word approximations in Japanese children's transition to language\***

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### ABSTRACT

Verbal/vocal interactions of three Japanese mother–child dyads were examined when the children were 1;0, 1;2 to 1;3, 1;6 to 1;7, and 1;8 to 1;9 to determine whether mothers provide information which may facilitate the elaboration of child lexical forms during the transition from the prelinguistic to the linguistic period. Mothers were likely to reproduce only the child's word-like utterances, both well- and ill-formed. This provided an opportunity for the child's ill-formed word-like utterance to be contrasted with an immediate maternal response. This finding, along with results showing within-child variability of lexical forms, suggested that maternal contrastive replies 1) signal errors to the child (cf. Saxton, 1997), and 2) may promote the child's selection and stabilization of production alternatives which are more accurate. Maternal reproductive responding presumably originated in their tendency to seek content-oriented communication, as was reflected in mother's growing inclination to continue verbal interactions following the child's non-word-like vocalizations.

### INTRODUCTION

Characteristics of vocal productions before the onset of true language have been extensively investigated. Several studies focus specifically on the transition from the prelinguistic to linguistic stages, addressing questions concerning the issue of continuity/discontinuity (e.g. Oller, Weiman, Doyle

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& Ross, 1976; Stoel-Gammon & Cooper, 1984). These studies have shown that common phonetic characteristics in such aspects as the phonetic inventory and syllabic shapes are present in both the prelinguistic and the linguistic stages, strongly supporting phonetic continuity. Furthermore, word acquisition itself has been shown to be part of a continuous process. Before the emergence of meaningful adult-based words, children are often observed to produce 'phonetically consistent forms' (PCF), or repeatedly occurring isolatable phonetic units loosely bound to specifiable contexts (Dore, Franklin, Miller & Ramer, 1975). The presence of relatively fixed unconventional phonetic forms carrying stable meanings has also been noted by many researchers (e.g. Menyuk & Menn, 1979; Stoel-Gammon & Cooper, 1984). Once such fixed phonetic forms, often referred to as 'protowords' (Menyuk & Menn, 1979) and 'quasi-words' (Stoel-Gammon & Cooper, 1984) emerge in a situationally consistent manner, a growing number of recognizable meaningful utterances based on adult words start to appear in the child's productions. Thus, the child's utterances during the initial period of the linguistic stage are characterized by the co-occurrence of both recognizable words and non-word vocalizations, with the ratio of words to nonwords increasing with age (Robb, Bauer & Tyler, 1994).

One major feature of word productions during the period of transition to language is the simplification of phonetic forms. Phonetic characteristics of children's speech in the earliest linguistic stage show a strong tendency for consonant clusters to be reduced and for word-final consonants to be deleted (e.g. Ingram, 1976). Furthermore, because many words acquired early by English-learning children are monosyllabic (Hart, 1991, Table 2; Vihman, 1993), these simplification tendencies inevitably yield many homonyms, making it particularly difficult to judge whether or not children's utterances are based on adult words. There are reported cases where correct renditions of certain words at an early stage of language development deteriorate later (Leopold, 1947; Ferguson & Farwell, 1975; Vihman & Velleman, 1989). However, the occurrences of such 'phonetic regressions' are relatively small in the total word productions, and output forms are generally simplified and erroneous with respect to adult targets. Thus, solid criteria for identifying adult-based words are needed (Vihman & McCune, 1994).

The simplification of lexical forms clearly involves biologically-based perceptuomotor constraints (Kent, 1992; Locke & Pearson, 1992). The aforementioned continuity in the phonetic and temporal aspects of babbling and early meaningful speech supports the biological basis of lexical form acquisition. There are phenomena, however, which also implicate the involvement of non-biological, 'cognitive' operations in early lexical productions. Children appear to attend selectively to certain phonetic characteristics of the language addressed to them, and attempt words containing particular sounds while avoiding words with other phonetic properties

(Ferguson & Farwell, 1975; Schwartz & Leonard, 1982). Such individualized production strategies would render unique paths of development and idiosyncratic early lexicons among children.

Another major characteristic of early speech is production variability within a child. It is known that children often produce, successively or on different occasions, what appears to be the same word with different pronunciations (Ferguson & Farwell, 1975; Stoel-Gammon & Cooper, 1984; Ferguson, 1986; Vihman & Velleman, 1989). In some cases contextual factors, such as attentional variation, prosody and phonetic environment, may cause this phonetic variability. Production variability can also be observed even without such factors. Nevertheless, most children steadily improve accuracy and diminish variability to eventually acquire adult lexical forms. Without doubt, immature muscular control is one of the causes of inaccuracies and variability, and maturation of the articulatory control mechanism improves phonetic accuracies (Smith, 1988).

Again, however, a cognitive basis of phonological development has been offered as another source of production variability (Ferguson & Farwell, 1975; Kiparsky & Menn, 1977; Macken & Ferguson, 1981; Menn, 1983). In this model of phonological development, the child is considered to play a highly creative role, and the acquisition process involves the active discovery of structure, hypothesis testing and problem solving. Selection and avoidance presumably are strategies for children with limited articulatory control to induce as little distortion as possible in their attempts to render adult words (Menn, 1983). As the child becomes more proficient in producing the sounds of adult words, such strategies become less necessary. Production variability is also speculated to reflect the child's endeavour to acquire adult lexical forms through trial and error. Through attempts at the realization of particular words with different articulatory patterns, the child eventually selects phonetic forms that match adult input. Within physiologically constrained degrees of freedom, the child's creativity is displayed in the construction of a more mature system.

Besides these 'internal' factors, environmental language is another important source for early vocal/verbal development. The ambient language is known to have a global effect on the patterns of vocalizations even during the prelinguistic period (Boysson-Bardies & Vihman, 1991). Adult phonetic and/or semantic contingent responses have also been proposed to facilitate children's language development (Snow, 1977; Hardy-Brown, Plomin & DeFries, 1981; Veneziano, 1988; Velleman, Mangipudi & Locke, 1989). During child-mother interactions, mothers employ a characteristic mode of communication, which may facilitate the formation of lexical knowledge. One such communicative style is the mother's tendency to respond to the child's vocalizations by imitating them. Veneziano (1988) pointed out that at around the time the child begins to produce his/her first recognizable words,

mother and child engage in vocal/verbal exchanges in which the phonetic and/or semantic aspect(s) of one partner's utterance is reflected in that of the other. More specifically, mothers frequently reply to their child's vocalizations by inferring what the child meant to say and then responding contingently as if the child's phonetic forms were specific words. The studies of child-mother interactions generally conclude that vocal/verbal interactions play significant roles in the construction of early lexical knowledge.

Despite speculation concerning facilitation by maternal speech, the mechanism of the elaboration of the child's lexical forms during vocal/verbal exchanges has not been sufficiently explored, with no study examining maternal responses in relation to the quality of child utterances. As reviewed above, the earliest stage of language development is characterized by the mixture of word-like and non-word-like utterances. These types of child utterances were grouped together in analysing maternal responding in the past studies. If one is to claim that a child during the transition period may benefit from maternal 'responses' to child utterances, rather than verbal input from mothers in general, two issues would need to be addressed: a relationship between the adjacent child's and mother's speech, and the type of child utterances to which the mother is responding. Past studies dealt with the former issue, with little or no consideration to the latter. If maternal responses vary depending on the word-like-ness of child utterances, they can be expected to have more focused effects on the elaboration of the child lexical forms.

Possible roles of maternal feedback during child-mother interactions have been much debated in the context of the acquisition of grammar, a stage of language development that follows the transition period. Studies have shown that mothers respond differently according to the grammaticality of the utterances of young children who are beginning to acquire syntax (Hirsh-Pasek, Treiman & Schneiderman, 1984; Demetras, Post & Snow, 1986; Furrow, Baillie, McLaren & Moore, 1993). These studies generally show that mothers tend to repeat a well-formed utterance exactly or continue conversation without inquiry, while recasts or clarification questions are more probable after ill-formed utterances. These findings suggest that the child receives differential feedback depending on the grammaticality of his/her speech, although overt parental approval or disapproval is generally unavailable for children to correct ill-formed productions (Brown & Hanlon, 1970). The facts of differential responding, however, do not imply that maternal responding patterns have corrective functions for grammatical errors. For one thing, evidence that adult response types are related in different ways to grammatical and ungrammatical child utterances is not sufficient to conclude that the child recognizes the response type of each adult reply and successfully applies the information to construct correct grammar (Marcus, 1993; Morgan, Bonamo & Travis, 1995; Saxton, 1997). The

mother, in response to the child's erroneous speech, virtually always responds grammatically, or provides positive input. Signalling the adequacy of output to the child, or negative evidence, should thus require other factors, such as the immediacy of maternal feedback and the proximity in form of the utterance of the mother to that of the child. More recently, Saxton (1997) proposed a theoretical framework in which negative evidence, which the child can utilize for modification of his/her rules, is conceptualized as adult correct forms within a unique child-mother discourse structure. The presentation of correct forms immediately following the child's erroneous forms allows the child to contrast them with his/her own errors. This CONTRAST THEORY of negative input claims that the conflict between the child's erroneous forms and correct adult forms provides the child with an opportunity to detect a difference in linguistic formations between two adjacent utterances, which constitutes a basis for rejecting his/her errors. Turning back to the acquisition of lexical forms, maternal reproductive verbal replies which incorporate part of the child's preceding phonetic forms would also constitute a contrast. Thus, the scope of this theory expands from syntax to lexicon, in which phonetic conflicts created in child-mother discourse constitute a basis for elaborating the child's lexical forms.

As noted previously, child speech output includes utterances with various degrees of phonetic accuracy, and lexical forms of certain words are often varied across production attempts during the initial stage of language development. Mother-child vocal/verbal exchanges might promote a gradual phonetic approximation of adult targets and assist in stabilizing pronunciation, but how this is possible remains unspecified. The literature generally points to the fact that maternal feedback is available for the child to utilize AFTER the acquisition of the syntactic skills needed for multi-word sentence productions. Not enough work has been done, however, to determine whether or not the mother's interaction patterns help promote the child's transition from babbling to phonologically well-formed utterances, PRIOR TO the syntactic stage. We hypothesize that reproductiveness is a key element which facilitates language acquisition. The present study investigated whether the mother replies to the child's inaccurate productions of conventional words with utterances which reproduce phonetic elements of the child's utterance. Such feedback may form the basis on which the child modifies his/her utterance. It should be stressed that such partially reproductive responses should follow the child's ill-formed productions of adult targets, but that the child's vocalizations which bear hardly any resemblance to words should not be reproduced or modified to the same degree for the feedback to promote the production of meaningful utterances. Non-discriminatory responses to the child's word-based and non-word-based output would reduce the effectiveness of the feedback in signalling differences between the target word and the phonetic form of the child's

utterance. Thus, for maternal feedback to have the potential to be corrective during the transition period, two conditions need to be met, namely, 1) the presence of phonetic contrast between child and mother utterances, and 2) selectivity of maternal reproductions with respect to the word-like-ness of child utterance.

A related question is whether or not the mother changes her patterns of responding to child utterances over the period in which the child rapidly progresses from babbling to speech. Even before phonetic shapes and meanings become consistently linked, mothers seem to encourage child vocalizations by verbally responding to them (Schaffer, Collis & Parsons, 1977). If reproductive responding by a mother occurs selectively to word-like utterances in child-mother interactions as hypothesized above, would the patterns of the mother's responding to the child's non-word vocalizations also change as such vocalizations gradually decrease in occurrence? It is possible that the mother's communicative style also adjusts so that the child's nonmeaningful utterances elicit different types of maternal response as the linguistic level of the child advances. Snow (1977) reported that mother's interrogative speech declined in frequency between 0;3 and 1;0, but increased slightly by 1;6. Since maternal speech in this study included responses to both word and nonword utterances, the reported change of talking patterns at 1;0 may have been caused by responses to the child's meaningful utterances. An inspection of the mother's responses which is limited only to the child's nonmeaningful vocalizations would give us further insights into changes on the mother's side.

This study focused on vocal/verbal interactions of Japanese child-mother dyads during the child's initial stage of language development when non-word vocalizations co-occur with word productions in which production variability prevails. Child utterances were classified into: well-formed or nearly well-formed word-based productions (W), possible ill-formed word-based productions (PW), or other vocalizations (O). The study compared maternal reproductive and non-reproductive responses to these three types of child utterances. The main goal of the study was to reveal whether a mother responds to the different types of utterances in such a manner that information conducive to the phonetic adequacy of child output is presented to the child. More specifically, it was investigated whether reproductive responses are more likely to follow the child's lexical productions, including both well-formed and ill-formed word-based productions, than his or her non-word-like vocalizations. Only under this condition, the child's ill-formed word-like utterances (PW) can be contrasted with the mother's presentations of correct forms, so that the errors in the child production can be signalled. It is certainly possible that mothers selectively reproduce well-formed words only, responding to ill-formed word-like utterances non-reproductively. We hypothesize, however, that the maternal responding

behaviour differs depending on whether the child utterance is word-like (both W and PW combined) or not (O), rather than on whether it is well-formed (W) or not (PW and O combined).

A related subgoal of the study was to reveal whether the mother's response patterns to the child's non-word-like utterances changed over a span of eight to nine months after the onset of the linguistic stage. Any trends will reflect alterations in certain maternal attitudes or expectations towards communication with the child with growing verbal capacities. While an analysis of maternal responding to child word-like productions (i.e. the W and PW categories) would also be of much interest, this study focused on non-word-like child vocalizations (the O category) which occurred with sufficient frequency for analysis throughout the period of eight to nine months. Overall, this study attempted to provide data concerning the nature of the mother's vocal/verbal responding behaviours to child productions of various degrees of word-like-ness, on the one hand, and longitudinal changes in the responding behaviours to non-words, on the other. Results will be discussed with respect to possible roles of maternal feedback on the acquisition of language during the initial stage of its development.

#### METHOD

##### *Subjects*

The subjects were three Japanese mother-child pairs. The mothers were all college-educated, and the children (Y.T., R.N., and J.S.) were all boys, raised by the mothers at home. First words appeared before 1;0 for all three children. Y.T. and R.N. were first-born children, and showed steady language development from 1;0 on. J.S. was the third child in his family, and has a ten-year-old sister and a seven-year-old brother. His language development appeared to be somewhat slower than Y.T. and R.N.s.' in terms of the number of different lexical items produced during our observations. In order to ascertain that J.S.'s vocabulary development was normal, a checklist, made to suit the vocabulary of Japanese children based on the MacArthur Communicative Development Inventory: Words and Gestures (Fenson, Dale, Reznick, Thal, Bates, Hartung, Pethick & Reilly, 1993), was administered at 2;1 to 2;3, approximately six months after the last observation. The vocabulary development of the three subjects at this point of time was comparable, with the numbers of words in each child's expressive vocabulary registering as 196, 220, and 198 for Y.T., R.N., and J.S., respectively, among a total of 329 words on the list. Two-word combinations had emerged by 1;10 in Y.T., by 1;6 in R.N., and by 1;9 in J.S.

The three children were followed longitudinally from 1;0 to 1;8-1;9, and four observations were made for each child during this period at home. The ages (years;months.days) at which observations were undertaken were as



follows: 1;0.23, 1;3.26, 1;6.4, and 1;9.4 for Y.T.; 1;0.9, 1;2.28, 1;6.3, and 1;8.26 for R.N.; 1;0.19, 1;2.28, 1;7.8, and 1;8.26 for J.S.

#### *Procedure*

Each child was videotaped while interacting with the mother during play situations. An extension microphone connected to a video-recorder was placed on the floor between the mother and the child, approximately 50 cm from the child's mouth. The mother was asked to interact naturally with the child, first with the child's favorite toys at home, and then with (1) picture books, (2) a set of wooden blocks, finger puppets, a car, truck, and train, and (3) kitchen utensils and a stuffed bear, which were provided by the observer, one set at a time. Each play situation lasted for about 10 minutes, with a total observation time of approximately 50 minutes.

#### *Data analyses*

All the children's utterances were phonetically transcribed from the videotaped recordings. The mothers' utterances were orthographically transcribed. The transcripts also included such contextual information as the direction of the child's gaze, the actions of the child, the objects surrounding the child, the objects which the child manipulated or held, the positioning of the child (sitting, standing, etc.), and the positions and actions of the mother. This information assisted the judges in inferring the direction of the child's attention and the intent and meaning of his utterances. The transcripts were analysed for child utterance types and maternal response types.

*Classifications of the child's utterances.* Neither phonetic resemblance to a lexical form nor situational coherency alone are sufficient parameters for word identification; in addition, valid criteria should include both phonetic and contextual considerations (Vihman & McCune, 1994). In the child's early speech, utterances are candidates for word-based utterances when they are phonetically similar to adult words or to lexical forms used specifically in child-directed speech (e.g. /waNwaN/ for /ɪnu/ or 'dog'), and are used in a context-appropriate manner. If the phonetic forms do not resemble the lexical forms of the language to a certain degree, they may not be classified as word-based, but may still be differentiated from random vocalizations. Utterances which bear only marginal phonetic resemblance to words, as judged from the phonetic forms of the utterances and the context, are called 'possibly word-based utterances.'

This study developed operational definitions of three types of utterances, (1) word-based utterances, (2) possible word-based utterances, and (3) others, taking into account the phonetic form of the child's utterance and the possible target words as judged from the phonetic form and the context in which it occurred. While Vihman & McCune (1994) presented detailed

criteria to identify word candidates, we devised a different categorization system which reflected the degree of well-formedness of the child output. The criteria for categorization are described in the Appendix. The degrees of proximity between child utterances and the target words were examined based on seven major error types involved in lexical form changes: consonant substitutions, vowel substitutions, consonant deletions, vowel deletions, syllable deletions, voicing change, and miscellaneous patterns. A set of language-specific error patterns which fits the Japanese phonological system was adopted from among proposed phonological processes for English-speaking children (e.g. Ingram, 1976; Hodson & Paden, 1981), and was used to exemplify production errors (Appendix).

Each of the child's utterances was first checked to see if it met the criteria for a word-based utterance (W); if not, it was then checked to see if it was a possible word-based utterance (PW). Utterances were coded as W when they were phonetically identical to adult words, which conformed to the context. During this early period of language development, however, certain articulatory inaccuracies and simplifications are inevitable due to the immaturity of articulatory control, and completely accurate word productions are relatively rare. For this reason, the criteria for category W allowed for certain inaccuracies. More specifically, utterances were coded as W when they were identified as words with confidence, as judged by their phonetic forms and the context, but were slightly different from the phonetic forms of the corresponding words with one or two of their phonetic segments being deleted, added, replaced, or voiced/devoiced. Thus, both well-formed and nearly well-formed word productions were included in this category. PW utterances exhibited greater deviance than W utterances from the phonetic forms of the corresponding words, and they were ill-formed word-like productions. The judge must be able to infer possible targeted words from their phonetic forms and the context, while the relationship between the child utterance and their targeted words may not be as apparent as in W utterances. If the child's utterance did not qualify for either the W or PW category, the utterance was classified as 'others' (O). Babbling-like vocalizations, as well as monosyllabic vocalizations which are used to express surprise, draw one's attention, and convey affirmation, such as [a], [o] and [N], belonged to this category. The category O also included protowords, which are defined as repeatedly occurring idiosyncratic phonetic forms which are bound to specifiable contexts, because they are not based on conventional lexical forms.

Because the focus of the study was the phonetic relationship between child utterances and maternal feedback, whether the child's utterances were spontaneous or rote imitations was not taken into consideration. Possible rote imitations, therefore, were also classified in either the W or PW category, depending on the degree of phonetic resemblance to the words. It should

also be noted that the above categories can not be equated with ‘meaningfulness.’ It is true that the degree of word-like-ness and interpretability are inevitably correlated. However, the critical dimension of the classification criteria was phonetic shapes rather than understandability in this study, in which the main theme concerns the acquisition of CONVENTIONAL lexical forms. Utterances which reflect less conventional forms, such as interjections and onomatopoeic vocal expressions accompanying actions, therefore, were classified as ‘Others.’

Contextual parameters in word identification include, in principle, the mother’s utterances which immediately follow the child’s (Vihman & McCune, 1994). However, because the mother’s response characteristics in relation to the child’s utterance types were the focus of the study, the mother’s verbal responses to the child utterance were excluded in judging the status of the child’s utterance. Only when more than one interpretation of a target word was possible did we refer to the mother’s reply.

*Classifications of the mother’s response to the child’s utterance.* Maternal responses to child utterances were categorized as one of the following three major categories: I. Reproductive responses, II. Nonreproductive responses, and III. No responses (Table 1). Mothers’ responses were further classified in order to examine the manner in which reproductions were formed. Since it is not yet known if interrogative and non-interrogative utterances have different psycholinguistic effects on early talkers, these two types of speech were treated separately in further classifications. Reproductive responses incorporate the phonetic characteristics of the preceding child utterance into maternal responses. Reproductive utterances can be divided into the following three sentence forms: (a) Non-expansive, non-interrogative reproductions, (b) Non-interrogative expansions, and (c) Reproductive questions. Non-expansive, non-interrogative reproductions consist of two subtypes: (1) Exact repetitions and (2) Corrections. Utterances were coded as exact repetitions if the mother reproduced the child utterance in exactly the same phonetic form, regardless of whether the child production was a well-formed word, an ill-formed word, or a non-word vocalization. Corrections were those maternal responses in which the mother, following the child’s ill-formed word production, repeated the word but in a phonologically correct form (e.g. the mother produced a well-formed, [torakku] or ‘truck,’ after the child production of [tʃak]). Corrections follow not only the child’s PW productions but may also follow his W productions, because certain phonetic variations were permitted to be recognized as W productions. In such cases, maternal responses to the child’s W productions with his intended words were still coded as corrections (e.g. Child: [towak]; Mother: [torakku]). Maternal replies to the child’s O productions were also coded as Corrections when the mother appeared to interpret the child utterance, not classified into

TABLE I. *Maternal response types*


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I. Reproductive responses
A. Non-expansive reproductions, non-interrogative:
1) Exact repetitions
Repetition of child utterance in exactly the same phonetic form, regardless of whether it is W, PW, or O.
2) Corrections
Repetition of child's ill-formed word production but in a phonologically correct form; the mother may do so by interpreting an O utterance as a word.
B. Expansions, non-interrogative:
1) Non-corrective expansions
Expansion of child utterance in exactly the same phonetic form, regardless of whether it is W, PW, or O.
2) Corrective expansions
Expansion of child's ill-formed word production with its replacement by a well-formed word; the mother may also expand an O production by interpreting and replacing it with a word.
C. Reproductive questions:
1) Non-expansive questions:
a) Exact repetitions with rising intonation
b) Corrections with rising intonation
2) Expansive questions:
a) Non-corrective expansive questions
Non-corrective expansions into questions.
b) Corrective expansive questions;
Corrective expansions into questions.
II. Nonreproductive responses
A. Neutral replies
Simple acceptance of child utterance with [N] or [uN].
B. Move-ons, non-interrogative
Non-interrogative statement by the mother, either relevant or irrelevant to what the child had said.
C. Nonreproductive questions
Questions which do not include the phonetic forms of the child's preceding utterances.
III. No responses

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either W or PW, and responded to it by producing a word which seemed to be the phonetically and contextually closest fit (e.g. Child: [doa]; Mother: [torakku]).

In Expansions, the mother repeated the child utterance with other linguistic elements added. There were two sub-types of expansions: non-corrective expansions and corrective expansions. The mother may expand the child's correct word productions (e.g. Child: [torakku] or 'truck'; Mother: [torakku-da-ne] or 'That's a truck,' or [torakku hofii-no] or 'You want the truck'), or may incorporate the child's ill-formed PW productions (e.g. Child: [kjak]; Mother: [kjak-na-no] or 'You go *kjak*'). These were cases of non-corrective expansions. Non-corrective expansions not only follow W

and PW productions, but they also occur after O productions when the mother quoted the child utterances (e.g. Child: [a:]; Mother: [a:tte] or 'You say [a:]'). Corrective expansions were instances in which the mother expanded an ill-formed word production, replacing it with a well-formed word (e.g. Child: [gakkū]; Mother: [torakkū hōjii-no] or 'You want the truck'). The child's O productions may also be correctively expanded when the mother appeared to interpret the child utterance which was judged as O (e.g. Child: [bu, bo:]; Mother: [poppo-da-ne] or 'That's a choo-choo train').

The reproductive questions category comprised of three subtypes: exact repetitions with rising intonation (e.g. Child: [waNwaN]; Mother: [waNwaN?] or 'Doggy?'), corrections with rising intonation (e.g. Child: [bawa]; Mother: [waNwaN?]), and expansive questions. Expansive questions may be non-corrective expansive questions (e.g. Child: [waNwaN]; Mother: [waNwaN iruu?] or 'Is there a doggy?') or corrective expansive questions (e.g. Child: [bawa]; Mother: [waNwaN hōjii-no?] or 'Do you want a doggy?').

Nonreproductive responses were maternal responses into which the phonetic elements of the preceding child productions were not incorporated. They consisted of the following three types: neutral replies, non-interrogative move-ons, and nonreproductive questions. In neutral replies, the mother simply accepted the child utterance with [N] or [uN]. In Japanese, [N] or [uN] is an informal interjection indicating acceptance or simple acknowledgement similar to *yes*. Move-ons were any kind of non-interrogative statement by the mother, either relevant or irrelevant to what the child had said. When the mother made inquiries, but did not include the phonetic forms of the child's preceding utterances, the responses were coded as nonreproductive questions.

Mothers often repeated the child utterance by first accepting it with [uN] or [N], as in Child: [torakkū], Mother: [uN, torakkū]. All of the above reproductive and nonreproductive response types included the mother's utterances preceded by [uN] or [N]. Finally, instances in which the mother's response was not initiated within three seconds after the end of the child utterance were coded as no response.

*Reliability.* Reliability of transcriptions was checked by an independent judge, who coded half of the transcripts at each age level for each subject. In obtaining intertranscriber agreement rates, differences in vowel duration (e.g. [ba] vs [ba:]) and in voicing (e.g. [ata] vs [ada]) were not considered discrepant. Point-by-point interjudge agreement calculated for the child phonetic forms yielded reliability estimates of 76.0%. Child utterance types were also determined based on the transcriptions of the independent judge. The two judges agreed on the assignment of the categories of W, PW, or O

to the utterances in 92.6% of the cases. Kappa, a statistic for a nominal scale agreement (Cohen, 1960), was calculated to be 0.813. The judges also agreed on the assignment of maternal response types for 97.4% of the child-mother exchange episodes, yielding a kappa of 0.896.

#### RESULTS

A total of 1411 utterances were obtained for the three children, with an average of 118 utterances per observation for each child. Total numbers of W, PW, and O utterances were 282, 218, and 911, respectively.

#### *Frequencies and proportions of word-based utterances (W), possibly word-based utterances (PW), and others (O)*

Table 2 shows the frequencies of occurrences and their proportions of W, PW, and O utterances during each observation. At 1;0, 89.1%, 94.5%, and 91.3% of the utterances were categorized as O for Y.T., R.N., and J.S., respectively. None of the utterances produced by R.N. and J.S. was judged to be W, and only 6.3% of Y.T.'s utterances were classified as W. The percentages of W utterances generally increased with age until the last observation at 1;8 to 1;9, when the proportions of W productions reached 45.9%, 43.8%, and 38.2% for Y.T., R.N., and J.S., respectively. PW were present in all children at all observations, with mean occurrence rates across observations of 17.4% for Y.T. and R.N., and 10.7% for J.S.

Even at the last observation, 23.0%, 27.0%, and 57.4% of the utterances were classified as O for Y.T., R.N., and J.S., respectively. Each child produced, at least at one point, some polysyllabic utterances which were highly likely to be protowords. Such utterances, for which no adult words appeared to be targeted, occurred in Y.T. at 1;9, in R.N. at 1;2, and in J.S. at 1;2 and 1;8, respectively. The frequencies of occurrence were small; their occurrence rates among all O productions throughout the observation period were 0.9% in Y.T., and 2.4% in R.N. and J.S.

#### *Number of lexical items and degree of phonetic variability in the child's W and PW productions*

Besides the frequencies of W, PW, and O utterances among the total vocal productions, number of word types produced during each observation comprises another index of the child's developing language skills. Under the present system of utterance classification, both W and PW utterances represent the child's lexicon (e.g. [ko:dʒi], a PW production, for /çiko:ki/ or 'airplane'). Thus, the number of lexical items must be counted from W and PW productions. An estimate of phonetic variability, a major characteristic of early speech, may also be obtained from the utterances in the W and PW categories. The mean number of phonetically different forms (PDF) per lexical item was taken as the index of phonetic variability.

TABLE 2. *The numbers and their percentages in parentheses of W, PW, and O utterances*

		W	PW	O	Total
Y. T.	12 mos	4 (6.3)	3 (4.7)	57 (89.1)	64
	15 mos	1 (1.6)	13 (20.6)	49 (77.8)	63
	18 mos	43 (29.9)	19 (13.2)	82 (56.9)	144
	21 mos	56 (45.9)	38 (31.1)	28 (23.0)	122
R. N.	12 mos	0 (0.0)	6 (5.5)	104 (94.5)	110
	14 mos	8 (5.8)	27 (19.4)	104 (74.8)	139
	18 mos	26 (20.0)	20 (15.4)	84 (64.6)	130
	20 mos	60 (43.8)	40 (29.2)	37 (27.0)	137
J. S.	12 mos	0 (0.0)	11 (8.7)	116 (91.3)	127
	14 mos	2 (1.6)	16 (12.9)	106 (85.5)	124
	19 mos	30 (26.1)	19 (16.5)	66 (57.4)	115
	20 mos	52 (38.2)	6 (4.4)	78 (57.4)	136

TABLE 3. *Number of lexical items (LI), mean number of phonetically different forms (PDF) per lexical item, and the range of PDF for a lexical item in parentheses, for each child at four observations*

Subjects	Obs.1		Obs.2		Obs.3		Obs.4	
	LI	PDF (range)	LI	PDF (range)	LI	PDF (range)	LI	PDF (range)
Y. T.	4	1	6	1.8 (1-5)	16	1.9 (1-5)	42	1.7 (1-7)
R. N.	4	1.3 (1-2)	13	1.4 (1-3)	16	1.9 (1-6)	44	1.3 (1-3)
J. S.	9	1.1 (1-2)	11	1.5 (1-4)	10	2.0 (1-5)	11	2.0 (1-5)

Table 3 shows the number of different lexical items and mean number of PDF per lexical item observed during each session. 'Lexical items' refer to those utterances which were thought to be conventional-word-based. The number of lexical items generally increased with age in the speech of Y. T. and R. N. In the speech samples of J. S., however, lexical type did not increase in number over the eight month period. Considering that the proportions of W utterances constantly increased in the speech of J. S. (see Table 2), these data showed that this child tended to repeatedly produce particular lexical items during each observation while the frequency of lexical productions in the total vocal output grew with age. Between the sessions at 1;7 and 1;8, the phonetic forms of his word productions increasingly approximated adult forms so that a greater number of utterances qualified for the W category, rather than the PW category, at 1;8.

Phonetic forms were consistent for some lexical productions, but varied greatly across productions for others. The largest number of PDF for a lexical item was as much as 7 for Y. T. at 1;9 (Obs. 4), 6 for R. N. at 1;7 (Obs.

TABLE 4. *Examples of phonetic variations in the speech of the three children, and their utterance types. Observations during which a target lexical item was not produced are indicated as NP (Not Produced)*

Subjects	Lexical item	Obs.1	Type	Obs.2	Type	Obs.3	Type	Obs.4	Type
Y. T.	/torakku/ /trak/* 'truck'	NP		[ta]	PW	[ke:k]	PW	[twa]	W
				[tfa:]	PW	[towat]	PW	[twak]	W
				[tfoa]	PW	[tfa:k]	W	[dakku]	W
				[tfa:tfa]	PW	[kjak]	W	[kakku]	W
				[tfa:tfe]	PW	[twak]	W		
R. N.	/çiko:ki/ 'airplane'	NP		[o:gi]	PW	[dodʒi]	PW	[a:ki]	PW
						[dokikki]	PW		
						[kokikki]	PW		
						[do:ki]	W		
						[koki]	W		
J. S.	/waNwaN/ 'doggy'	[wa]	PW	[bobo]	PW	[wa:wa]	W	[auaua]	PW
		[buwawa]	PW	[paba]	PW			[wauwa]	W
				[hoho]	PW			[wa:wa]	W
				[bauwau]	PW			[waNwa]	W
								[waNwaN]	W

\* Y. T.'s mother used both forms at home; the categories of the child utterances were determined based on the phonetically closer target forms.



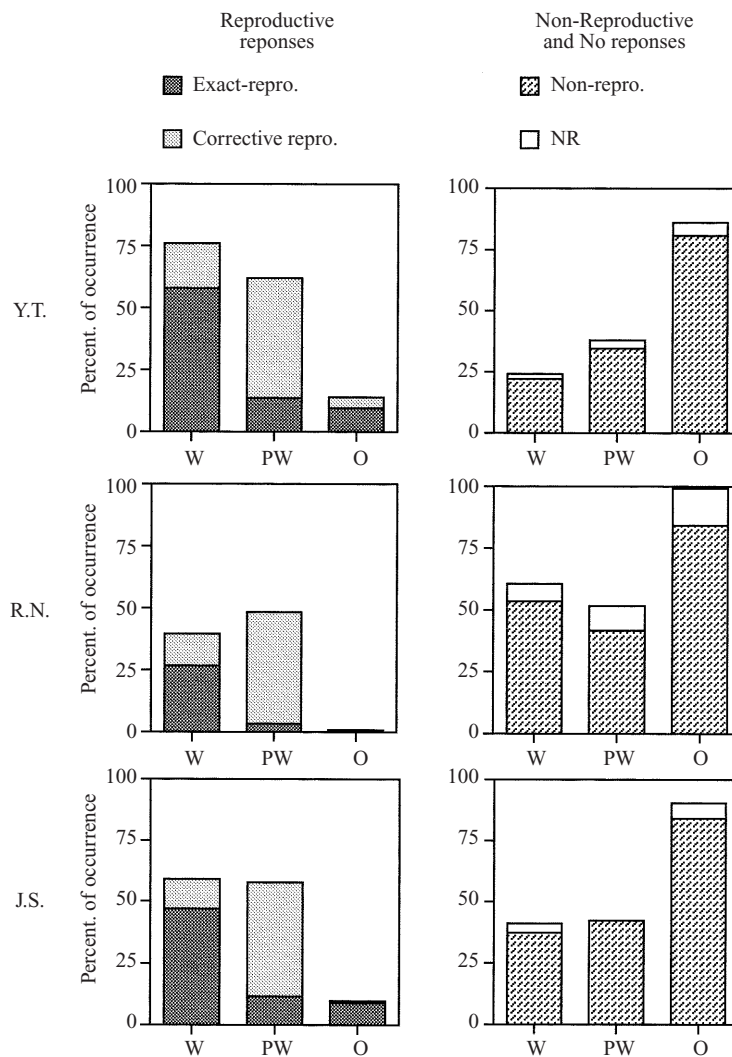


Fig. 1. Percentages of the three major maternal response categories.

3), and 5 for J.S. at 1;2 (Obs.3) and 1;8 (Obs.4) (Table 3). Table 4 shows examples of phonetic variations observed across sessions for each child. There were also some words for which phonetic forms were consistent across productions. In some of such words, however, limited production frequencies may have yielded a smaller chance for the manifestation of production variability. The mean number of phonetically different forms per lexical item during a single observation period was between 1.0 and 2.0.

Among the lexical items which were produced more than once, the mean percentages of those which exhibited within-child production variability during an observation were 63.2%, 52.5%, and 60.0% in Y.T., R.N., and J.S., respectively.

*Types of mother's responses to child utterances*

In order to obtain reliable results concerning the types of maternal responses to the child's W, PW, and O utterances, sufficient numbers of occurrences of each child utterance type are required. Therefore, data from the last two observations in which W productions were more than 15% of total utterances for all children were added for analysis. For Y.T., the cumulative data from the last two observations yielded 99 W, 57 PW, and 110 O utterances; for R.N., 86 W, 60 PW, and 121 O; for J.S., 82 W, 25 PW, and 144 O. The types of maternal responses to the children's utterances were examined using this database.

Figure 1 displays the percentages of the occurrence of reproductive responses in comparison with those of nonreproductive responses and no responses, for the child's W, PW, and O utterances. Three major findings were obtained from this analysis. First, the occurrences of reproductive responses were comparable between the child's W and PW utterances. Y.T.'s W and PW utterances were followed by reproductive responses 76.3% and 62.1% of the time, respectively. As for R.N., 38.5% and 48.0%, and for J.S., 59.8% and 57.9% of W and PW utterances, respectively, were responded to by maternal reproductive responses. There was no significant difference between maternal responding patterns to W and PW utterances in all three mothers (Fisher's exact test = n.s.). Reproductive responses included non-expansive, non-interrogative reproductions, expansions, and reproductive questions. When the responses to the child's W and PW utterances are combined, non-expansive, non-interrogative reproductions occurred most frequently, followed by expansions, and reproductive questions appeared least frequently (Table 5).

Second, there was a distinct difference between maternal responding patterns to the child's W and PW utterances combined and his O utterances. All three mothers responded to the child's W-PW utterances reproductively with markedly greater percentages than to the O utterances. The mean proportions of the occurrences of reproductive replies were 69.2%, 43.2%, and 58.9% to the W-PW utterances of Y.T., R.N., and J.S., respectively (Table 5). In contrast, they were low after the O utterances, accounting for only 13.6%, 0.8%, and 9.0% of the maternal responses to the O productions of Y.T., R.N., and J.S., respectively. Reciprocally, nonreproductive responses predominated only to the child's O productions. The difference in the distribution of maternal response types was highly significant (Fisher's exact test:  $p < 0.0001$  for all subjects).

TABLE 5. *The frequencies of occurrences and their percentages in parentheses of each type of Reproductive responses and those of Non-reproductive responses and No responses during the last two observations*

Ch	Utt	Type	Repro responses			Non-Repro Subtotal	NR
			Non-exp	Repro	Expansions		
Y.T.							
	W+PW		60 (38.5)	26 (16.7)	22 (14.1)	108 (69.2)	4 (2.6)
	O		9 (8.2)	3 (2.7)	3 (2.7)	15 (13.6)	6 (5.5)
R.N.							
	W+PW		27 (18.5)	23 (15.8)	13 (8.9)	63 (43.2)	12 (8.2)
	O		1 (0.8)	0 (0.0)	0 (0.0)	1 (0.8)	18 (14.9)
J.S.							
	W+PW		34 (31.8)	21 (19.6)	8 (7.5)	63 (58.9)	3 (2.8)
	O		5 (3.5)	3 (2.1)	5 (3.5)	13 (9.0)	9 (6.3)

The third set of findings comes from the comparison between maternal responses to the child's W and PW productions. There was a distinct difference between the manners in which the child's W and PW productions were reproduced by the mother in all the mother-child dyads. Figure 1 also indicates the percentages of exact reproductions and corrective reproductions. Both exact repetitions and non-corrective expansions were two subtypes of exact reproductions, whereas corrections and corrective expansions belonged to another, broader class of corrective reproductions. The occurrence rates of the non-corrective and corrective types varied depending on the well-formedness of the child utterances. In both non-expansive reproductions and expansions, the non-corrective types, i.e. exact repetitions and non-corrective expansions, predominated in the responses to W utterances; conversely, the corrective counterparts, i.e. corrections and corrective expansions, occurred with greater proportions than did the non-corrective types following PW utterances. In non-expansive reproductions, the differences between the distribution of exact repetitions and corrections for W and PW were significant in all three mother-child dyads (Fisher's exact test:  $p < 0.0001$  for Y.T.;  $p = 0.0002$  for R.N.; and  $p = 0.0017$  for J.S.). The differences were also significant in expansions ( $p < 0.0001$  Y.T.;  $p = 0.027$  for R.N.; and  $p = 0.025$  for J.S.). In reproductive questions, however, the occurrences of corrective inquiries were not significantly different between W and PW productions. Overall, the results indicated that maternal replies constituted a more contrastive feedback for the child's ill-formed word-like utterances than for well-formed word-based productions in both non-expansive, non-interrogative reproductions and expansions.

MATERNAL RESPONSES TO WORD-LIKE-NESS

*Changes in the mother's response types to the child's O utterances*

The data were next analysed to determine whether maternal responses to child utterances changed with age. Since only nonmeaningful vocalizations occurred with frequencies sufficient for cross-age comparisons in all subjects, the proportion of occurrences of each maternal response type to O utterances was compared across 4 observations for each child (Table 6). The total

TABLE 6. *The proportions of occurrences of maternal response types to the child's O utterances*

Y. T.				
Response types	12m	16m	18m	21m
Repro subtotal	14.8	9.1	11.7	15.5
Non-Repr que	18.5	22.7	26.7	52.0
Move-ons	35.2	25.0	34.9	14.5
Subtotal	53.7	47.7	61.6	66.5
Neutral Rep	18.5	20.5	20.9	12.8
NR	13.0	22.7	5.8	5.2
Subtotal	31.5	43.2	26.7	18.0
R. N.				
Response types	12m	15m	18m	20m
Repro subtotal	11.5	1.0	1.6	0
Non-Repr que	4.8	16.2	22.6	27.3
Move-ons	47.1	41.9	48.6	51.4
Subtotal	51.9	58.1	71.2	78.7
Neutral Rep	13.5	23.8	12.9	5.8
NR	23.1	17.2	14.3	15.5
Subtotal	36.6	41.0	27.2	21.3
J. S.				
Response types	12m	14m	19m	20m
Repro subtotal	12.9	6.6	9.6	8.4
Non-Repr que	6.9	7.6	16.7	17.5
Move-ons	36.2	39.6	37.8	54.8
Subtotal	43.1	47.2	54.5	72.3
Neutral Rep	35.4	34.0	31.3	11.3
NR	8.6	12.2	4.6	8.0
Subtotal	44.0	46.2	35.9	19.3

occurrence rates of reproductive responses stayed relatively constant over the entire period with no major direction of change. However, the sum of non-reproductive questions and move-ons, or content-rich response types, tended to increase in the responses of all three mothers. The rising tendency was evident after the second observation for Y. T., and after the first sessions

for R.N. and J.S. Despite the common pattern of change, the mothers differed in their use of content-rich response types; there was a marked increase in non-reproductive questions in the mother of Y.T. between the last two sessions, whereas the proportions of move-ons rose considerably in the mother of J.S. during the corresponding period. Reciprocally, the total occurrences of neutral replies and no responses tended to become less frequent over time. In all three mothers, these trends were apparent after the second session. Overall, these trends indicated that the mother's response patterns changed over time in such a manner to more directly elicit verbal replies or to continue communication with verbal content.

#### DISCUSSION

It has been suggested that maternal phonetic and/or semantic contingent responses facilitate the child's language development (Hardy-Brown *et al.*, 1981; Veneziano, 1988; Velleman *et al.*, 1989). This study attempted to provide data showing that child-mother vocal/verbal exchanges could promote the elaboration of lexical forms in the period of transition from prelinguistic speech to language. While there is much research on the paths to the acquisition of adult phonetic forms, the nature and possible roles of maternal feedback have not been fully investigated. The main objective of this study was to examine whether a mother shows reproductive responding patterns in a manner which could assist the child in learning correct phonetic forms. To this end, child utterances between 1;0 and 1;8 to 1;9 were first classified into word-based utterances, possible word-based utterances, and others, based on the degree of proximity to adult phonetic forms and the context in which they occurred. Consistent with the report that nonword vocalizations occurred throughout the single-word stage of English-learning children (Robb *et al.* 1994), substantial proportions of the child speech consisted of utterances which showed only marginal phonetic similarity to conventional words, and of non-word-like vocalizations, even at the last observation. Within-child production variability was also evident in all children, and the lexical forms of many words varied across productions even during a single observation period.

Maternal reproduction would have potentially facilitatory effects in the elaboration of lexical forms if the following two conditions are met: (1) a mother replies to a child's immature speech forms with correct models of his/her attempts through partial reproductions, and, conversely, (2) the child's nonmeaningful vocalizations are not reproduced or modified with similar frequencies. An analysis of maternal responding confirmed this pattern, showing a distinct difference in reproductiveness in responding depending on the word-like-ness of the child utterances. All three mothers responded to the child's W and PW utterances with significantly higher

percentages of reproductive responses than to the O utterances. The children's W productions tended to be repeated in their exact phonetic forms or in an expanded form, but their PW utterances tended to elicit the correct renditions of the targeted words or longer utterances incorporating the correct phonetic forms. Reciprocally, nonreproductive responses and no responses predominated only to the children's O productions. Thus, reproductive feedback was contingent on the type of the children's utterances.

Reproduction of certain phonetic properties of child utterances is a common feature shared by repetitions and expansions, whether of the non-corrective or the corrective type. However, only corrections and corrective expansions would create a contrast between the child utterance and the maternal reply. Corrections present the child with appropriate phonetic models, and corrective expansions further provide the child with models of how correct forms can be embedded in a more linguistically complex structure. Saxton's (1997) contrast theory claims that a conflict between child erroneous linguistic forms and immediately following adult presentation of correct models constitutes the basis on which the child perceives the adult form as a correct alternative and rejects his/her own production errors. The observed patterns of child-mother vocal/verbal interactions coincided with those which Saxton identified as facilitatory for the acquisition of grammatical forms. Modified reproductions of the child's ill-formed word-like speech ensured the contrastiveness of maternal feedback, providing the child with opportunities to learn about the adequacy of his output forms. Although the mother could have imitated or modified the child's non-word-like vocalizations in reply, the child utterances which were not recognizable as conventional words were generally responded to with non-reproductive utterances. Thus, through modifications by partial reproduction and the selectivity of reproductive responding, maternal responding patterns may promote the acquisition of lexical forms.

Besides the coexistence of word-based utterances and vocalizations not directly linked to adult words, another major characteristic of child speech during this period is within-child production variability. This study showed that phonetic forms of certain word-based productions were highly variable. Some possible sources of variability are: input variations, contextual influence, and articulatory restrictions, as reviewed by Ferguson (1986) and Schwartz (1988). Furthermore, production variability may originate in a lack of precision in the phonetic specifications of a lexical representation. More specifically, the child recognizes the presence of a certain phonetic segment in a word, but being unable to identify the sound, the word is stored with a fuzzy phoneme with much broader specifications (Ingram, 1974; Menn, 1983). For example, the segment may be represented as /(*consonant-like*)/, /(*front vowel*)/, or even /(*syllabic*)/. In this view, production variability manifests the immature underlying form, but the variability is further

interpreted as reflecting the child's attempt to obtain auditory effects which are closest to adult productions.

In cognitive models of phonological development (e.g. Ferguson & Farwell, 1975; Kiparsky & Menn, 1977; Macken & Ferguson, 1981; Menn, 1983), children are assumed to actively discover structures, test hypotheses, and solve problems. It is speculated that this theoretical model would predict that the reproductive responding patterns of the mother found in this study are beneficial for the child's acquisition of lexical forms in two ways. First, contrastive feedback from the mother provides phonetic information to equip the underspecified segment with more features, and to fill in missing phonetic elements. Second, the immediate feedback cues the child as to which productive attempt is closer to the target, and would assist the child in selecting one alternative phonetic form of a lexical item over the others. Such a process is unique to interpersonal verbal interactions. It is possible that variability originates, at least in part, from immaturities of articulatory control (Smith, 1988), in which case the knowledge of the mistaken phonetic element would have little impact on improving the child's articulatory motor control. However, for lexical items which lack precise phonetic specifications, or for those for which the child is struggling to discover the structure, feedback would provide a model for forming a proper representation, and function as the ground on which the child selects a certain phonetic alternative.

In this theoretical framework which takes production variability into account, exact repetitions and non-corrective expansions to W utterances should also be facilitatory. For the child's correct output, the mother's reproductive utterances have a positive effect, confirming the child's preceding well-formed productions (Demetras *et al.*, 1986). Neutral replies of [uN] or [N], which is an informal form of 'yes,' would also acknowledge the child's preceding utterance. From the child's point of view, however, maternal reproductions carrying phonetic information have greater value as feedback than simple affirmations by [uN] or [N]. In addition, given the child's active attempt at attaining adult lexical forms, such positive input functions to stabilize the production of correct phonetic shapes. It is assumed that the child has a certain structural comparison mechanism for immediate events, possibly related to auditory encoding skills and echoic memory capacity, to detect and highlight the difference between his own phonetic output with the adult's. The child does not simply perceive unmatched phonetic segments from adult replies; rather, the whole process, including the attempt at attaining correct adult forms, the selection of certain alternatives, and the stabilization of well-formed ones, leads the child to produce approximations of adult phonetic forms.

The present data showed that there were differences in the rates of two reproductive responses depending on the well-formedness of the child

utterances. The corrective types, i.e. corrections and corrective expansions, occurred with greater frequency than did their non-corrective counterparts (i.e. exact repetitions and non-corrective expansions), following PW utterances, whereas the non-corrective types predominated in the responses to W utterances. In other words, the mothers tended to exactly repeat the child's well-formed productions, but they were more likely to reply with correct renditions of the targeted words when the child's word productions were ill-formed. This seemingly differential responding to W and PW productions would be an example of what Marcus (1993) called 'definitional artifacts.' That is, because mothers nearly always talk in linguistically correct forms, certain response types, such as exact repetitions, inevitably follow well-formed utterances more often than ill-formed ones. Mothers' non-discriminatory responding with adult words to W and PW productions suggested that the mother responded to the child's lexical attempts by reproducing the CONTENT of the child utterances, and this in turn provided phonetic information to the child. Mothers' response patterns are most simply explained by their sensitivity to the semantic value of speech, rather than sensitivity to phonetic adequacy. The content sensitivity is consistent with the assumption that the manner in which parents respond to the child's utterances depends upon their ability to understand the meaning of the utterances (Furrow *et al.*, 1993).

As the results indicated, the mother's interpretation of the child's vocalizations as meaningful constitutes the foundation of mother-child communication during the early period of language development (also, Harding, 1983; Veneziano, 1988). How, then, did the mother respond over time to vocalizations which did not seem word-based? Results of the longitudinal analysis showed that the proportion of content-rich response types (i.e. non-reproductive questions and move-ons) tended to increase in all three mothers, whereas neutral replies and no responses tended to become less frequent over time. Taken together, the maternal response patterns for the child's O utterances gradually changed with age, with the mother increasingly tending to rely on content-oriented verbal communication.

Such changes in maternal responding may begin even earlier than 1;0. In keeping with the finding that the proportion of mother's neutral utterances tended to decrease, the proportion of occurrences of the maternal utterances which merely expressed the mother's attentiveness to the infant's vocalizations (e.g. *mmmh* and *really*) reportedly decreased during the infant's first year of life (Broerse & Elias, 1994). The present findings suggest that two types of maternal expectations arise: (1) the expectation that the child utterances are meaningful or word-based, and (2) that the child is capable of answering questions and taking verbal turns. In other words, communication is becoming semantically richer, and information exchanges become more and more central to child-mother interactions. The emergence of the verbal



route of interaction in the child provides the mother with a chance to take advantage of this new channel to infer the child's intention. It is speculated that these changes had the same basis as the content-based responding tendency of the mother, as reflected in the distinctively different responding patterns for W-PW utterances and O utterances.

The conclusions of this study may be limited by its small sample, and the mother's responsiveness to the child utterance may have been influenced by the recording situation. Nevertheless, the consistency of maternal reproductiveness across the three mother-child dyads indicated that mothers do give children feedback which may promote the acquisition of lexical forms during the transition period. The data of Velleman *et al.* (1989) suggest that children who receive more phonetically contingent responses from their mothers tend to learn language more rapidly during the late-prelinguistic and early-linguistic periods. The corrective potential of contrastive feedback has also been demonstrated by Saxton (1997) in the acquisition of irregular past test forms. How adults ('reproductive response patterns might benefit the child in the acquisition of lexical forms needs to be examined in future studies.

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## APPENDIX

### INSTRUCTIONS FOR CHILD UTTERANCE CODING

Each of the child's utterances was first checked to see whether it qualified as a word-based utterance (W); if not, it was checked for categorization as a possible word-based utterances (PW); if it did not qualify for either category, the utterance was classified into other utterances (O).

#### *I. Definition of word-based utterances (W)*

(a) Utterances are coded as word-based (W) when they are phonetically identical to adult words, which conform to the context.

(b) Utterances are coded as W when they are identified as words with confidence, as judged by their phonetic forms and the context, but are slightly different from the phonetic forms of the corresponding words with one or two of their phonetic segments being affected by any the following major error patterns: consonant substitution, vowel substitution, consonant deletion, vowel deletion, syllable deletion, voicing change, and miscellaneous patterns.

Consonant Substitution includes such narrower error patterns as stopping, affrication/deaffrication, apicalization, palatalization, backing, place and/or manner assimilations, and gliding. In Japanese phonology, both place and manner of articulation for certain consonantal phonemes change concomitantly depending on the following vowel. For example, when the phoneme /tʃ/ is apicalized in the syllable /tʃo/ , it also tends to become deaffricated as [to] because the syllabic form [tso] is nonexistent in this language.

#### Consonant Substitution

[takana] for /sakana/ ('fish')	(stopping)
[batsɯ] for /basɯ/ ('bus')	(affrication)
[to:to] for /tʃo:tʃo/ ('butterfly')	(apicalization + deaffrication)
[baʃɯ] for /basɯ/ ('bus')	(palatalization)
[geNʃa] for /deNʃa/ ('train')	(backing)
[kju:ʃu:ʃa] for /kju:kju:ʃa/ ('ambulance')	(place and manner as- similation)
[towakkɯ] for /torakkɯ/ ('truck')	(gliding)

#### Vowel Substitution

[daNʃa] for /deNʃa/ ('train')

## Consonant Deletion

[ko:i] for /ko:ri/ ('ice')

## Vowel Deletion

[bas] for /basu/ ('bus')

[mmamo] for /mama mo/ ('mommy too')

## Syllable Deletion

[ko:ki] for /hiko:ki/ ('airplane')

## Voicing/Devoicing of Consonants

[çigo:ki] for /hiko:ki/ ('airplane')

[tʃu:su] for /dʒu:su/ ('juice')

## Miscellaneous Patterns

[rotakku] for /torakku/ ('truck') (metathesis)

[buuwawa] for /waNwaN/ ('doggy') (syllable addition)

Unlike English, most of the typical vocabulary of Japanese children is polysyllabic. There is even a tendency for certain monosyllabic words to be first acquired in polysyllabic forms, e.g. /omeme/ for /me/ ('eye') and /otete/ for /te/ ('hand'). Thus, monosyllabic consonant-vowel utterances intended for words generally reflect syllable deletion. Because a syllable in Japanese generally has a simple, vowel-only or consonant-vowel structure, much of the phonetic information is carried in the polysyllabic form itself. Reduction of disyllable words into a consonant-vowel structure, therefore, yields ambiguous monosyllabic utterances. For these reasons, only deletion of a single syllable in words consisting of more than 3 syllables is accepted for the W category. While Japanese is a moraic language, syllables are used as a basic rhythmic unit since there is no evidence that verbal productions of children aged 1;0 to 1;8 are mora-based.

Words in adult forms as well as in child forms are accepted.

e.g. Child forms	Adult forms	
waNwaN/	/intu/	('dog')
/kokko/	/niwatori/	('chicken')
/tʃuNtʃuN/	/tori/	('bird')

Many of the Japanese child-form words derive from onomatopoeia, as exemplified above. Onomatopoeic or idiosyncratic phonetic forms which reportedly are used as words at home BOTH by mother and child are treated as W, such as [pi:po] ('police car') used by Y. T. and [dʒa:] ('pour') used by R. N. However, onomatopoeic expressions which the child produces with actions (e.g. [bu:::] moving a car) are not included in the W category, because such expressions are more weakly linked to conventional phonetic forms, allowing a certain degree of originality.

Certain monosyllabic vocalizations, such as [a], [o] and [N], can be used to express surprise, draw one's attention, and convey affirmation. Such vocal-

izations with emotional connotations are classified into interjections in Japanese. Other interjections, however, have more specific lexical forms, such as /hai/ or ‘yes,’ /are/ used when experiencing unexpected events, and /hora/ used to draw one’s attention. Only the latter type of interjections are included in the W category. Only /hai/ was present in the speech samples of the subjects.

## II. Definition of possible word-based utterances (PW)

Utterances which do not meet the criteria for W are checked for categorization as possible word-based utterances (PW) using the following criteria: a) Utterances are coded as PW when they show some phonetic resemblance to adult words, as judged from their phonetic forms and the context in which they occurred, but do not meet the criteria for W. Some of them are monosyllabic consonant-vowel utterances for which more than one possible target word can be speculated without the necessary contextual information.

Example	Situations
[ko] for /kokko/ (‘chicken’)	Looking at a picture of a bird.
[ma] for /uma/ (‘horse’)	Looking at a picture of a horse.
[na:] for /nainai/ (‘All gone.’)	Putting blocks into a sack.
[aido:] for /hai do:zo/ (‘There you go.’)	Giving a block to mother.

The above examples have specific referents (e.g. names of objects and animals) or the utterances are accompanied by gestures or body movements which suggest target words or phrases, as is the case with *All gone*. PW also includes utterances which cannot be classified into W with certainty due to a lack of specific referents or gestures, but which may possibly be meaningful words from the phonetic forms and the context.

### Examples

[kottʃia]

From the context, this may be interpreted as being a degraded form of /kottʃi da/ (‘This way’), but it is uncertain as no explicit referent is present.

[kores]

Looking at blocks scattered on the floor. This may be derived from /kore/ (‘this’).

b) Utterances are coded as PW when they are assumed to be inaccurate imitations of the mother’s immediately preceding utterances, and are also semantically consistent with the context. They may or may not be understood from their phonetic forms and the contexts alone.

Examples	Situations
Mother: [oNbu]	
(‘Carrying on the back’)	

- Child: [o:u]                      Looking at a picture in which a dog is carrying  
a koala bear on its back.
- Mother: [kottʃi] ('This way')
- Child: [tʃi]                      Looking at a train in his hand.
- Mother: [nan daro:] ('What is it?')
- Child: [nnano]                    Looking at a camera.
- Mother: [kuzzure tʃatta] ('They collapsed')
- Child: [kwʊtʃatta]                      Looking at a collapsed tower of blocks.

The judge must be able to infer possible targeted words from their phonetic forms and the context. As is the case with W, onomatopoeia with actions (e.g. [bu:::] while moving a car) and certain monosyllabic interjections are not included.

### *III. Definition of Other utterances (O)*

The child's utterances which are classified into neither W nor PW are classified as Other utterances (O). Babbling-like vocalizations, as well as monosyllabic vocalizations which are used to express surprise, draw one's attention, and convey affirmation, such as [a], [o] and [N], belonged to this category. This category also included protowords, i.e. repeatedly occurring phonetic forms which are bound to specifiable contexts.